An evaluation of information and communication technologies in the FET phase to enhance self-directed learning

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DECLARATION

DECLARATION

I, Frans Sipho Mahlaba, hereby declare that this thesis for the degree *Doctor in* Education in Curriculum Studies at the Potchefsroom campus of the North West University is my own independent work and has not been previously submitted by me to any other faculty or university.

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ABSTRACT

KEYWORDS: Evaluation; Information and Communication Technologies; Self-directed learning; Curriculum; Social collaboration; Learning environment; Blended Learning; Face-to-face learning; Online learning.

Education departments are faced with the challenge to supply or 'e-supply' Information and Communication Technologies (ICTs) to their institutions in order to balance supply and demand in the ever-changing, dynamic twenty-first-century information-age milieu (Hadini, Trifess & Rifai, 2020:2). To fulfil the e-supply mandate, education departments frequently procure a large spectrum of ICTs from various developers, manufacturers and publishers. The main concern is whether ICTs considered for procurement do indeed appropriately meet pedagogical needs of the end-users, namely learners and educators (Andyani, Setyosari, Wiyono, & Djatmika, 2020:129). To optimally test for appropriateness and ascertain whether required standards were met during ICT development or design, evaluations need to be performed. In addition to pedagogy, the secondary rationale for ICT-evaluations could be cost-effectiveness; the difference in cost and outcomes (Verbelen, Weale & Lewis, 2017:396) or product value. Considering the rationale, ICT-evaluation should be a formal, non-haphazard process governed by user-centred criteria, preferably embedded in a specialised capable tool or instrument (Raulamo-Jurvanen, Hosio & Mäntylä, 2019:4).

Contextually, this study focuses on the Gauteng Department of Education (GDE), which is no exception to the above-stated challenges of e-supply. Also the GDE's mandate is to continually e-supply ICTs and devise measures for determining their appropriateness by means of prior evaluations. The mandate is implicit in various national and provincial policy documents, including the Guidelines on the Management and Usage of ICTs in public schools in Gauteng (2010) and Professional Development Framework for Digital Learning (2017). The connotation from such documents is that ICT-evaluation and -selection should adopt a user-centred approach which values and prioritizes the ICT end user (Merlo, Audrey, Llaria, Terrasson, Villeneuve, & Pilniere, 2019:197). Also implicit in policy documents is the thrust for ICT selection to be influenced by institutional and moral norms rather than by personal preferences (Lamb & Kling, 2003:212; Rossi, 2016).

The purpose of this study was to research whether GDE adheres to the aforesaid ICT-evaluation mandate. In particular, the study investigates whether GDE managers and educators implement policy-based processes and procedures during ICT-evaluation and -selection in the FET-Phase.

The study also endeavours to establish an *ideal, all-inclusive* set of criteria for the development of an ICT-evaluation instrument suitable for self-directed learning (SDL) environments.

The objectives of the study were to:

- describe by means of a literature review whether managers and educators use ICT-evaluation procedures to select appropriate ICTs and determine the main barriers within the process globally and in South Africa.
- determine what an ideal evaluation instrument should look like according to literature and educators in order to support the implementation of ICTs in the FET-Phase curriculum in self-directed learning environments.
- understand the whether GDE managers and educators perceive an ICT-evaluation instrument as being a viable tool for evaluation of the FET-Phase curriculum.
- determine whether education managers involve educators in the process of ICT-evaluation and -selection for the FET-Phase curriculum.
- obtain suggestions from subject teachers and GDE curriculum specialists on what can be infused with an ICT-evaluation instrument to enhance self-directed learning in the FET-Phase.
- propose means to integrate and utilize an ideal, all-inclusive ICT-evaluation instrument for the enhancement of self-directed learning in the FET-Phase curriculum.

The interest to undertake this research was based on the identified gap; the gap being that although GDE's affirmation of ICT-evaluation is implicit in the above-stated policy documents, there was no evidence of an ICT-evaluation instrument or of such criteria. Furthermore, the study inquired about the level at which the end-user's needs and inclusion are catered for when ICT-evaluations are performed. The interest was also invoked by the researcher's past experience as a FET-Phase educator, Learner and Teacher Support Materials (LTSM) co-ordinator as well as previous research experience on LTSM evaluation. As a product of previous LTSM work and research, an evaluation instrument was developed for the GDE and was used to contribute to the national Department of Basic Education evaluation processes and procedures.

Prior to undertaking this study, a research paradigm needed to be identified and adopted. Consequently, the combined principles of Functional Pragmatism and Interpretivism were deemed suitable; thus adopted. Based on the central convictions of Interpretivism and Functional Pragmatism, humans need to work collaboratively in order to gain a common comprehension of their world and together take optimal multilateral actions (Juuti, Lavonen, & Meisalo, 2016:38). Much as these philosophical convictions were used during data collection, the researcher also propagates consideration of such when ICT-evaluations are planned and performed. Thus one may propagate that meaningful evaluations are not possible where disregard exists for social collaboration with the educator, the ideal knowledgeable techno-pedagogue (Sasirekha & Sasthya, 2017:249) who, on a daily basis, socially interacts with the learner, his partner and ultimate customer of the GDE.

Based on the Philosophical paradigms, this study adopts Design-based research (DBR). DBR is compatible with the objectives of this study because it plays the role of generating knowledge of theory and practice by exploring relationships between new findings and existing theories (Goff & Genet, 2017:107). It makes it feasible to generate new knowledge and theories, and improve curriculum implementation strategies. DBR therefore lays a proper foundation for the path this study needs to take. This study adopted a mixed research method; thus utilised both quantitative and qualitative strands. The Quantitative strand employed numerical data to express research findings based on social phenomena (Ong & Puteh, 2017:14). On the converse, the qualitative strands gave a textual description of oral or optical data (Hammarberg, Kirkman, & De Lacey, 2016:499). Both sets of data were used to reach decisions in real life, concerning ICT-evaluation. The quantitative strand was characterized by a survey and the qualitative strand consisted of interviews; both individual and focus-group.

Regarding the research findings, to determine the validity and reliability of the survey questionnaire, the researcher applied factor analysis by means of which many variables, probably with a shared variance (Bork, Wijsen & Rhemtulla, 2018:586), were condensed into one. The factor analysis yielded three factors, viz. participation, procedures and leadership. Regarding participation, the majority of the responses reflected doubt that educators were fully allowed to participate in ICT-evaluation processes. A possibility exists of lessened involvement due to lack of directive, intrinsic motivation (Azeez, Fapohunda & Jayeoba, 2019:20), acceptance of ICTs and attitude towards ICT-based SDL (Pan, 2020). Pertaining to procedures, most respondents stated their wish to be included in ICT-evaluation through social collaboration. They also stated insufficient awareness programmes regarding ICT-evaluation. Inputs from survey, individual and focus-group interviews as well as a literature review were applied in the development of the ICT-evaluation instrument which was created and tested with the aid of a small working group. Thus one may conclude that the intended outputs of this research work, namely development of criteria and an instrument for ICT-evaluation, were achieved.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

CHAPTER 1: INTRODUCTION

1.1 OVERVIEW OF THE STUDY

This study was undertaken to propose processes and procedures to be implemented during the evaluation of ICTs for the Further Education and Training (FET) Phase, which includes grades 10 to 12, with the support of an empirically validated evaluation instrument. Although it is not explicitly mentioned in the study's title, an ICT- evaluation instrument was developed as part of this research work. Such Execution was motivated by a notion that instrument development is indispensable where there is evaluation of educational policies, systems and facilities (Sugiharni, Satish, Mahindra, Arcana, & Dayana (2018:5804). Development and utilization of the ICT- evaluation instrument might be challenged by the digital divide effect (DD). Thus, it was pivotal for engagement in the theoretical review of the DD, an essential concept in Chapter three, section 3.3.3.

As also stated in the title of this work, ICT evaluation is done to enhance SDL) in the FET-Phase. It was also inevitable to discuss SDL without engaging in the theoretical review of Blended learning (BL), a related concept involving face-to-face and online learning, discussed in Chapter three, section 3.4. The following two-pronged research question propelled this study: *To what extent do Gauteng Department of Education (GDE) managers and educators implement policy-based processes and procedures during ICT-evaluation and -selection in the FET-Phase; and what is the ideal, all-inclusive set of criteria for an evaluation instrument suitable for self-directed learning environments?*

Following is an in-depth motivation coupled with essential factors such as theoretical perspectives based on a literature review; identified gaps; problem-statement; as well as research questions, aim, design, methodology and methods. The researcher also gives an exposition of and refers to ethical considerations which govern the letter and spirit on which the study was established. This is coupled with a section on trustworthiness and, of optimal value, declaration of the contribution the study aspires to make to the education department(s) for ultimate benefit to the end-users, i.e., the educator and the learner. The next subsection describes the theoretical perspectives on which ICT evaluation will be based in this study.

1.2 THEORETICAL PERSPECTIVES OF ICT EVALUATION AND SELECTION

This study was inspired by the researcher's prior involvement, background and experience in curriculum delivery, both as head of Learner Teacher Support Materials (LTSM) evaluation as well as an educator in the FET-Phase. Hence the researcher has previously fulfilled a leadership role in LTSM instrument development projects in the GDE. Notably, due to the context of that era within the GDE, such formal evaluation works were focused on printed as opposed to ICT media. As a deliverable, this study envisaged to produce a pedagogical instrument to evaluate and select ICTs that, amongst other things, satisfy the Curriculum Assessment Policy Statement (CAPS) needs and is receptive and conducive to SDL environments in the FET-Phase. Since ICT and SDL are both regarded as key elements of the study, the author of this document would like to elucidate the two terms and explain how they were applied in context.

SDL is remarkably defined as “a process in which individuals take the initiative with or without the help of others in diagnosing their learning needs, formulating goals, identifying human and material resources, and evaluating learning outcomes" (Knowles, 1975:18). From this definition, one may deduce that SDL is centred on the individual learner who is allowed to enjoy autonomy, take own initiative, set own self-learning goals and, through self-assessment, decide on the learning outcomes to be realized (Siminica & Dumitru, 2013:121). While engaged in SDL, the learner does need to engage with others (Roumell, 2016:7) socially. The social context has a role to play in SDL because it constantly contributes to and influences the learner’s self-perception, attitude towards learning and life-long strategies (Roumell, 2016:7). Infusion of social context implies that in SDL, a learner does not entirely work in isolation but ought to engage with others socially. During that social context, the educator’s role is mainly to set the required informal learning environment (Song & Bonk, 2016:4) for the learner by promoting effective learning strategies (Palmer, Chu, & Persky, 2019:1964).

In the context of this study, an ICT-evaluation instrument is designed to support the educator to select appropriate ICTs for attainment of the aforementioned role. The educator aspires for selection of supportive digital resources or ICTs (Claro *et al.*, 2018:171) that are conducive to SDL environments characterised by empowerment of the learner to gain relevant SDL skills. Once the educator has done his part, he grants the learner the opportunity of taking control and directing their own learning process and engaging in diagnostic self-assessment of needs, assessing individual competencies and determining needs (Sumuer, 2018:30).

When deciphering the existing GDE-evaluation instruments it seemed that in the past, formal evaluations were focused on printed LTSM and left out electronic media or ICTs. The researcher therefore identified lack of a formal ICT-evaluation instrument as a gap, which he then investigated by means of this research study. Although, UNESCO has an instrument, it is, according to the author of this document’s view, not based on SDL, not interactive and concise – therefore not fitting for use by educators at school level with the intent also to cultivate SDL in the Geography classroom. This study adopted and employed Functional Pragmatism and

Interpretivist philosophical convictions coupled with compatible data collection, analyses and interpretation methods and techniques.

Considering Southern African Consortium for Monitoring Educational Quality (SACMEQ) objectives in which some Southern African countries, including South Africa, committed to ICT acquisition for their schools (Moloi & Strauss, 2005:11), one may assume that ICT-evaluation is a non-negotiable, periodical, global and indispensable requirement in this era of digital revolution. Evaluations need to be done before ICTs are acquired. One may assert that ICT acquisition is no longer a mere choice but is mandatory because global ICT upgrades pose a challenge to any nation that seeks to compete in the socio-economic sphere influenced by the digital economy (Dzobelova, Yablochnikov & Semenova, 2019:2). The new digital era comes with diversity, differentiation and fragmentation as opposed to the past characteristics of standardization, homogeneity and organization (Loconto & Demortain, 2017:383).

As stated earlier, in the GDE context, selected ICTs should comply with the CAPS, be suitable for SDL and also encompass pedagogies. Adegbenro and Gumbo (2015:34) explain that pedagogies determine teacher- and student-experiences in an ICT learning environment. It is anticipated that when educators incorporate new pedagogies utilizing ICTs, they will potentially optimally reach their curriculum and SDL objectives. While achieving the aims of the Department of Basic Education (DBE) in the CAPS is compulsory, the SDL element of individualization or individualized learning plans (Robinson, 2018:3) means that a learner cannot be held back and thrown into boredom in case of content in which he/she is competent.

To support SDL as implied above, ICTs should be used in conjunction with other teaching aids, depending on the planned activities. In other words, SDL is meant to “enhance and support the educational environment and classroom instruction by creating opportunities for learners to (liberally) complete assignments” (Tondeur, Bassig, & Cagurangan, 2015:9). The proposed evaluation instrument also adopts what Dakich (2008:18) tabulates as four dimensions of educators’ ICT literacy. These are: (a) *Operational Understanding and application of ICT*; (b) *ICT-rich pedagogies and learning environments*; (c) *ICT for professional learning and engagement*; and lastly (d) *The Social ecology of living and learning with ICT*.

In relation to the study, the first dimension as stated above, *Operational Understanding and application of ICT,* implies that some sections of the instrument should focus on the level of ICT policy dissemination to all. The second dimension, *ICT-rich pedagogies and learning environments,* is a continuation of the first dimension but here the proposed instrument will encourage evaluation of whether ICTs allow the educator to implement both traditional and new pedagogies in ICT integration. The third dimension, *ICT for professional learning and* *engagement,* caters for proper training of the educators for, inter alia, utilization of ICT in the classroom. The fourth dimension, *The Social ecology of living and learning with ICT,* appeals for an instrument that evaluates ICTs that support and promote SDL in the FET classroom.

In consideration of the aforementioned dimensions, the question that arises is whether ICT-evaluation and -selection processes and procedures of the GDE empower end-users to perform their set curriculum delivery goals. For example, the United States report which was a result of an 18-month study, came up with specific goals (Carbonara, 2005:214) which are discussed in Chapter one, section 1.4.2. These goals set a pace for competitiveness are also recommended to participants during development of an ICT-evaluation instrument. The other counterparts whose ICT evaluation procedures are considered include the Arab States discussed in section 1.4. As earlier alluded to, next is a discussion of the gaps that researcher identified and which motivated for this study.

1.3 GAPS

The SACMEQ document, draft Professional Development Framework for Digital Learning (PDFDL) and CAPS focus mainly on utilization of ICTs. The identified gap was that, whereas there was commitment to ICT procurement, it seemed that the focus was on utilization without considering formal ICT evaluation to determine their appropriateness and compatibility to relevant teaching strategies, including suitability for SDL. Since besides centrally purchased ICTs, schools are also often approached by marketers of ICTs whose aims are to sell ICT media, the GDE proposed establishment of ICT committees using Guidelines on the Management and Usage of ICTs in Public Schools in Gauteng (GMUIPS, 2010:24). The GMUIPS does stress that as part of assessment, evaluation of the educators' level of ICT utilization will take place. The thrust of this study is that all ICT-evaluations will be made possible through the establishment of a specific evaluation instrument based on specific criteria. Such an evaluation instrument could serve as a guide for an educator who wishes to select ICTs to enhance SDL in the FET-Phase. When performed efficiently, evaluations should assist in eradicating a potential number of inappropriate ICTs from entering the education system and being used in the learning environment.

To successfully integrate ICT for curriculum delivery, the teacher should be equipped with Technological Knowledge, Pedagogical Knowledge, and Content Knowledge (Zhang, Liu & Cai, 2019:4). This is derived from the model coined by Koehler and Mishra (2009) named Technology, Pedagogy, and Content Knowledge (TPACK). In their model, Kohler and Mishra emphasize the role of educators in developing and implementing TPACK. Hence this study was executed to establish an ICT-evaluation instrument that will offer a balanced support to evaluators. Successful integration is also made possible when educators possess and strike a balance among vital knowledge and skills such as (a) pedagogical repertoire, (b) learning material selection skills and (c) ICT selection skills (Huizinga, Handelzalts, Nieveen and Voogt (2014:38).

As implied earlier, the greatest part of the identified gap was a lack of a formal instrument to select ICTs that are appropriate for supporting and enhancing SDL specifically in the FET-Phase. Obtainable documents suggest that the GDE previously focused on printed media (Gauteng Department of Education Limited Open Equivalent to Approval (LOETA) LTSM system, 2006). This is notwithstanding the provided guidelines for selection of hardware offered by the National Department of Education on the Thutong website (GMUIP, 2010:24).

To address these gaps in the body of scholarship, this current study developed ICT criteria, MIs and an evaluation instrument that considers and infuses the aforementioned ICT integration of knowledge and skills. Existence of such an instrument as a global archetype also challenges education managers to include educators in ICT evaluation. To include educators in evaluation, managers may need to place them in district, provincial or school-based ICT evaluation teams. The implication is for the twenty-first-century educators, known as knowledgeable techno-pedagogues (Sasirekha & Sathya, 2017:266), to optimally participate in ICT evaluation. In addition, the educator’s involvement in evaluations could benefit them in gaining knowledge and skills to evaluate and optimally utilize ICT content (Chetty, Qigui, Gcora, Josie, Wenwei & Fang, 2017:9). The identified gap emanated into a research problem which is, together with motivation of the study, discussed below.

1.4 DISCUSSION OF RESEARCH PROBLEM AND MOTIVATION FOR THE STUDY

In this digital information age, departments of education world-wide ought to be dynamic with a view to keep up with new developments, changes, upgrades and updates so as to increase agility, profitability, competitiveness, value add, inclusivity and innovation (Hanna, 2018:3). Such dynamism is demanded by the fast-growing, ever-changing ICT or technological innovations (Oviawe, 2016:9). To address the identified gap above, in the context of this study and cater for cost-effectiveness, the researcher proposed and developed a global evaluation instrument which is meant to be dynamic in nature. A dynamic instrument, portrayed in detail later in Chapter five, section 5.3.3.1.1, could support evaluators to optimally select ICTs that are harmonious with the demands of the digital age, durable and compatible with software updates.

The assumption is that globally schools need to be supplied with an empirically validated ICT-evaluation instrument which is based mainly on the criteria or guidelines that will be proposed to the Department of Basic Education (DBE). Such an instrument is of essence to ensure that ICTs that enter the school system are carefully selected in order to facilitate adequate and appropriate curricular and SDL experiences. It is proposed that the carefully selected ICTs comply with the generic requirements of the CAPS curriculum and specific subjects in the FET, whereas letting the learner to take control of and be accountable for his/her learning. The designed ICT-evaluation instrument consists of questions covering generic areas of the CAPS such as *Continuity and progression, Assessment, Layout and design, Educator support, Activities, Language and style, Pictures and illustration, General aims of the specific subject, Content and Skills* and *techniques*. (GDE LOETA LTSM system, 2006; CAPS, 2011).

The aforementioned proposal implies that the prerogative of the department of education is to have an evaluation instrument available that will assist in testing and evaluating whether selected ICTs optimally meet their teaching needs (Deshmukh, Lawrence & Vaidya, 2019:1649). These teaching-needs include pedagogic, scientific, curriculum, other technical requirements as well as limitations of the learner (e.g. level of cognitive development). It should be borne in mind that evaluation is performed to determine whether selected ICTs are suitable, meet user-needs (Jones, DeRuyter, Thompson, Norelli & Morris, 2018:231) and compare with other products in the market and economy (Lee, 2019:9). The aforementioned guidelines are expressed in *'Goal 16' of the DBE Action plan to 2019* (draft PDFDL, 2017). By and large, those guidelines are committed to improving computer literacy among educators and secondarily, enhancement of their ICT-evaluation and -selection skills. Educator and learner ICT skills acquisition forms an integral part of a discussion held later in Chapter three, section 3.2 regarding the digital divide.

Enhancing educators' ICT-evaluation skills requires a competitive ICT support system and training. The proposed ICT-evaluation instrument will serve as a supplement to such a process which will offer the educator more support regarding his/her curriculum implementation objectives. Some ICT evaluation guidelines can be traced back to the White Paper on e-Education (2004) as well as Guidelines for Teacher Training and Professional Development (2007) not excluding the Integrated Strategic Planning Framework for Teacher Education and Development in South Africa 2011-2025 (ISPFTED). An amalgamation of these guidelines could form a solid base for ICT-evaluation instrument development. Instrument development infusing this amalgamation of guidelines is particularised in Chapter three, section 3.6.

Largely, the reviewed literature, reported in Chapters two and three, amongst other things, reflect the intensity of the process of evaluation of ICT and related matters in various parts of the world. As alluded to earlier, regions across the developed, under-developed and developing countries are committing to ICT-related programs so as to fulfil their educational obligation of producing a world-class citizen – effective and accountable members of their workforce who can compete in the ICT-dominated world (United Nations Educational, Scientific and Cultural Organization (UNESCO), 2015:18). In the subsequent section, the level of such commitment in some regions of the world (as contained in UNESCO reports), Africa and then South Africa is set out deductively.

Driven towards the aforementioned obligation, ICT competence frameworks for learners have been implemented, and also recently for educators, in several countries (Tondeur *et al.,* 2015:3). Targeting both the learner and the educator lays a good foundation for enhancement of SDL in the learning environment as the school and teachers will fulfil their role of setting the learning stage for the learner (Martin, Kragler, Quatroche & Bauserman, 2019:181) to work in self-direction and independently and to take responsibility for their learning experiences (Barber & King, 2016:29). One may assert that in order to achieve the aforesaid obligation, it is vital for educators, as knowledgeable and trained practitioners, to work collaboratively with others when evaluating ICTs.

As introduced earlier in section 1.3, relevant UNESCO works focusing on ICT- and e-readiness are performed in the five Arab states of Egypt, Jordan, Oman, Palestine and Qatar. Their goals include producing learners who can work co-operatively with others, possess skills and competence to cope with life challenges and ultimately effective citizens who will assist in the development of their countries to cope with mainly digital revolution (UNESCO, 2015:28). Logically, ICT-evaluation using specific, tested, empirical instruments would be ideal to complement the works performed by the abovementioned countries. Robust ICT-evaluations could also assist education departments globally in decision-making and in questioning their goals and practices regarding ICT procurement (Mariño & Zaror, 2020). Evaluations are key since a large spectrum of ICTs could be procured to support the educator and need to be tested for appropriateness with minimal error or deterrents.

One of the possible deterrents regarding the aforementioned efforts to evaluate ICTs could be the world-wide phenomenon known as the digital divide (Zilka, 2020:234) which is comprehensively discussed in Chapter three, section 3.3.3. The said UNESCO document indicated three aspects concerning the digital divide in the Arab states, viz.: (i) the divide between the Arab world as a whole versus other regions; ii) the divide across Arab states (e.g. large, predominantly rural countries versus small, resource-rich countries); and iii) the divide within Arab states according to demographics, including socio-economic status, location (e.g. urban versus rural), culture and ethnicity. For quality assurance, these digital divide aspects will be juxtaposed with possible divides in the context of our local GDE schools to determine the extent thereof. Overall, data relating to all the five Arab states stated above shows that they are geared towards implementation of ICT in education (UNESCO, 2013:8).

As introduced earlier, for quality purposes, this study recommends the department of education to consider comparing its ICT evaluation processes, procedures and instruments with those of other countries. South Africa missed SACMEQ-I (that participated in 1995-1998) but was involved in SACMEQ-II which commenced in 1998 (Nethengwe, 2013:15). Moloi and Strauss (2005:13) stress the significance of constructing and utilizing instruments for the purpose of evaluating the quality of education systems. Thus, this study recommends that education departments globally develop and utilize an instrument for ICT evaluation, which forms part of the education system.

To add another dimension to the argument, comprehension and application of *Social-presence, Cognitive-presence* as well as *Teaching-presence* are essential during ICT evaluation and utilization (Swan, Garrison & Richardson, 2014). The three concepts are illustrated in Figure 1.1 (below).

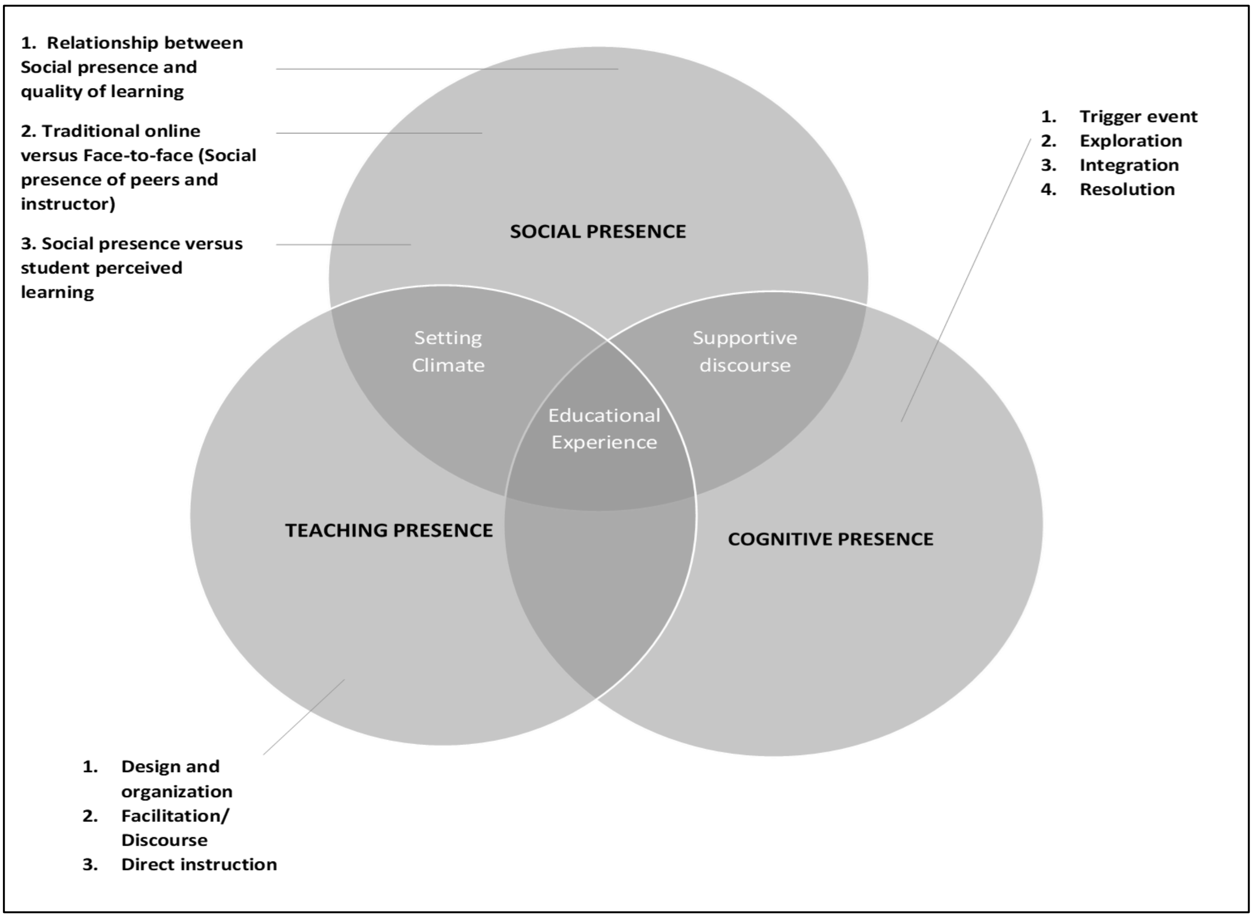


Figure 2-1: Community of Inquiry framework (adopted from Pollard et al., 2014)

Source: Author's own

As depicted in Figure 1.1, adopted from Pollard, Minor, & Swanson (2014), *Social presence, Cognitive presence* and *Teaching presence* are variables of Community of Inquiry (COI), which is grounded in the constructivist philosophy of SDL. Each of these presences has its own elements or dimensions which qualify interrelationships among different learning processes. The thrust of this study is to promote these presences via an ICT-evaluation instrument. According to Social presence, ICT evaluation should strike a balance between the following interdependent concepts: (a) social presence of managers and educators and quality of student learning with appropriate ICT; (b) traditional on-line learning and SDL; and (c) social presence versus learner-perceived learning. The three dimensions sought in Teaching presence are: (a) design and organization; (b) facilitated discourse; and (c) direct instruction. Cognitive presence unfolds in four stages: (a) triggering event; (b) exploration; (c) integration; and (d) resolution.

The instrument should be equipped with statements that directs the evaluator to select ICTs that are congruent to application of the COI in the SDL learning environment. Providing for the COI would be a means towards achieving a holistic and inclusive educational SDL and social environment (Pollard *et al.*, 2014:1). The manner in which these concepts form a strong basis for the study is outlined in the subsequent paragraphs. The developed ICT-evaluation instrument was designed to test whether recommended ICTs positively promote an educational experience that, inter alia, complements and supports curriculum implementation, development of SDL skills and learning relationships for learning to flourish (Chugh, Ledger & Shields, 2017:8) in the COI.

The focus of this study is not on the fiscals expended on ICT procurement but on whether selected ICT tools are practical, appropriate, integrative, add value to curriculum implementation and, most importantly, meet user-needs. (Chan *et al.*, 2017:18). The level at which, inter alia, end-users are involved in all crucial stages of ICT-evaluation also remains the subject and interest of this study. In order to optimally participate in ICT evaluation, evaluators need to be offered training and development. For effective training of ICT evaluators, pedagogical and technological factors need to be considered. Significantly, among technological factors, 'capability of the devices' stands out (draft PDFDL, 2017:9). This also implies that a device should not be selected for its own sake but should meet certain minimum technical requirements. Bladergroen, Bythewayy, Cantoniz, Chigona, Pucciarelliz, & Sabiescuz (2014:3) conducted a near-similar project to this research work dubbed Measuring E-Learning Impact in Primary Schools in South African disadvantaged areas (MELISSA). However, the focus of MELISSA was on primary schools and internal human processes such as affective and cognitive attitudes towards ICT. Thus far probably nothing similar to MELISSA has been developed for the FET-Phase. The next section delves into the research questions so as to address the specified gaps stated above.

1.4.1 Research Questions

This study proposes end-user inclusive processes and procedures to be implemented during the evaluation of ICTs for the FET-Phase with the support of an empirically validated evaluation instrument. It was propelled by the following two-pronged research question: *To what extent do Gauteng Department of Education (GDE) managers and educators implement policy-based processes and procedures during ICT-evaluation and -selection in the FET-Phase; and what is the ideal, all-inclusive set of criteria for an evaluation instrument suitable for self-directed learning environments?*

With a view to answer the primary two-pronged research question, the following six secondary research questions were addressed:

1. What evaluation procedures or instruments do managers and educators use to support election of appropriate ICTs and what are the main challenges within the process globally and in South Africa?

2. What should the ideal evaluation instrument look like according to literature and educators so as to support implementation of ICTs in the FET-Phase learning environments?

3. To what extent do GDE managers and educators perceive an ICT-evaluation instrument to be a viable tool for evaluation in the FET-Phase curriculum?

4. To what extent do GDE managers involve educators in the process of ICT-evaluation and -selection in the FET-Phase curriculum?

5. What suggestions made by subject teachers and GDE curriculum specialists can be infused in an ICT-evaluation instrument to make it suitable for self-directed learning environments in the FET-Phase?

6. How can an ideal, all-inclusive ICT-evaluation instrument be integrated and utilized for the enhancement of self-directed learning in the FET-Phase curriculum?

To further answer the above-stated main and sub-questions, later in Chapter five, the researcher explicates the collected data, findings and analyses. Next the research aim or purpose are being clarified.

1.4.1.1 Research Aim/purpose statement

As noted, the central aim of this study was to *establish whether Gauteng Department of Education managers and educators implement policy-based processes and procedures during ICT-evaluation and -selection in the FET-Phase as well as to develop an ideal, all-inclusive set of criteria for an evaluation instrument suitable for self-directed learning environments*. The six secondary research objectives were to:

1. Describe by means of a literature review whether managers and educators use ICT-evaluation procedures to select appropriate ICTs and determine the main barriers within the process globally and in South Africa;

2. Determine what an ideal evaluation instrument should look like according to literature and educators so as to support the implementation of ICTs in the FET-Phase curriculum in self-directed learning environments;

3. Understand the whether GDE managers and educators perceive the proposed ICT-evaluation instrument as being a viable tool for evaluation for the FET-Phase curriculum;

4. Determine whether education managers involve educators in the process of ICT-evaluation and -selection for the FET-Phase curriculum;

5. Gather suggestions from subject teachers and GDE curriculum specialists that can be infused in an ICT-evaluation instrument to make it suitable for self-directed learning in the FET-Phase; and

6. Propose means to integrate and utilize an ideal, all-inclusive ICT-evaluation instrument for the enhancement of self-directed learning in the FET-Phase curriculum.

To endeavour to achieve the aforementioned aims, a variety of theories and models were considered in the course of this study. For example, in his model, Hilton (in Carbonara, 2005:214) advises that implementation of a technology plan is based on the following steps: *Accessibility, Connectivity, Staff Development and Effective Use*. Thus throughout the entire course of this study, the researcher was conscious of these steps when: (a) addressing the gaps identified within the GDE's ICT-implementation plan; (b) interrogating the GDE manager's implementation of ICT-evaluation processes and procedures; and (d) developing ICT-evaluation criteria and instrument suitable for SDL. The first step, *Accessibility,* ascertains availability of software and hardware before its appropriateness is evaluated (Carbonara, 2005:14). *Connectivity* enquires whether the schools with hardware do have internet connectivity. *Staff-*

development and Effective Use questions the educator's ICT education levels and implementation considering, amongst other things, the age of the educator as a possible factor.

As stated earlier, the study explored whether the concept *DD* could assist in dealing, among other things, with the last step of Carbonara's model. In Chapter three, section 3.2, dedicated to the DD, factors such as ICT exposure, motivation and age, amongst other things, are considered potential deterrents to ICT use. For instance, as explored in some studies pertaining to Gerontology, age-linked loss in sensory, cognitive, and motor functioning could be a factor for some of the potential evaluators to adapt to ICT development and use (Kamin, Lang & Beyer, 2017:391). More specifically, the step of *Effective Use* seeks to test whether a relationship exists between educators' training level and actual ICT utilization. In the following paragraphs discussion is made regarding specific research design and methodology that were adopted in this study.

1.5 RESEARCH DESIGN AND METHODOLOGY

1.5.1 Research design

The research design of this study consisted of methodology, philosophy/paradigm, sampling methods, methods of data collection, and methods of data analysis as suggested by Punch & Oancea (2014). The study implemented purposive sampling to select participants. The researcher was the key instrument and collected data by means of: (a) survey questionnaire; (b) individual face-to-face interviews; and (c) focus-group interviews (Creswell, 2017:43). This study adopted a design-based research (DBR) which is, with the aid of Figure 1.2. (below), briefly described in the next paragraph.

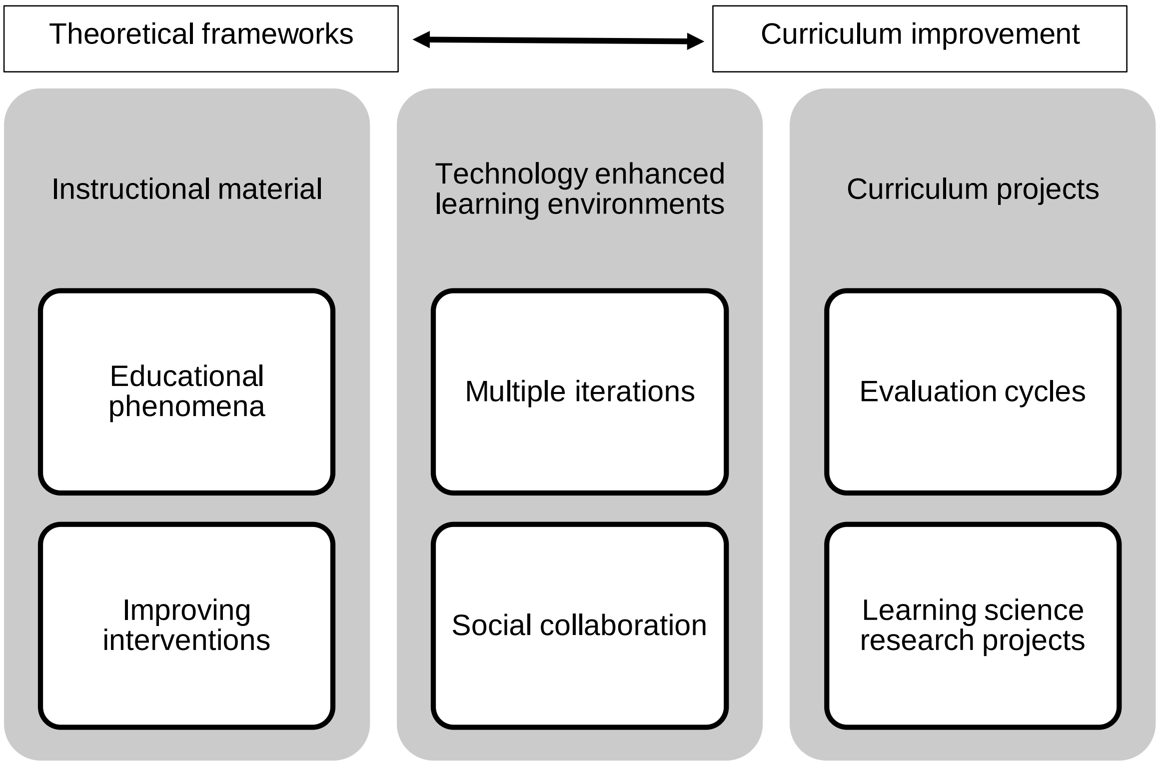


Figure 2-2: A portrayal of Design-based Research (Lewis, 2020; Ivens & Oberle, 2020:10; Green, 2017)

Source: Author's own

As portrayed in figure 1.2., DBR is regarded as compatible since it levels the plain for a reciprocal relationship between curriculum improvement and advances in theoretical frameworks. The rationale for choosing DBR is its compatibility since, as portrayed in figure 1.2, it is suited for learning science research projects that engineer instructional materials, technology-enhanced learning environments, curriculum projects, study of educational phenomena that emerge from curriculum issues, multiple iterations, evaluation cycles, and for improving interventions (Lewis, 2020; Ivens & Oberle, 2020:10). This study falls within these set parameters of DBR.

In this DBR, which is influenced by the variants of combined Functional Pragmatism and Interpretivism (both described in section 1.5.1.2 below), the researcher aimed to be realistic and uphold collaboration, democracy, and mutual understanding (Green, 2017) with other professionals. Contextually, the targeted professionals included ICT designers, ICT managers, other researchers in the field as well as educators or curriculum- and ICT practitioners.

To cement on the afore-declared and intended social collaboration, dialogue was pivotal to mitigate possible perceived 'power relations' in order to put others at ease (e.g. interview participants). Svihla (2014:36) enumerates collaborative effort and iterative cycles (including dialogue and product adaptation) as important methodological standards in DBR. During the entire course of the study the researcher was sensitive to potential 'top-down' syndrome. As stipulated by Land and Zimmerman (2015), DBR also supports SDL principles whereby the learner uses mobile technologies in and out of the school setting to support learner-centred identification and explanation-building practices including control of the learner's own learning (Sumuer, 2018:30). In the next section, the adopted research methodology of this study is elaborated on, which also collaborates with the research design.

1.5.1.1 Research methodology

Collection and analysis of both qualitative and quantitative data is a laborious, time-consuming process (Creswell, 2009:216; Creswell, 2018:14). However, both qualitative and quantitative data are required for this DBR study. Therefore, in this study, the mixed-research, multi-strand design approach was adopted in which the survey questionnaire was conducted, followed by secondary data collection methods, including semi-structured individual and focus-group interviews. The aforementioned data collection methods complement one another in a continuum (Maarouf, 2019:2) (see schedules Annexures A: survey questionnaire, B: semi-structured individual interview schedule, and C: focus-group interview schedule).

As alluded to earlier, with a view to identify/explore the main ICT evaluation challenges and to finalize the proposed evaluation instrument, the researcher adopted a mixed-research, multi-strand design approach. The mixed-method research approach consists of both qualitative and quantitative strands to be discussed later on in this section. This section expounds how the researcher will, as suggested by Svilla (2014:36), in social collaboration with participants, collect, classify and analyse both qualitative and quantitative data using corresponding, relevant techniques.

Data differ in terms of open-/closed-ness and this determines the quantitative or qualitative nature of the inquiry – the former being close-ended and the latter, open-ended (Creswell (2018:14). One may deduce that, in the mixed-method approach, the two methods complement each other because each method has its own value. In recognition of the relationships explained in the former sentence and literature review, the researcher specifically chose a mixed-research, multi-strand design approach with both qualitative and quantitative strands in which the latter builds upon the former. Further reasons for adopting a mixed, multi-strand approach was for one to be able to consider multiple viewpoints and perspectives, each with its advantages, disadvantages (Queirós, Faria, Almeida, 2017:372; Onwegbunze, 2014: 12) and standpoints which is often limited when opting exclusively for one approach. Figure 1.3 (below) depicts the instruments, sequence and processes of data collection utilized in this mixed research-based inquiry.

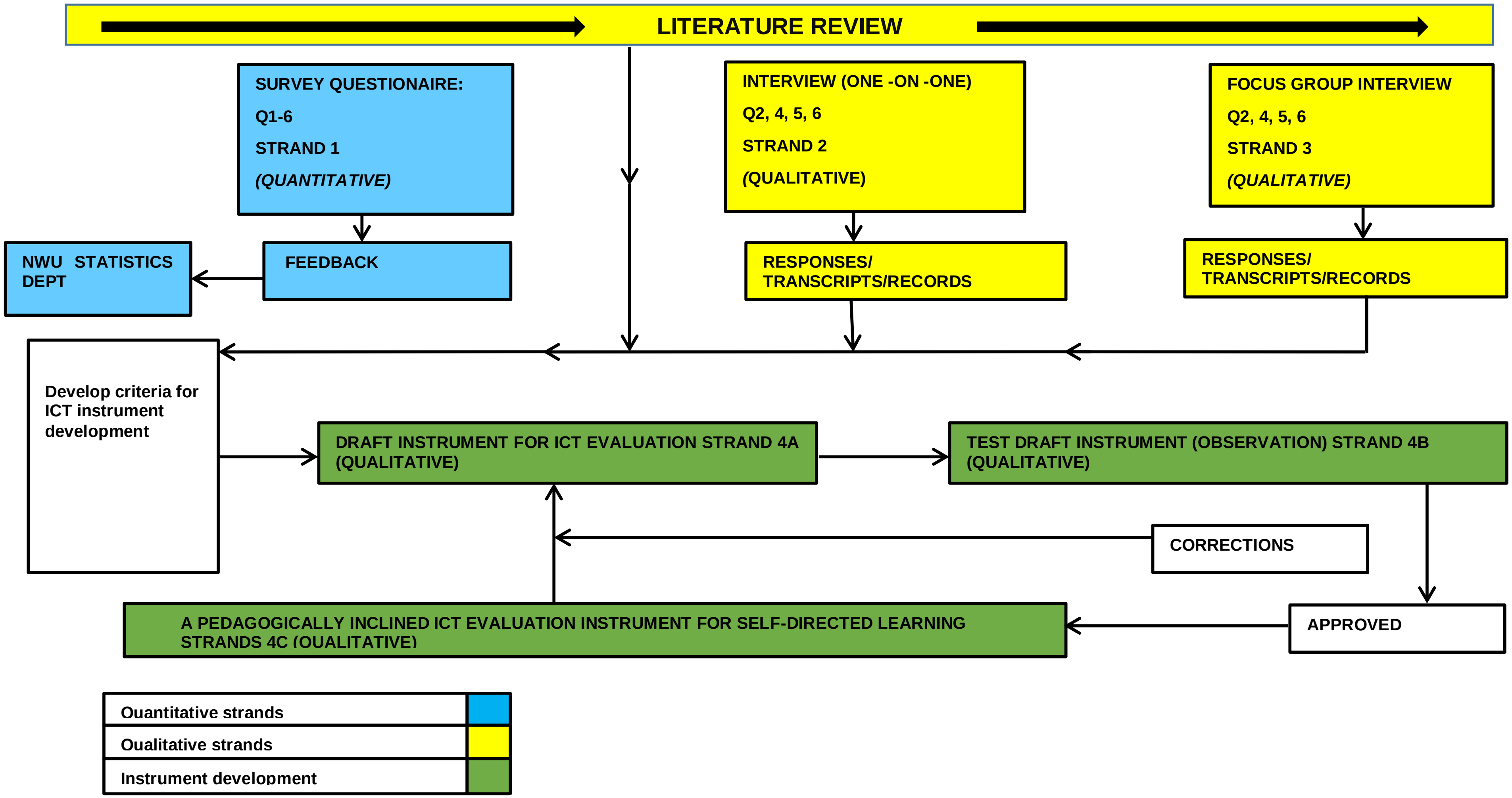


Figure 2-3: Data collection tools and processes in the design-based research

Source: Author's own

In Figure 1.3, each of the data-collection methods is annotated with a strand to depict the aforesaid multi-strand design, viz. Strand 1: Survey Questionnaire (Quantitative); Strand 2: Semi-structured individual interviews (Qualitative); and Strand 3: Focus-group interviews (Qualitative). Analysis of survey questionnaire (Feedback), Semi-structured individual and Focus-group interviews (responses, transcripts and records) were undertaken in that sequence. These strands were followed by the development of criteria for the proposed ICT-evaluation instrument (working document); crafting of a draft Instrument for ICT-evaluation; testing the Draft ICT-evaluation instrument; editing/approval of the draft instrument; and approval of the final instrument. Development of the ICT-evaluation instrument was labelled Strands 4A to 4C. Next is an exposition of the study's philosophical paradigms.

1.5.1.2 Philosophy paradigm

As stated earlier, this study is mainly rooted in the principles of combined Functional Pragmatism and Interpretivism which is associated with collaborative, multilateral action, intervention and social construction of knowledge. The research-methodological framework of this study consists of three epistemological orientations, namely: (a) aiming for explanation and prediction; (b) aiming for interpretation and understanding; and (c) aiming for intervention and change. Below, an outline is given of these philosophy paradigms as well as an illustration of how they apply to the study. The first to be illustrated is Interpretivism.

1.5.1.2.1 Interpretivism

According to Thanh and Thanh (2015:24) Interpretivist researchers understand and value experience and opinion, based on the unique backgrounds of people. This depicts a deductive approach by means of which the researcher views the world through the perspectives and experiences of the participants. An interpretivist researcher constructs and interprets meaning from data gathered from the participants' experiences and perceptions. This study employed the constructivist variant adopted from Butler (in Goldkuhl, 2012:4) wherein the researcher was cautious not to impose but construct meaning based on the internal logic obtained from social interaction among the participants. The variant was applied as participants engaged in instrument development, testing and approval as well as the researcher's own interaction with participants during semi-structured individual and focus-group interviews.

Willis (cited by Thanh & Thanh, 2015:25) is of opinion that "Interpretivism usually seeks to understand a particular context, and the core belief of the interpretive paradigm is that reality is socially constructed". This paradigm was therefore best suited for the study, which sought to explore and give meaning to the evaluation experiences and perceptions of educators. The purpose was thus to uncover the realities of evaluation and self-directed utilization of ICTs in the FET classroom.

1.5.1.2.2 Functional Pragmatism

Pragmatism emerged through the writings of well-renowned scientists such as Dewey (1998). Pragmatism non-singular ontology (Kivunja, 2017:35) is based on the premise that: (a) the life-world of a human being is influenced by action and constant becoming or change (i.e. action is the end of life (Dewey, 1998:3); (b) without action, any relational structure is meaningless; and (c) understanding democracy in social theoretic rather than in purely political settings (Frega, 2019:3; Goldkuhl, 2012:7). Action, however, needs to be purposeful in order to change existence. The major meaningful action in the proposed inquiry entails exposing the participants to social interaction with the researcher in which they air their views, share knowledge and experiences in the practice of ICT-evaluation, -selection, -approval as well as -application in the classroom with relevance to teaching practice. The researcher will therefore deduct meaning and create knowledge as a consequence of such human interaction. Pragmatism is therefore concerned with how participants' views and knowledge are used, practiced or actioned in reality.

A pragmatist researcher creates a data base or research plan which will be implemented in the answering of research questions effectively and efficiently (Nicholas & Blake, 2020:107). Whereas aiming for effectiveness, the researcher becomes conscious not to accommodate appropriateness without meaningfulness (Goldkuhl, 2012). Whilst the ICT-evaluation instrument aims for efficiency of the evaluation process, the selected ICTs should as well be appropriate for the learning environment in the FET-Phase. Choice of pragmatism is justified because DBR is compatible with the philosophy of pragmatism, a bottom-up methodology (Nijhawan, 2017:11) which emphasises social collaboration, multilateral knowledge and meaning construction as well as co-operation. Next is a discussion of the study's sampling methods.

1.5.1.3 Sampling Methods

A sampling strategy should correlate with the research objective(s), questions and rationale. Qualitative research sampling was deliberate or purposive. In purposive sampling, in which the objective is specific and defined (Davoudi, Nayeri, Raiesifar, Poortaghi & Shamsi, 2017:5), the logic of the study should be considered rather than simply following an 'ad hoc' approach (Punch & Oancea, 2014:164). Furthermore, Davoudi *et al.* (2017:5) explain that in purposeful sampling and theoretical sampling, participants are selected based on: (a) determined criteria by research purpose; (b) under the guidance of a theory; and (c) with the purpose of refining and elucidating the emerging theory. Thus in this study, so as to utilize experience, the researcher selected participants by means of purposive sampling.

The sample group was heterogeneous in nature, as participants were drawn from various secondary schools across Gauteng. The mix included urban, peri-urban, previously advantaged and disadvantaged as well as quintiles per poverty index. For liberty and free expression, participants were grouped according to rank (homogeneous so that seniors and juniors were not placed in the same group); also selected because they had experienced the central phenomenon (Creswell, 2009:217). This tallies with what Punch and Oancea (2014:235) suggest by saying that qualitative research should deal with the questions as to who and what will be studied and why.

The sampling design was single stage because the researcher would have had access to names of participants and could sample them directly (Creswell, 2018:150). Fifty (50) (n=50) survey questionnaires were distributed to educators who might previously have taken part in the evaluation of LTSM. Furthermore, participants (n=120) were sampled to participate in a total of 12 focus-group interviews (approximately 10 participants per group). As earlier stated, these participants were selected by means of purposive sampling. During these interviews, the participants were engaged in a common social interaction in their prior knowledge and experience were applied to socially construct knowledge on issues that are pertinent to the evaluation of the FET ICT instrument. Another 15 participants (n=15) were selected via precision-equivalent random sampling for the semi-structured individual interviews in order to draw a fair distribution among the sampled GDE districts. Next is a discussion of the methods of data collection applied in this study.

1.5.1.4 Methods of data collection

Data collection may be referred to as a process in which a researcher engages in the collection of information to be used to answer his research question(s) (Creswell, 2018). Each method of data collection in this study is discussed below:

1.5.1.4.1 Survey questionnaire

A survey questionnaire comprises of a set of questions, specifically designed by the researcher, which probes educators who previously partook in evaluation of LTSM, with a view to provide quantitative or numeric data which allows the researcher to give a description of trends, attitudes or opinions of the educator population (Creswell, 2018:12, 147). In this study, 50 (n=50) survey questionnaires were distributed to find answers to research questions 1 to 6 (see Figure 1.3 above). With the assistance of the North-West University – Statistical Consultation Services, the typical initial questions were classified into sections such as personal information; ICT-evaluation experience; actual engagement with the instrument; and instructions to the participant. Elements of the quantitative approach were added in which some of the responses were scored or quantified. the next strand was the semi-structured individual interviews discussed below.

1.5.1.4.2 Semi-structured individual interviews

Unlike a structured interview, a semi-structured interview involves clinical judgement, is not scripted, allows the interviewer to divert, is akin to a guided conversation, and consists of standardised questions in which interviewers may insert additional queries or probes (Levis *et al.*, 2018:378). A semi-structured interview uses an interview schedule to guide the researcher, focuses on issues that are meaningful to the participant and allows diverse perceptions to be expressed (Evans, 2018:2). It directs the interview conversation towards the research question and consists of main themes and probing questions (Kallio, Pietilä, Johnson, & Kangasniemi, 2016:11). A total of 15 interviews (n=15 covering research questions 2, 4, 5 and 6) were conducted with FET-educators, who might have had evaluation experience, with a view to further explore certain details and aspects of the phenomenon. “In essence, the interview method is the art of questioning and interpreting the answers” (Qu & Dumay, 2011:243).

1.5.1.4.3 Focus-group interviews

A focus-group capitalizes on group dynamics such as interactive and collaborating nature (Guest, Namey, Taylor, Eley & McKenna, 2017:693) in which the interviewer is concerned with participants’ communication among themselves rather than with the interviewer, who only acts as a mediator (Qu & Dumay, 2011:245). Based on their emphasis on stakeholder reaction to proposed programs, interpreting survey results and stimulating discussion (Bernard, Wutich & Ryan, 2017:88) which is key in the context of this study, focus groups were deemed vital. Contextually, focus-group interviews were regarded as ideal for the study, which takes into cognisance educators as major stakeholders in evaluation of ICT. Similar to the semi-structured interview, a focus-group interview, referred to as “an in-depth understanding of social issues” (Nyumba, Wilson, Derrick & Mukherjee, 2017:20), enables the researcher to gain extensive comprehension of pertinent matters via the true-lived experiences and realities of the participants (Pool, 2014:92). The intention of utilizing focus groups was to promote discourse among participants. Discourse, the creative use of language as a social practice, was vital to optimize chances of reaching the focus groups objectives (Mullet, 2019:119). To capture the discussions and direct the focus-group interviews, the researcher used an interview schedule with a list of open-ended and probing questions. As mentioned earlier, there were 12 focus groups comprising approximately ten participants each, chosen across seven districts of the GDE. The next section discusses how the afore-discussed data collection instruments were distributed.

1.5.1.5 Distribution of data collection instruments

Due to the unprecedented advent of the COVID-19 pandemic and its related restrictions, the process of distribution of data collection tools had to be amended to some extent. However, although the process was slightly amended, the researcher still abided by ethical prescripts. In the following section, the author of this document briefly explains how the survey questionnaires were distributed.

1.5.1.5.1 Distribution of survey questionnaires

Due to the COVID-19 pandemic restrictions, the researcher had to amend his plans from physically visiting schools to electronic data collection means. Due to the said restrictions, although the researcher had received permission to conduct research at GDE institutions (see Annexure G: GDE Approval letter), visiting schools was prohibited (Annexure H: GDE No School Access letter). The researcher therefore did not go to the sampled GDE institutions physically, and resorted to administering the survey online via the Google Forms application. The original survey questions were loaded onto the Google Forms application. To distribute the forms, a link was sent to the sampled survey participants via e-mail and WhatsApp. More than n=50 survey questionnaires were distributed but only n=50 were recollected via Google Forms application, then the system was shut. The participants were required to respond and submit their survey with a click of a button on their cell phones or personal computers. Next discussion follows on how interview schedules were distributed.

1.5.1.5.2 Distribution of interview schedules

Similar to the situation with survey questionnaires, the originally planned school visits, to distribute interview schedules, were abandoned due to COVID-19 regulations. As researchers were prohibited from physically accessing GDE institutions, individual interviews were administered online via the Zoom-meeting application platform and recorded on Otter application (an application that records and converts voice recordings to text). The interviewer was still guided by questions embedded in the semi-structured individual interview schedule. Informed consent forms were electronically signed, distributed and recollected by electronic means. The interviewer used the DocuSign application to administer the Informed Consent forms. Next is brief of how both quantitative and qualitative data collected during the three strands were analysed.

1.5.1.6 Analyses of Data

This study employed a linear open, axial and selective data coding and analysis approach (Williams & Moser, 2019:46). This design of data analysis was opted to stay in line with the spirit of the aforementioned Functional Pragmatism and Interpretivist paradigms. Both content (transactional) and personal attributes (interactional) formed part of the data analysis spectrum. In analysing data, steps included coding, sorting and construction of themes whereby data with common attributes are classified into main categories (Medeylan, 20Creswell and Creswell, 2018:193). Data were coded and organised manually. The subsequent paragraphs illustrate how analyses of each of the data-collection methods were applied, starting with the survey questionnaire, then documents and lastly, interviews.

1.5.1.6.1 Analysis for survey questionnaire

In the case of the survey, statistical analyses of participants' responses were used (Creswell (2018:193). With the support of the NWU-Statistical Consultation Services, the Likert scale was applied in case of matrix questions used, then responses were grouped, classified and interpreted. Also Cronbach's alpha coefficient based on inter-item correlations was used to measure internal reliability. This assisted in determining whether a strong or poor correlation existed between participants' responses per the five-point scale. Next, input regarding analysis for interviews follows.

1.5.1.6.2 Analysis for interviews

Both semi-structured individual and focus-group interview data were transcribed via the Otter application, edited and analysed manually to substantiate theoretical generalizations based on literature reviews. For optimum results, an interview involves posing a set of questions and probes packaged into consistent themes aimed at challenging the interviewees to offer more intricate responses. The interviewer is at liberty to modify the style, pace and sequencing of questions and the interviewees flexibly respond to questions without distinct boundaries. Figure 1.4 (below) maps out the process of analysis for interviews used in this study.

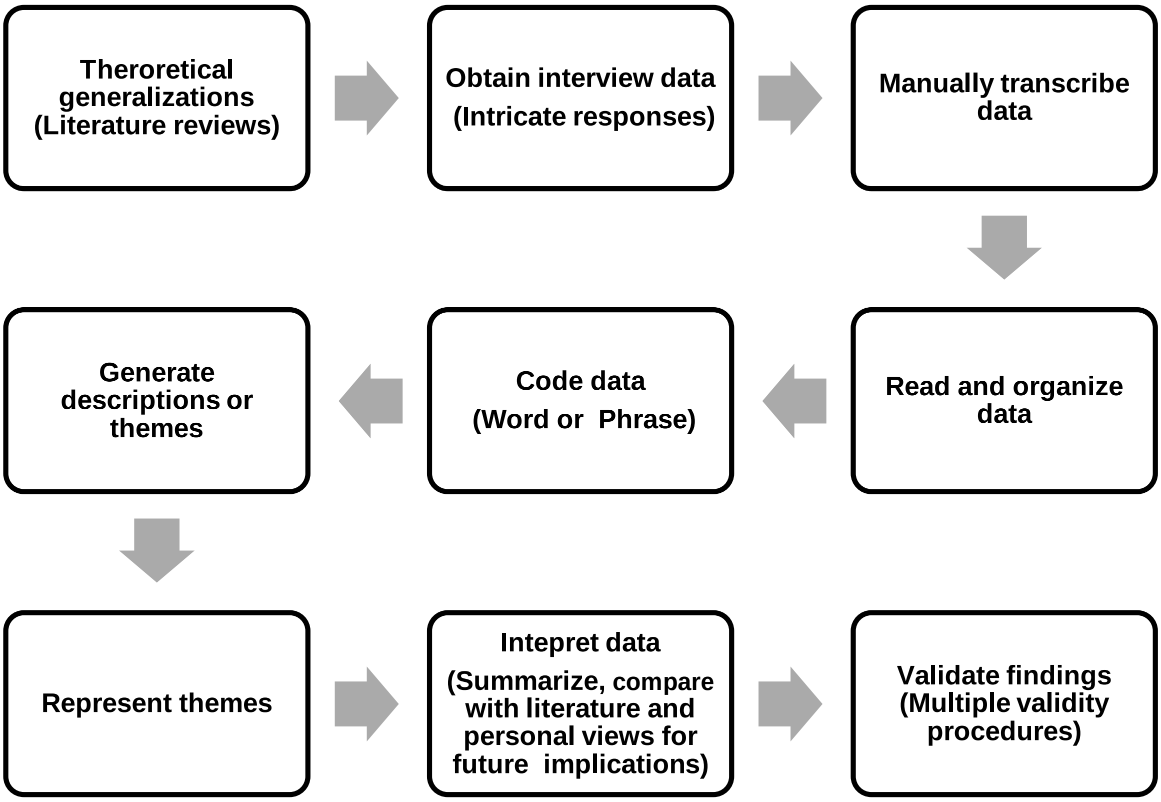


Figure 2-4: Steps and processes followed in the analysis of interviews

From figure 1.4, it is clear that in this study, the researcher analysed interview content using manual methods to code and analyse qualitative data. The researcher made theoretical generalizations based on literature reviews, coded data, read and organized data, represented data by themes, interpreted data and, finally, validated findings. To analyse the interviews, the researcher undertook steps including editing interviews that were transcribed via the Otter application, reading data; organizing data, coding data; generating descriptions and themes; and representing the themes (Creswell, 2018:193–195). Since data were dense, winnowing was implemented as per qualitative analyses procedures suggested by Creswell (2018:193). Interview data were sorted, coded and organised in accordance with themes.

Coding condenses, in a word or phrase (mostly a noun), the basic topic of a passage (Adu, 2019:322) in qualitative data analysis. Coding may be simplified as a researcher-generated construct that symbolises meaning to each datum (i.e. codes are labels of meaning) (Miles & Huberman, 2013:71). Additionally, Creswell (2018:193) describes coding as a “process of organising data by bracketing chunks of text and writing a word describing the category”. Hence the text from the interview transcripts was sorted and coded for analysis. These steps were succeeded by interpretation of data by summarising findings, comparing findings with literature, personal views discussion and focusing on the future implications of the findings. Next validation was performed to assess credibility and accuracy of the findings using multiple validity procedures (Creswell 2018:198). The entire research work was governed by research ethics as laid down in the following paragraphs.

1.6 ETHICAL CONSIDERATIONS

1.6.1 Research Ethics – Training, Application and Approval

Due to the stringent requirements of North-West University, the researcher underwent a vigorous research ethics application process. Prior to application, the researcher attended a Training and Resources in Research Ethics Evaluation (TRREE) training programme. An attendance certificate was obtained (Annexure D: Research ethics training certificate). The research ethics application process was evaluated and approved by the Research Ethics Committee of the Faculty of Education of North-West University (Annexure E: Confirmation of Ethics Approval). Typical pivotal issues dealt with in the ethics application included identification of research team, participants' benefits/expectations, gatekeepers, sample size, legal requirements, informed consent, confidentiality and privacy, data management (storage, safekeeping, destruction), monitoring of research, data-collection instruments, data analyses and risk audit (environmental and humans related).

Due to the advent of the COVID-19 pandemic and restrictions, researchers were prohibited from physically attending schools to conduct research. Consequently, the researcher had to resort to using electronic applications. The survey questionnaire and interview schedules were embedded on Google Forms and the interviews were conducted online via the Zoom Meeting platform. Prior to that, the researcher wrote a formal request to the NWU Research Ethics Committee to request permission to use electronic data collection means instead of visiting schools physically. The next section deliberates on some of the important ethical issues that were considered during research.

1.6.2 Ethical issues considered

Based on the ethics training and vigorous application process (mentioned in section 1.6.1 above), the following ethical issues were inaugurated and highly considered prior, during and after data-collection process as advocated by Stichler (2014:6) as well as legislative frameworks including the Helsinki Declaration (World Medical Association, 2013) principles:

1.6.2.1 To bring about more good than harm

The researcher ensured that the data-collection processes and objectives of the research work were intended to bring more good than harm to the participants. Logically, this research work was intended to benefit its participants during and after the research. During research, participants potentially acquired skills, experience and exposure through their participation in a formal, scientific academic research work and in the development of an ICT-evaluation instrument. The research process also afforded participants an opportunity to, amidst the COVID-19 regulations, practically engage in electronic surveys and interview process using their most valued ICT gadgets. Besides, since they could ultimately be users and evaluators of ICTs, participants were encouraged to gain ownership of the ICT evaluation process. To eliminate risk, as prescribed by the COVID-19 regulations, data collection occurred online without physical human contact with participants. The next ethical consideration focuses on risk audit.

1.6.2.2 To fairly distribute risks and potential benefits of research

Potential risks and benefits were stipulated in the informed consent form (Annexure F: Informed consent form) and discussed with the participants prior to their participation. It was therefore stipulated to the participants that online measures were to be used to eliminate the risk of spreading COVID-19. The next ethical consideration pertains to sensitivity to the interests of the human participants.

1.6.2.3 To promote the interests of humans who participate in research before the interests of science and society

Caution was exercised to make sure that the interests of the participants were prioritised above the interests of the study or science. Hence the researcher, guided by the GDE, prioritized the safety and well-being of the participants as opposed to persuasively conducting research in unsafe conditions. Had it not been for the intention to improve the ICT-evaluation processes and procedures and criteria, there would have been no point in initiating this study. The next ethical consideration centred on voluntary participation.

1.6.2.4 To ensure voluntary participation and informed consent – subjects must be able to choose to take risks of research

The purpose of Informed consent is to safeguard that participants receive and comprehend information appropriately so that they can make autonomous decisions (Kadam, 2017). Courtesy of the NWU- Ethics committee, a template of the informed consent form was presented to the researcher. The form stipulates important ethical issues such as non-compulsory participation, participants' right to refuse or withdraw from participation anytime they feel uncomfortable, confidentiality, and permission to record proceedings. The next ethical consideration was based on confidentiality and privacy.

1.6.2.5 Confidentiality and privacy

Although challenged by openness of data access across multiple platforms (Kamanzi & Romania, 2019:743), confidentiality as well as privacy are still valued in research ethics. Thus, in this research work, participants' personal information, records and identity were protected. The researcher used gender-neutral pseudonyms (Lee & Carver, 2019) instead of descriptors or names that could lead to identification of any of the participants during data analysis and interpretation. All information obtained from participants was treated confidentially and anonymously. Audio and video recordings were deleted after transcription of interview proceedings. Electronic transcripts of the interviews were stored in a password-protected computer. Only the researcher had access to the raw data which will be kept in safe custody – only accessible to the researcher for seven years and destroyed thereafter. As part of the ground rules, during focus-group interviews, participants were requested to respect each other's opinions and contributions and to keep discussions and other participants' identities confidential. The next ethical consideration is based on respect.

1.6.2.6 To show ongoing respect for persons

Participants were always treated with and shown collegial respect during their address. Outermost means were made to make them feel as valuable participants in the process. Furthermore, cordial, professional, respectful language was used at all times. The next ethical consideration regards transparency.

1.6.2.7 To uphold transparency during the research

Research methodological transparency is enhanced by means of a detail of disclosure and detail regarding specific steps, decisions and judgment calls during research, since lack of transparency equates to research performance problems (Aguinis, Ramani & Alabduljader, 2018:82). There were no hidden facts regarding the processes and procedures of the research. Thus research methodology, potential benefits and risks were openly discussed with participants. All documents used were also explained to them as well as the objective of the research. Letters of approval from gatekeepers and NWU were also shared with them. Beyond the participants, transparency regarding theory, design, measurement, analysis and reporting was upheld and shared with peers and gatekeepers throughout this research work. The next ethical consideration regards protection from harm.

1.6.2.8 Protection from harm

As alluded to earlier, in ethical research the researcher must weigh the risk of harm and comfort against potential benefits of research (Blades, Stritzke, Page & Brown, 2018:14). Typically, precautions were taken to avoid any harm or discomfort to the participants at the expense of scientific benefit. To counter the biggest threat of the time, COVID-19 regulations were adhered to. Furthermore, as earlier declared, cordial, professional language was used at all times to avoid hurting the participants emotionally. The next ethical consideration concerns dissemination of findings of this research.

1.6.2.9 Dissemination of research findings

Effective dissemination is significant for liaison between research, policy and practice (Tripathy *et al.*, 2017:10). Also as required by the ethics code and the GDE, research findings were communicated to Head Office and districts for access by participants and any other interested persons or directly to participants by request. A free online copy was made available for ease of access. The researcher was open to making a full, formal presentation of the findings to the GDE as required in their research conditions as stipulated in the Annexure G: GDE approval letter. Once completed, the researcher presented a copy of the thesis to the GDE and announced his availability to perform formal presentations. The findings made could be used at training, conferences, for publication of articles and as a library reference source. The next ethical consideration pertains to monitoring of research.

1.6.2.10 Monitoring of research

Regular meetings were arranged for the researcher and supervisors to discuss progress in the research process. These meetings were also documented on the broad PhD study implementation time schedule spreadsheet. Progress reports were submitted to the NWU-Education Ethics Committee as requested. Although forming part of ethics, trustworthiness is isolated in the next discussion to highlight its significance.

1.7 TRUSTWORTHINESS

Trustworthiness of both the researcher and the participants as well as the data collection instrument is a key element of a research process. Regarding the researcher, Shufutinsky (2020:50) advises: (a) the use of self to increase the transparency, rigour, credibility, and trustworthiness of the research processes and the data presented and described; and (b) exclusion of self from the data to contribute to transparency and trustworthiness. Hence the researcher maintained this trend throughout the course of the thesis. Nowell, Norris, White &

Moules (2020:3) state three terms, namely credibility, conformability and dependability as criteria for trustworthiness, yet transferability, as illustrated below, can also be added to the list. Trustworthiness was supported by triangulation. The four criteria of qualitative research which measure trustworthiness, validity and reliability are briefly described below:

1.7.1 Credibility

Credibility is obtained when the research measures what it is meant for and there is no discrepancy between the respondents' opinions and the manner in which the researcher presents such views (Nowell *et al.*, 2020:4). Thus the researcher had to be optimally credible when reporting on the research findings in order not to misrepresent participants' opinions.

1.7.2 Dependability

Dependability measures the level of consistency, logic, traceability and clear documentation of the research process as well as consistency of the data collected (Pool, 2014:95). Dependability relates to consistency and alignment between the data analysis and accepted standards for a particular design (Korstjens & Moser, 2018:122). As declared earlier, although kept confidential, primary interview and survey responses are kept in safe and password protected ICT gadgets accessible to the researcher only.

1.7.3 Confirmability

Confirmability refers to interpretations given by the researcher being clearly derived from the data. It measures impartiality of the research data and the level at which the results of an inquiry could be confirmed or validated by other researchers (Nowell *et al.*, 2020; Anny, 2014:279). The researcher only drew inferences from the analysis of the data and from no other source.

1.7.4 Transferability

Transferability is equivalent to applicability, the level at which others (readers) can transfer the findings to their settings (Korstjens & Moser, 2018:122). Thus, the researcher openly made available the thesis for future reference and access to participants, gate keepers and other researchers. Also the researcher strove to ensure that the research remains within the parameters of the research questions. For ethical compliance, the researcher adhered to and employed the aforementioned strategies and considerations in conjunction with one another.

1.8 SIGNIFICANCE AND POSSIBLE CONTRIBUTION OF THE STUDY

This section declares what the author of this document regards as the significance and possible contribution of this study to the body of scholarship and ICT implementers in general. In the next section, the broad contribution of the study to the field of ICT evaluation is declared. Furthermore, the author of this document explored how the study was significant and would make a contribution towards evaluation processes and procedures, crafting of ICT evaluation criteria and development of an ICT-evaluation instrument.

1.8.1 The study's contribution to the field of ICT evaluation

The empirical data obtained from the study provided evidence regarding an evaluation of ICTs in the FET-Phase to enhance SDL. As it was declared as part of the objective of the study in section 1.4.1.1, the inquiry was designed to establish whether GDE managers and educators implement policy-based processes and procedures during ICT-evaluation and -selection in the FET-Phase and the *ideal, all-inclusive* set of criteria for such an evaluation instrument. To respond to the inquiry and as an output, the study contributes to the education system and the existing body of scholarship with: (a) a set of ICT-evaluation criteria; (b) ICT-evaluation processes and procedures; (c) a generic ICT-evaluation instrument for the FET-suitable for SDL. In the next paragraph, the significance and contribution of the study to evaluation processes and procedures are described.

1.8.1.1 Evaluation processes and procedures

To satisfy the needs of the stakeholders who are of outmost value (Hong, Hwang Tsai, Liu & Lee, 2020:4), this study was aimed at establishing and offering guidance on steps to follow during ICT-evaluation. In order to clearly illustrate the steps to be followed in the process of ICT evaluation, the researcher therefore planned to, based on inputs from literature reviews, survey and interviews, construct an ICT-evaluation process map (supplied and discussed in Chapter 6, section 6.4.1.1). The process map clearly indicates steps to be followed during ICT-evaluation, -selection and –utilization. More striking about the process map is its applicability at school, provincial and district level, a clear recommendation of social collaboration of all the relevant ICT-evaluation stakeholders. This social collaboration would then possibly pave a way for selecting into the school's system, ICTs that are suitable for the educator's curriculum delivery. The next section explores the study's significance and contribution towards ICT evaluation criteria crafting.

1.8.1.2 ICT evaluation criteria crafting

As an endeavour to answer the second sub-question of this research work which is to establish an ideal, all-inclusive characteristics of an ideal evaluation instrument, the study aspired to design internal (e.g. Measurement Indicators, statements, commentary boxes etc.) and external (outlook) characteristics of an instrument. To design such ICT-evaluation characteristics (detailed in Chapter Three, sections 3.4 and 3.5), the researcher relied on reviewed literature and engagement with participants step-by-step. Developed criteria were converted to MIs, which were in turn embedded in the ICT-evaluation. The next section exposes how the study is significant and contributes to the development of ICT-evaluation instrument.

1.8.1.3 ICT-evaluation instrument development

As a product of this study, an ICT-evaluation instrument (demonstrated in Chapter 5, section 5.4) was developed based on the MIs, which were originated from evaluation criteria based on literature review, learning models, as well as input from participants' responses during surveys, interviews as well as focus group discussions. The necessity of the ICT-evaluation instrument was established based on the research findings. The study endeavoured to establish whether the ICT-evaluation instrument is essential and should be used globally by managers and educators at different levels, integrate e-learning and curriculum objectives, support the educator in curriculum delivery, learner management and control, assist educator to audit skills of self and learners. Furthermore, to be effective, the instrument should be dynamic and even measure for ICT dynamism against out-datedness. It should be used for pre-procurement evaluations as well as on a regular basis to determine whether ICT media are still up to date. In contrast to the contributions of the study, next is a discussion of the study's limitations.

1.9 LIMITATIONS OF THE STUDY

The data-collection process of this DBR was executed during the challenging era in which the entire world was attacked by the Corona virus. Due to COVID-19 regulations, such as national lockdown, the planned fieldwork to organise face-to-face interviews and survey had to be altered and replaced with online measures. Unlike in face-to-face contact, online interviews conducted on Zoom Meetings were difficult to arrange and manage. Appointments were occasionally not duly met and as a result starting meetings sometimes was delayed. In some instances, meetings had to be rescheduled.

Time was also a challenge as a large amount of work had to be squeezed into a compact implementation plan. The researcher's personal feeling is that the research proposal and ethics application process took up a bit too much time. ICT-evaluations is an unfamiliar topic of research; thus finding academic references posed a challenge. Lastly, considering the intensity of the research matters in this study, the sample size was small. If time permitted, the scope could have been made larger to gather more opinions on these matters. Perhaps, successive to this study, this research should be taken to a higher level in contexts that will permit more time, e.g. establishing units that deal specifically with General evaluations or ICT-evaluation as part of Higher Education Institutions' organizational structures.

1.10 CHAPTER DIVISION

The frameworks of the remaining chapters in this thesis are as follows:

- **Chapter 2: Self-directed learning**

Chapter two focused mainly on SDL and it also dissected SDL models, theories and tenets, which were recommended for consideration when crating criteria for developing an ideal ICT-evaluation instrument. The crafted criteria form the basis of what may be termed Measurement Indicators (MIs) which should be embedded in an ICT-evaluation instrument. These MIs were constructed in the form of quantitative or qualitative statements or questions. Evaluators were expected to attempt to answer these MIs when evaluating ICTs to test their suitability. The MIs determine the scores to be achieved by ICTs during evaluation. When scores are satisfactory, the ICTs should be selected into the school's system for utilization by educators as an aid to deliver curricular objectives. Furthermore, so as to identify SDL tenets, Chapter two delved into SDL as a concept, its demands on the learner and educator, and the perception thereof as a twenty-first-century skill. Chapter two also portrays an educator's responsibilities as an evaluator, an educator as an SDL practitioner and an educator's ICT benefits.

- **Chapter 3: ICT evaluation perspectives**

Chapter three aimed at and focused on ICT-evaluation perspectives in its quest to answer the overarching, two-pronged question, and six sub-questions. An ICT-evaluation instrument was crafted based on various theoretical perspectives. The aspired ICT-evaluation instrument aimed to assist evaluators in selecting sound ICTs that possess specific minimum qualities to enhance SDL learning in the FET-Phase. Once optimally achieved, an ideal SDL environment, as well as appropriate ICTs, could form a steppingstone for education planners and managers to adhere to the education department's agenda of producing world-class, competitive citizens. Such citizens are accountable members of their workforces who can compete in the ICT-dominated world (UNESCO, 2015:18). Pursuance of the above-stated aspirations could be hindered or nullified by the digital divide (DD), which was also intensively discussed.

- **Chapter 4: Research Design and Methodology**

Chapter 4 discussed the research design and methodology of the study to address the identified gap in the GDE. This chapter also further endeavoured to answer the corresponding main question and its six secondary research questions. To map a way towards that endeavour, a mixed, multi-strand design approach was adopted. The mixed multi-strand design was discussed using both quantitative and qualitative strands as leverage. Quantitative research is concerned with data that can be represented or measured numerically (Goertzen, 2017:12). On the other hand, qualitative research provides detailed descriptions, challenges existing theories and exposes new theoretical directions (Bansal *et al.*, 2018:1189).

Chapter four also detailed research features under main headings such as purpose of the research; research design and methodology; data-collection methods; data sampling; and ethical considerations. The clarified research features included sampling methods and techniques, development and validation of the data-collection tools, research paradigms, and research methods and techniques. Collected data serve as input towards the development of the ideal ICT-evaluation criteria and instrument. There was also an assertion of the stance of this study to adopt a collaborative approach for all the processes, including interviews, discussions, crafting, testing, and finalising the ICT-evaluation instrument.

- **Chapter 5: Analysis of Data and Research Findings**

Chapter five advanced the journey towards answering the two-pronged main question of this current study by analysing collected data, findings and analyses of quantitative and qualitative strands. The quantitative methodology employed numerical data to quantify social phenomena (Ong & Puteh, 2017:14), yet qualitative research concerns the methodical collection, organization, description and elucidation of written, oral or optical data (Hammarberg *et al.*, 2016:499).

Quantitative research was performed in the form of a survey – Strand one: The survey comprised a set of closed-ended questions that probed the participants (n=50) to provide quantitative or numeric data which allowed the researcher to present descriptions of trends, attitudes and opinions of the population (Creswell, 2018:12, 147). The questions were classified into various sections. Qualitative research consisted of semi-structured individual interviews as well as focus-group interviews; Strands two and three: The semi-structured individual interviews involved clinical judgement, were not scripted, allowed the interviewer to divert and consisted of standardised questions and probes set on an interview schedule. The semi-structured individual interviews focused on issues that are meaningful to the participant and allowed diverse perceptions to be expressed (Evans, 2018:2). It directed the interview dialogue towards the research question (Kallio, Pietilä, Johnson, & Kangasniemi, 2016:11). The focus-group interviews capitalized on group dynamics such as interactive and collaborative nature (Guest, Namey, Taylor, Eley & McKenna, 2017:693), since several people were interviewed together utilizing a flexible and exploratory discussion format. The focus-group interviews emphasized interactions between participants rather than between the interviewer and interviewees, with the interviewer serving the role of mediator (Qu & Dumay, 2011:245).

- **Chapter 6: Conclusions, Implications and Design Principles**

Chapter six serves as a conclusion to the long journey of research and literature review undertaken in this study, as evidenced in the preceding chapters (summarised in the overview section 6.2 below). This chapter was intended to provide a clear summary of deduction insights and viewpoints of the researcher that arose from the argumentation. These are brought to a final synthesis as the chapter concludes the investigation and essence of the argument. Furthermore, the chapter aimed to indicate the level at which the identified gaps have been filled, and to determine whether the research aims of the research have been achieved. This chapter also consists of sections dedicated to a detailed summary, contributions, limitations, and recommendations on further research regarding pertinent educational issues to consolidate and achieve these aims.

1.11 CHAPTER CONCLUSION

Chapter one started by giving the reader an overview of the entire study. In this mentioned overview it was stated what the study proposes, being processes and procedures for ICT-evaluation guided by the research question. Following the overview, the chapter introduced a section on theoretical perspectives of ICT-evaluation. In that section the inspiration to conduct the study was discussed, which included the researcher's prior LTSM evaluation and instrument development experience. The foreseen deliverable was stated as a pedagogical ICT-evaluation instrument to evaluate and select ICTs that, amongst other things, satisfy the Curriculum Assessment Policy Statement (CAPS) curriculum needs and is receptive and conducive to SDL environments in the FET-Phase.

Part of the rationale for ICT focus was to align the study with commitment of education departments to supply appropriate ICTs to schools based on the SACMEQ II. Besides, the international trend was for countries to aspire to compete in the socio-economic sphere which is largely influenced by the digital economy (Dzobelova *et al.*, 2019:2; Loconto & Demortain, 2017:383). When developing an ICT-evaluation instrument, many factors could be considered, including the four dimensions of educator illiteracy as suggested by Darkish.

Furthermore, the identified gaps that have necessitated the study were also declared. First, the GDE only focused on utilization instead of formal evaluation, especially at school level. The second gap was that, although policy favours evaluations, there was no evidence of a formal ICT-evaluation instrument. Lack of such formalization might deny educators the opportunity of fully possessing TPACK, which is proposed by Zhang, *et al.* (2019:4), as some elements hold implications for ICT-evaluation, -selection and -approval.

In this chapter, the author of this document also discussed the research problem and motivation for the study. As stated above in the gap, non-existence of a formal evaluation process and empirically evaluated ICT-evaluation instrument necessitated the study and presented itself as a problem. Having an instrument is a prerogative of meeting teaching-needs (Deshmukh, *et al.*, 2019:1649; Jones, *et al.*, 2018:231). The ICT-evaluation instrument needs to be SDL compliant. However, SDL does not mean aloofness but that the learner should still collaborate with others. The ICT-evaluation instrument supports the educator in selecting supportive digital resources or ICTs (Claro *et al.*, 2018:171). Once the ICTs have been selected the learner is emancipated to take control of their learning environment by determining own needs (Sumuer, 2018:30). The research aim was stipulated based on the research question.

Furthermore, the research design and methodology were stipulated. This was an explanatory multi-strand mixed DBR. The premises on which this work is based were stated as philosophical variants of combined Interpretivism and Functional Pragmatism. The sampling method opted for was purposive, which implies that the objective is specific and defined (Davoudi, *et al.*, 2017:5). Data-collection methods were stated as survey, individual and focus-group interviews. The manner in which the data of these methods were analysed was also presented in a full section of the chapter.

The chapter concluded with a section describing ethical consideration factors. In this section the author of this document included training, risk/benefit ratio, human interests, confidentiality, respect, monitoring as well as trustworthiness. The significance and possible contribution of the study were stipulated: The study should contribute to the body of scholarship regarding evaluations, SDL and BL application as well as technical knowledge of how to develop an instrument. The limitations of the study were stipulated as being limited time and scope and COVID-19 regulations.

Next is Chapter Two which delves into the concept *Self-directed Learnin*g: its meaning is based on various perspectives; attributes of the SDL learner and educator; as well as on SDL demands on and implications for the twenty-first-century educator, learner and learning environment.

CHAPTER 2: SELF DIRECTED LEARNING AND ICT EVALUATION

2.1 CHAPTER OVERVIEW

As earlier declared in Chapter one, this research was designed to answer the overarching, two-pronged question: *To what extent do Gauteng Department of Education (GDE) managers and educators implement policy-based processes and procedures during ICT-evaluation and -selection in the FET-Phase; and what is the ideal, all-inclusive set of criteria for an evaluation instrument suitable for self-directed learning environments?*

In the mission to answer the research question, in this chapter, the author of this document focuses on SDL and presents an exposition of SDL tenets. As demonstrated later in Chapter three, section 3.4, these tenets should, to a great extent, be considered when crafting criteria for developing an ideal ICT-evaluation instrument. The crafted criteria should be converted into MIs which are then embedded in the proposed ideal evaluation instrument. These MIs were constructed in the form of quantitative or qualitative statements or questions to guide evaluators when scoring ICTs.

In order to identify SDL tenets, the author of this document in this chapter delves into SDL as a concept, its demands on the learner and educator and into the perception thereof as a twenty-first-century skill. The author of this document also portrays the responsibilities of an educator in his role as an evaluator using an ICT-evaluation instrument to achieve SDL objectives. Finally, a summary is given of educator ICT benefits. Next is a look into the concept of SDL.

2.2 THE CONCEPT OF SELF-DIRECTED LEARNING

Although the concept of SDL has been researched over decades, the advent of the digital revolution has brought it to the fore and also changed its context (Rashid & Asghar, 2016:606). The contemporary context is that SDL is made more viable where ICTs are used to increase students' engagement in the learning environment. In SDL, learners are emancipated to determine their learning requirements and goals; select resources to achieve their goals; decide upon and employ their preferred learning strategies; and to assess the outcomes of the learning process (Du Toit-Brits, 2018; Du Toit-Brits, 2020; Tredoux, 2012; Vahedi, Zannella, & Want, 2019:4). Although the SDL approach prescribes learners' emancipation from previous rigid, traditional teacher-centred limitations, learners are still required to conduct themselves responsibly during learning (Lemmetty & Collin, 2016:59).

The aforementioned approach implies that in SDL learners are allowed to take charge of their own learning responsibly. It also implies that learners' needs are highly prioritised. Contextually, the goal of putting the learner's needs first is valued by GDE, which is regarded as the pivotal leading agency (Tan, Liu & Louw, 2017:15). For this goal to be realised, the learner should be allowed to enjoy autonomy, take own initiative, set own learning goals and, through self-assessment, decide on the learning outcomes to be reached (Siminica & Dumitru, 2013:121).

Accordingly, SDL is essential for this study which aspires to advocate implementation of SDL principles, practices and methods in the FET learning environment. Coupled with this aspiration is the aim to advocate for schools to use ICTs that are SDL-compatible. To increase the feasibility of schools to select and utilise ICTs that are suitable to SDL, a viable evaluation instrument should exist. It is for this reason that this study proposed development of an ICT-evaluation instrument equipped with SDL-specific MIs. Due to the aspirations of this study as described earlier, the concept *SDL* is discussed in the following paragraphs.

Due to the widespread use of SDL in different parts of the world, competing terms are used in its place. These terms include self-regulated learning (Rashid & Asghar, 2016:607), self-planned learning and learning projects (involvement in projects); autonomous learning (independence of thought, individualised decision-making, critical intelligence; Autodidaxy (self-instruction outside formal settings); self-education and open learning (Brocket & Hiemstra, 2018). However, for consistency in the context of this study, the researcher chose to use the term SDL. Various perspectives exist in terms of SDL definitions, descriptions and principles – some of which will be explored in this chapter. However, the next section describes how SDL is perceived as an approach to learning.

It is the opinion of the author of this document that dissecting the SDL concept, attributes and demands on the learner and educator has an impact on the study. The aspired for effect is that since SDL is implemented around the globe, as outlined above, developing an instrument that lacks direction towards SDL could be ineffectual to the twenty-first century ICT world as SDL is a core skill within the twenty-first century- (Du Toit-Brits & Blignaut, 2019). Developing an instrument to enhance SDL without comprehending this principal concept could negatively affect intended pedagogical goals. However, understanding the enables ICT- evaluation instrument developers to craft relevant Mis.

2.2.1 Self-directed learning – an effective approach to learning

North-West University adopts SDL as an effective approach to learning (Lombard, 2018:1). In particular, NWU adopts SDL because it advocates for reform in the learning environments from traditional to the SDL approach. Reform, and conversion to SDL, are not only advocated for institutions of higher learning, but also includes the workplace and schools. Inclusion of all sectors of society in SDL advocacy holds the potential of a positive synergy, since all sectors are interdependent and supposedly aspire for producing a world-class citizen or member of their institution who optimally contributes to the GDP of their country. As stated earlier in Chapter one, the state and its education departments aspire to produce a world-class citizen; effective and accountable members of their workforce that can compete in the ICT-dominated world (UNESCO, 2015:18). A competitive world-class citizen is the one who shall, upon completion of formal learning, continue to serve in an ideally SDL-compliant workplace. An SDL-compliant workplace or organisation is one that advocates SDL and in which the worker is allowed to discover his or her own identity. Such workplaces focus increasingly on the self-sufficiency of employees and self-directedness – they appoint self-directed teams in which individuals accept the responsibility of their allocated projects and aim to develop their competencies. SDL organisations are agile, fast-paced and less hierarchical (Lemmetty & Collin, 2020:51). Next is a look at SDL from a social, collaborative constructive perspective.

2.2.2 Self-directed learning from a social, collaborative, constructive perspective

The above-defined aspiration to reform institutions towards SDL can only thrive if schools are immersed (Lombard, 2018:16). One may thus assume that one way of immersing schools is by supporting their educators and evaluators to select ICTs that enhance SDL. It is for this reason that this study aspires to investigate best means and criteria for evaluating ICTs in the FET-Phase to enhance SDL in learning environments. During those investigations, SDL principles will be imported as advocated by NWU and other educationists. Importing the SDL principles will be handy to construct formal evaluation criteria and indicators and to embed those indicators in an SDL ICT-evaluation instrument. An SDL ICT-evaluation instrument should enable evaluators to select ICTs that produce self-directed, life-long learners who possess skills and competencies to cope with the demands of life in general.

In short, the ‘overarching mission’ of SDL, is “a commitment to cultivating inquiry-led, self-directed and adaptable learners” (Lombard, 2018:14). The mission for selecting SDL-compliant ICTs as stated above is to create a self-paced, autonomous learning environment which is often made possible by innovativeness. Innovative learners are proactive rather than reactive and apply SDL in their own life-long experiences (Knowles, as cited by Du Toit-Brits, 2018:376). In short, one may conclude that innovativeness coupled with creativity and novelty by both the learner and educator (Kalyani & Rajasekaran, 2018:3) is made feasible by an SDL environment. From the fore-going discussions it becomes clear that SDL involves a social interaction including the learner and educator, the educator or evaluator and other education officials and also is a cognitive matter. Hence the social and cognitive characters of SDL are discussed in the next sections.

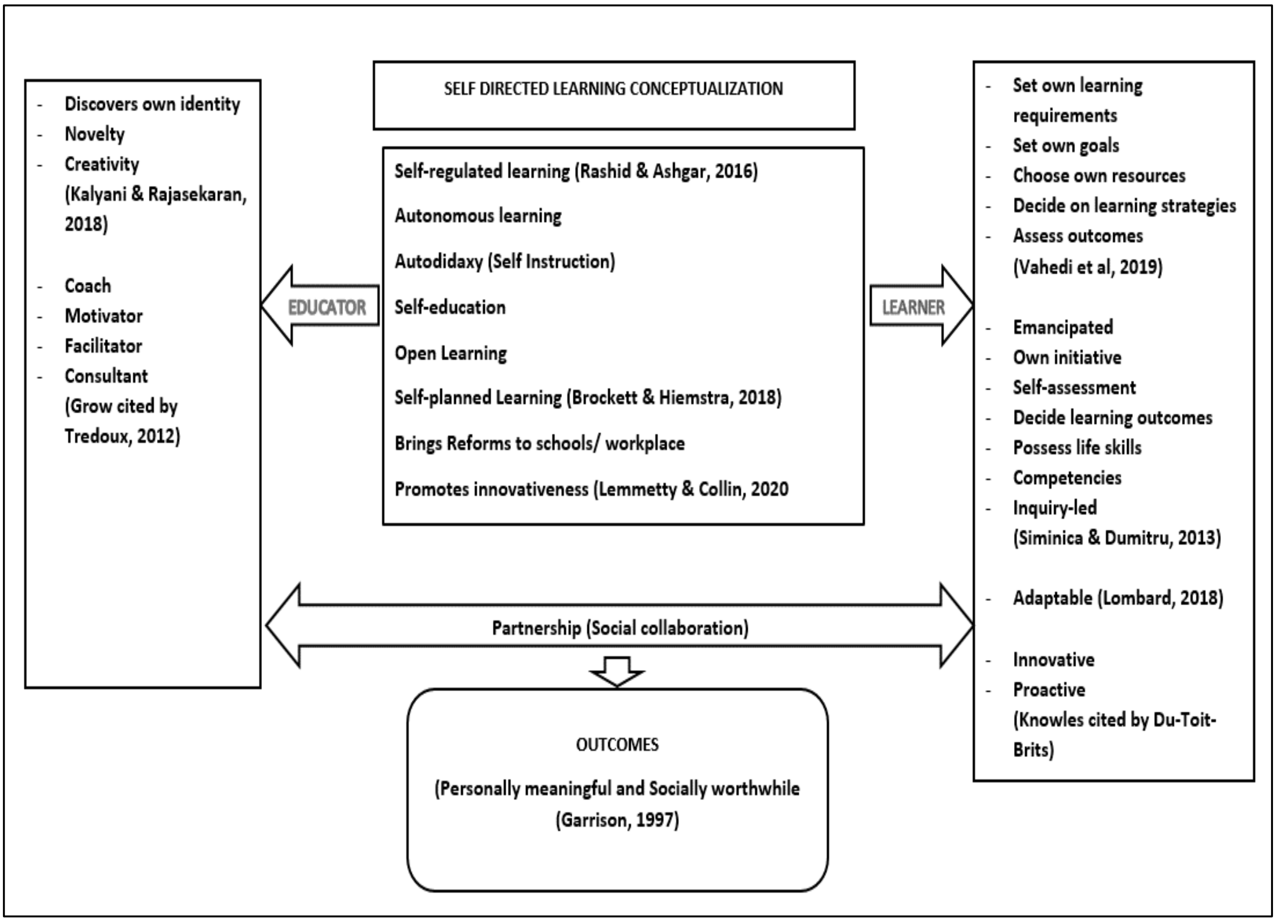


Figure 2-1: Self-Directed Learning conceptualisation

Source: Author's own

Figure 2.1 indicates that SDL may be presented as autonomous, self-regulated learning (Rashid & Asghar, 2016) characterized by self-instruction (Autodidaxy, self-education, open-minded learning which is self-planned by the learner (Brockett & Hiemstra, 2018). SDL brings reforms to schools by promoting innovativeness (Lemmety & Collins, 2020). It is a partnership of social collaboration between the learner and others and its outcomes are personally meaningful and socially worthwhile to the partners (Du Toit-Brits, 2020; Garison, 1997). Figure 2.1 also illustrates the character of both the SDL learner and the educator. Depending on the learner's development level, the educator becomes the coach, motivator, facilitator and consultant (Du Toit-Brits, 2018a; Grow, as cited by Tredoux, 2012:37). The SDL educator is liberated to find own identity, novelty and creativity (Kalyani & Rajasekaran, 2018:24). On the other hand, the SDL learner is emancipated to take own initiative by setting own goals and learning requirements, choosing own resources under the educator's guidance, setting own strategies and assessing own outcomes (Du Toit-Brits, 2018a; Vahedi *et al.*, 2019:4). The SDL learner is adaptable (Lombard, 2018) and proactive (Knowles, as cited by Du Toit-Brits, 2018).

To put this study in perspective, the next section deals with some of the SDL research sub-areas as portrayed on the NWU website. Although this study is rooted in only one of these research sub-areas, mentioning others is inevitable. It is inevitable because the proposed ICT-evaluation criteria and instrument are holistic and cover SDL extensively.

2.2.3 Self-directed learning research sub-areas

As suggested above, to put in perspective where this study is located, Figure 2.2 (below) illustrates some of the sub-areas of the NWU SDL research unit including: (a) Problem-based learning to enhance SDL; (b) Assessment to support SDL; (c) Blended learning to support SDL; (d) Cognition and metacognition to enhance SDL; (e) Cooperative learning to enhance SDL; and (f) Indigenous knowledge and contextualised learning to enhance SDL (www.nwu.ac.za).

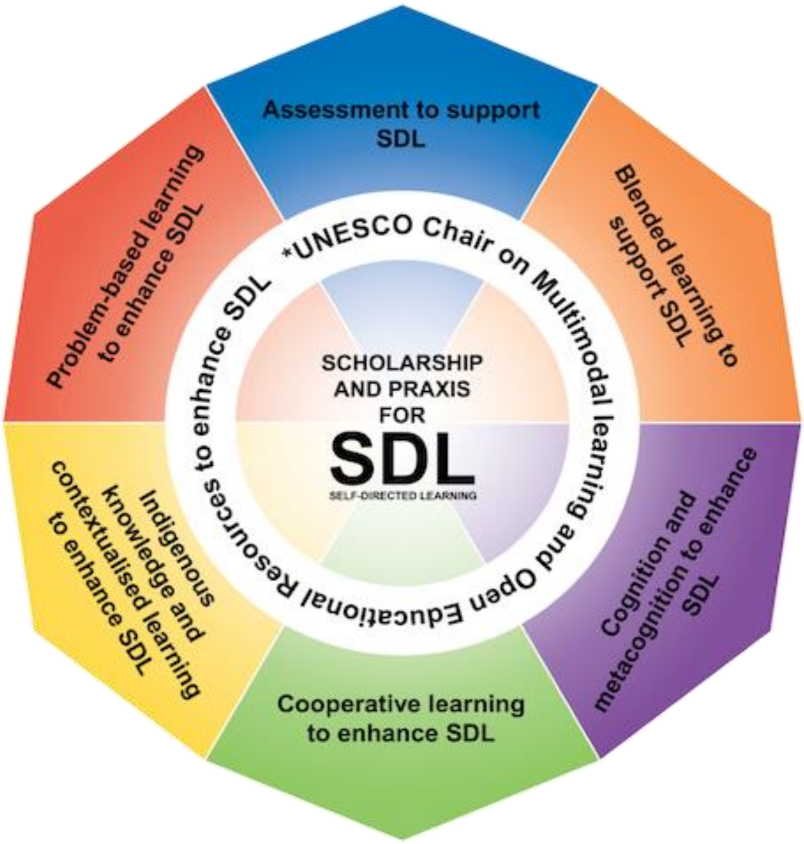


Figure 2-2: Self-directed learning research subareas

(www.nwu.ac.za)

Figure 2.2 shows the dynamism of SDL as a pivotal central concept around which all the aforementioned research areas revolve. These research areas all have a certain element of interdependence, and influence curriculum implementation from various perspectives.

In relation to these subareas, this study is located within *BL to Support SDL* since BL and SDL form its focal point. The location of the study in the sub-area is influenced by its focus: "An evaluation of information and communication technologies in the FET-Phase to enhance SDL." The intended output for the research work is thus to yield an instrument to evaluate ICTs that adhere to principles of SDL as much as possible, as stipulated in Knowles' definition that an "SDL learner takes the initiative and responsibility for what occurs; selects, manages, and assesses own learning activities; takes the initiative in diagnosing their learning needs, formulating learning goals; and identifying learning resources and outcomes evaluating the outcomes of their own learning process; thus taking responsibility for directing their own life and learning" (Knowles, 1975:18). The aspired for self-directed and innovative learners are proactive rather than reactive and apply SDL in their own life-long experiences (Knowles, as cited by Du Toit-Brits, 2018b:376). To close the SDL concept, it is fair to uphold the interpretation by Mok and Mo (2018) that SDL is "assessment as learning, learning how to learn, and learning to learn".

The next section deals with the attributes of the pivotal SDL participants who were also, in Chapter one, declared as the end-users of the selected ICTs. First, the attributes of an SDL learner are elaborated on, followed by those of the SDL educator.

2.3 ATTRIBUTES OF A SELD-DIRECTED LEARNER AND EDUCATOR

The next sub-section exposes the demands made on and expectations from the SDL learner, which are coined into attributes. These attributes centre on Knowles' (1975:18) definition segments which clearly describe the nature of a learner in SDL. The attributes of a learner also illustrate how the SDL learner is expected to operate within the appropriate learning environments in which they are emancipated from traditional teacher-centred limitations in order to take control with responsibility (Lemmetty & Collin, 2016:59).

2.3.1 Attributes of a learner in self-directed learning

Knowles (1975:18) maintains that SDL activity takes place with or without the help of others. Consequently, the learner is an active participant who takes charge of his learning. As alluded to earlier, adherence to SDL principles suggested by Knowles (1975:18) will yield a user-friendly ICT-evaluation instrument that assists the evaluator, educator and ICT-manager in selecting ICTs that set an environment in which the learner is emancipated from traditional teacher-centred limitations to take responsibility and the initiative for his learning situation. Once emancipated, the learner gains confidence and increased competence (Biemiller & Meichenbaum, 2017:89). The learner is regarded as an active participant in learning.

Since emancipated, self-directed learners select time, area of work and the sequence or order at which they will approach their work, all one their own (Lemmetty & Collin, 2016). In other words, the learners take charge of their learning activities and circumstances. As an active participant, the learner is also enabled to establish their own learning needs and set or formulate their own goals (Vahedi *et al.*, 2019:4). The learner should also be able to select their secondary LTSM, including ICTs and set their outcomes. Setting their outcomes allows the learner to have the drive to pursue their goals and consequently cover the intended scope of work potentially with diligence.

Furthermore, some of the attributes of self-directed learners may be summarised as task awareness (Toh & Kirschner, 2020:9); learning strategies and learning activities (Rashid & Asghar, 2016:605); evaluation; and interpersonal skills (Vahedi, *et al.*, 2019:8). The aforementioned implies that SD learners need to be conscious of factors that accelerate learning, to adopt learning strategies, carefully select activities to engage in, monitor and evaluate own activities, and to possess and improve their interpersonal skills (Rashid & Asghar, 2016:605).

As an active SDL partner, the educator continues to fulfil the role of a guide to the learner. During that guidance, the educator is expected to direct and support the learner to be self-directed. Guiding the learner is important because SDL does not imply educator's abdication of duties nor does it mean the learners' lonesomeness. This fact is also clarified by Tuzlukova and Singh (2018:417) when they emphasize on the learner's initiative - whether working alone or in collaboration with others. However, the educator's level of involvement should match the learner's level of self-directedness. In other words, SDL therefore is a journey of several phases during which the educator fulfils varying roles, depending on the learner's level of development and self-directedness. During that journey the educator needs to be conscious that although emancipated from traditional teacher-centred limitations, the self-directed learner still relies on the educator's leadership. For example, the educator leads the learner in choosing activities as well as selecting and integrating resources (Becker & Palenberg, 2018). As illustrated in Table 2.1 (below), during that journey, the learner executes his/her responsibilities within the perimeters of the SDL attributes. Such execution produces SDL inputs and outputs which could be beneficial to the learner and his SDL partners. For such illustration, the author, in Table 2.1, implements some of the learner attributes that were discussed in this section, 2.3.1.

Table 2-1: Input/ output analysis based on the attributes of an SDL learner

Source: Author's own

SELF DIRECTED LEARNING: LEARNER ATTRIBUTES				
Input	**Primary Output**	**Beneficiary**	**Secondary Output**	**Beneficiary**
Adherence to SDL principles/ goals	Self-directed Learner	Learner	A sound ICT-evaluation instrument	Evaluator Educator
Emancipation of Learner	Confidence Competence	Learner	Active participant	Learner
Emancipation of Learner	Time selection Sequence Goals/ order	Learner	Diligent learner	Learner Educator
Self-directedness	Awareness Strategies Activities Interpersonal skills	Learner	Measurement indicators (ICT-evaluation instrument)	Evaluator Educator
Educator's guidance and support	SDL	Self-directed Learner	Measurement indicators (ICT-evaluation instrument)	Evaluator Educator

As seen illustrated in Table 2.1 (above), for impact analysis one may describe actions taken towards attainment of some of the learner attributes as input measures. Relatively, attained learner or educator attributes may be regarded as output measures. Inputs result in or produce either a primary or secondary output. Each output has either the learner or educator or both as beneficiaries.

Furthermore, Table 2.1 clearly indicates that if educators adhere to SDL principles (input), they will have a self-directed learner (primary output). For the same input, a sound evaluation instrument will be yielded. As an input, emancipation of the learner yields a confident, competent learner – an active SDL participant. The same input yields a learner who selects own time, sequence and goal or order as primary output. The same input assists the evaluator when developing MIs for ICT evaluation. The evaluator ascertains whether the corresponding learner attributes are catered for. Similarly, when self-directedness (input) boosts the learner's awareness and capability to develop own strategy, activities and interpersonal skills. These become MIs for an ICT-evaluation instrument. Lastly, the educator's guidance and support produce a self-directed learner and MIs. In order to further illustrate the partnership of both the learner and the educator in SDL environments, the next sub-sections deliberate on the attributes of the educator.

2.3.2 Attributes of an educator in self-directed learning

Due to a variety of perspectives, an SDL educator can be expected to fulfil many roles. In the next section, the educator's roles of supporting the learner's self-directedness; the educator's roles of coaching, motivating, facilitation, consultancy (Du Toit-Brits, 2018a; Grow as cited by Tredoux, 2012:37); and integration of resources (Becker & Palenberg, 2018; Khaloufi & Laabidi, 2017:57) are described.

2.3.2.1 Supporting the learner's self-directedness in a self-directed learning environment

In SDL, the educator encourages the learner to learn to select their own ICT resources and decide on learning venues (Lai, 2015:75). The learner decides whether to confine to the traditional "brick and mortar" environment or engage in a variety of learning environments, including online learning (Horn & Stalker, 2017). Selecting their own resources, under the educator's guidance becomes an easy task because individual learners often intrinsically have the wish to own or enjoy ICT-resources or media and to be connected to the Internet. As portrayed by Azeez *et al.* (2019:20), intrinsic motivation is a "wish to devote strength to a particular endeavour due to the enjoyment one derives from that endeavour". In addition to this notion, an intrinsically-motivated educator is likely to increase their impact to facilitate learner self-directedness (Du Toit-Brits, 2018a; Louws, Meirink, Van Veen & Driel, 2017:174). In order to facilitate the learner's self-directedness, the intrinsically motivated educator assumes various roles, depending on the learner's level of self-directedness. How an educator navigates among different SDL roles is discussed in the next section.

2.3.2.2 Educator as Coach, Motivator, Facilitator and Consultant in a self-directed learning environment

Although, as explained above, learners are generally intrinsically motivated towards ICT use and ownership, an educator might encounter a smaller percentage of learners who refute computers. Those who refute computers are regarded as 'want-nots' instead of 'have-nots'. Those learners are technophobic (Van Dijk, 2006; Chetty, 2017). The educator needs to be equipped with strategies of detecting and supporting the so-called 'want-nots' or technophobic learners. This issue is fully discussed in Chapter three, section 3.3.3, which deals with the digital divide. The educator's task of supporting learners could be made simpler by learners who are already self-directed when approaching the learning environment.

As indicated earlier, over time the educator assumes various roles during the SDL journey. The educator's role progresses from coach to motivator, facilitator and then consultant, depending on the learner's level of readiness to engage in an SDL environment (Du Toit-Brits, 2018a; Du

Toit-Brits, 2020; Tredoux, 2012). These roles are referred to as steps in guiding the learners towards SDL. The learner's level of self-directedness is determined by their competency, skills and cognitive knowledge, which have a direct effect on the learner's performance (Abid, Hussain & Shoaib, 2019:3157). This implies that the educator should also possess skills of assessing the learners' level of readiness and thereby deciding how to navigate between the steps, as mentioned earlier, when guiding the learner towards SDL.

The steps mentioned above imply that SDL does not mean that the educator should abdicate. Furthermore, learners do need educators to facilitate or give advice, offer learning strategies and create an SDL environment. The SDL environment includes autonomous learning, SDL learning resources as well as how to use those resources (Brockett & Hiemstra, 2018:76). Learners' openness to the educator's involvement in the SDL environment implies that although they might be open and intrinsically motivated, they still need the educator's extrinsic motivation, leadership, guidance and support. One may therefore deduce that without the educator's support, learners do not feel confident or get a clear understanding of technological resources to their disposal (Brockett & Hiemstra, 2018:78). One can thus not reiterate that, in a more sophisticated ICT environment, learners need the educator's support. The next section exposes integration of ICT resources as another role of educators in guiding learners towards self-directedness. As explained next, although emancipated from traditional teacher-centred limitations, learners still need the educator to guide them on ICT resource selection and integration.

2.3.2.3 Integration of ICT resources

As outlined in the last section, in order to offer support to the learner in a blended and SDL environment, the educator needs to incorporate in-class and home-based learning activities using ICT resources such as videos and flash drive cloud technologies. With the use of these ICT resources, the educator strives to support the learner for improvement of the learning beyond the classroom. The SDL educator integrates classroom ICTs to support the learner outside the classroom (Khaloufi & Laabidi, 2017:57). Also, since learners, especially boys, often use ICTs for gaming or as toys (Dolch, 2019: 96; Ferreira, 2017:126), such can be turned into learning tools suitable for SDL.

As suggested in the previous paragraph, educator support to the learner through supply and management of ICT resources is in line with suggestions made by Brockett and Hiemstra (2018:75) who suggest facilitation of SDL by: (a) providing students with conceptual information that raises their consciousness of the language learning process and metalinguistic and metacognitive concepts; (b) providing students with methodological information on resources and strategies and involving them in experimenting and discovering what works for them and what does not; and (c) providing students with psychological support for effective management.

To sum it up, the educator should not abdicate but still fulfil his SDL responsibilities. As part of those responsibilities, the educator engages in ICT resource selection and integration. Thus, although emancipated from traditional teacher-centred limitations, the learner still values ideas and educator support. The learner incorporates learning resources that were recommended by the educator in the traditional classroom, even when they are in offsite SDL environments (Becker & Palenberg, 2018). Learners value the educator's pedagogical and metacognitive direction on how to use resources (Lai, 2015:75). To exploit that value, ICT-evaluation criteria should encompass the educator's skills to assist learners in integrating integrate resources, for instance converting entertainment ICTs or toys into learning ICTs.

Lai (2015) summarizes the teacher's role by stating five behaviours that would encourage learners to meaningfully execute the integration of ICTs, namely: (a) encouraging learners to use technological resources on their own beyond the class learning: (b) recommending specific technological resources that students could utilise for learning beyond the class; (c) leading students on how to use technological resources for learning; (d) using technologies in class; and (e) designating technology-enhanced homework. The next section explores how the demands of the highly digitalised, fast-paced twenty-first-century shape both the learner and the educator for SDL compatibility. The educator needs to understand the twenty-first century SDL demands on both himself and the learners in order to prepare the learner to be a useful human being and a world-class citizen (Du Toit-Brits & Blignaut, 2019).

2.4 SELF-DIRECTED LEARNING AS A TWENTY-FIRST CENTURY SKILL

In this section, the author of this document focuses on SDL as a twenty-first-century educator and learner skill. To initiate the discussion, based on some literature review, reasons are stipulated as to why SDL is regarded as a twenty-first-century skill. Later in the section, SDL qualities as a learner-centred approach, its implications for twenty-first century learner and educator are also discussed in detail.

2.4.1 Why self-directed learning is regarded as a twenty-first century skill

According to Sang, Liang, Chai, Dong & Tsai (2018:307) whereas, during the beginning of the twenty-first century many countries contributed with educational reforms to improve the quality and equity of education, China took the lead due to its curriculum reform. These reforms, including economic diversification, were implemented in order to foster twenty-first-century competencies among learners and educators; the latter being the transformation agents (Sang *et al.*, 2018:307). What is striking about the reform is that it challenged educators to make fertile grounds for learning competencies which included SDL. The other learning competencies which are also compatible to SDL were identified as (a) collaborative learning; (b) meaningful use of ICTs; (c) critical thinking; (d) creative thinking; and (e) problem-solving (Du Toit-Brits & Blignaut, 2019; Tuzlukova & Singh, 2019:416). What is intriguing about this study and strengthens the idea that SDL is a twenty-first-century skill, is that both SDL and ICT and other related learning competencies were being considered during the planning and implementation of those global reforms.

Furthermore, in Chapter one, based on the views of Oviawe (2016:9), the twenty-first century was portrayed as a highly digitalised, fast-growing and dynamic ICT age. This academic and socio-economic character of the twenty-first century demands education departments' worldwide to be dynamic in all respects of education. Education departments need to keep up with these demands in many ways. However, due to the scope of this study, the focus will remain on the demand for education departments to provide dynamic ICTs as well as up-to-date teaching-and-learning strategies such as SDL (Du Toit-Brits & Blignaut, 2019) and BL. For adaptability towards twenty-first-century challenges, the SDL learner had to be subjected to inquiry-based learning in order to develop high communication skills, problem-solving skills, self-management skills (Du Toit-Brits & Blignaut, 2019), as well as skills for systems thinking (Thang & Koh, 2017:151).

The qualities mentioned above also have a bearing on the nature of an ICT-evaluation instrument to be utilized to select ICTs for the learning environment. If well cast, the ICT-evaluation instrument will assist the evaluator as well as the educator to select and approve ICTs that are dynamic and relevant to the educational demands of the twenty-first century. Hence in this section, the author of this document concentrates on the contributions made by some authors and educationists who advocate for adherence to the twenty-first-century demands. These authors' contributions are clarified in the subsequent paragraphs. Next is discussion of the learner centred approach in SDL.

2.4.2 The learner-centred approach

Twentieth-century teaching and learning are characterised by a paradigm shift from a teacher-oriented to learner-centred approach (Mok & Mo, 2018). A learner-centred approach is one which is congruent with the aims of this study to come up with criteria for evaluation that will yield ICTs that enhance SDL in the learning environment. Figure 2.3 (below) conglomerates some of the characteristics of a learner-centred approach as expressed by Mok and Mo (2018). These characteristics which are discharged in the next paragraph apply to the aim of this study since the ICT-evaluation instrument should measure and evaluate the level at which the selected ICTs comply with SDL and therefore the current context within the learner's socio-economic milieu.

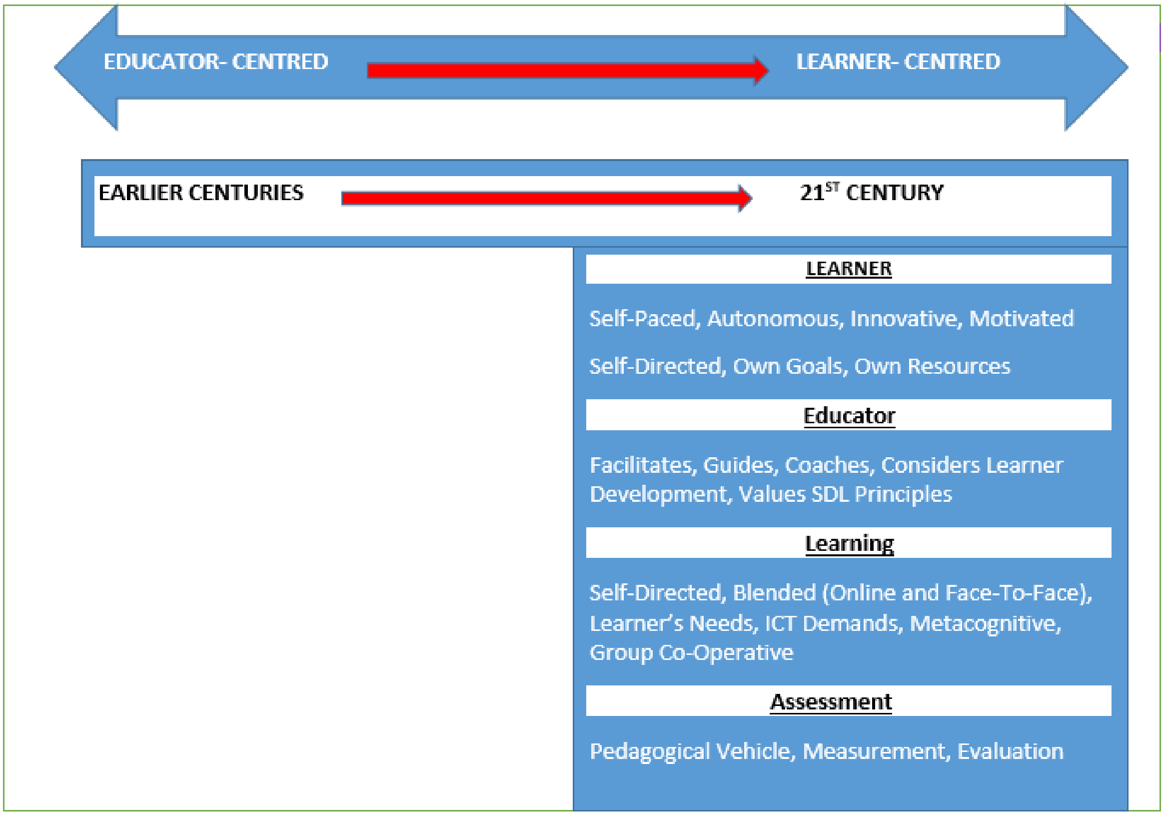


Figure 2-3: The author's impression of the paradigm shifts from Teacher-oriented to twenty-first-century Learner-cantered approach (Mok & Mo, 2018; Tan, Liu and Low, 2017).

Source: Author's own

In order to illustrate the paradigm shift alluded to above, Figure 2.3 depicts that in earlier centuries, teaching and learning were centred on the educator instead of on the learner. However, as the years progressed towards the twenty-first century, there was a gradual paradigm shift towards a learner-centred approach. The first attribute within the learner-centred approach is having a self-directed learner. Twenty-first-century ICTs should provide a learning environment that provides SDL. SDL implies that the learners will work or review learning at any location they prefer, at a time that they desire, at their own pace and alone or in a group setting (Venkaiah, Garimella & Koneru, 2018:7).

In addition to the ICT demands of the twenty-first century, the COVID-19 pandemic has posed a severe challenge to the GDE and education departments worldwide. Since during the COVID-

19 pandemic learning had to take place at home, the question becomes whether or not education departments were prepared for learners to learn in the compelled home environment. Were there any existing ICTs and if so, were they suitable for home and online learning? The digital divide (discussed in Chapter 3) may have also played its part preventing some learners from having relevant ICTs to learn at home or away from the traditional brick-and-mortar school learning environment (Horn & Stalker, 2017). Self-directedness does not mean that the learners are aloof, but they need to work in collaboration with others within an online learning environment (Lim & Wang, 2016:12). As it was defined in section 2.2.2, self-directedness implies that the learner is autonomous and engages in self-regulated learning (Rashid & Asghar, 2016) characterized by self-instruction, open-mindedness, and self-planning (Brockett & Hiemstra, 2018). Furthermore, the self-directed learner is emancipated to be innovative (Lemmety & Collins, 2020), self-assess own outcomes (Vahedi *et al.*, 2019:4) and, however, still engages in a partnership of social collaboration with the educator and other learners (Garrison, 1997).

Next, also illustrated in Figure 2.3, is that in a twenty-first-century learner-centred environment, the learner should be autonomous. An SDL learner is likely to be more creative and enthusiastic, which will increase the learner's freedom and autonomy (Lemmetty & Collin, 2016:59). According to Nasri and Mansor (2016:2019), an ideal SDL environment is achievable if (a) the learner is granted greater autonomy to take control of their learning; and (b) the learner balances his power relationship with the educator. In summary, self-directness is arguably unlikely without autonomy which is coupled with responsibility or a balance of power relations. In the COVID-19 crisis there is a forced dependence on the learner's sense of responsibility while they are autonomous. Autonomy therefore is one of the required criteria for developing MIs on the ICT-evaluation instrument. Creativity, alluded to earlier, works hand-in-hand with innovativeness. Creativity and innovativeness imply social collaboration towards a common goal (Tan & Liu, 2017:245).

As described earlier, the twenty-first-century learner-centred approach exploits assessment (whether self-, peer- and educator-) as a pedagogical vehicle for both learner and educator in SDL (Lombard, 2018:2). In self-assessment, the learner takes charge by setting their own goals within the parameters of the intended outcomes and assessing the level at which the set goals are achieved. Measurement and Evaluation are interrelated and form part of the assessment. Measurement refers to awarding scores or quantitative values (Nitko as cited by Lombard, 2012:2), whereas evaluation is qualitative, descriptive or narrative analysis of the learner's progress (Oosterhof cited by Lombard, 2018:2). Selected ICTs should mainly enable assessment strategies to apply as prescribed in the CAPS.

When a learner uses their ICTs to design own learning activities, their own learning experience is positively impacted (Vahedi, *et al.*, 2019:8). In search of resources and execution of learning strategies, SD learners initially depend on the educator (teacher oriented approach) and gradually progress towards independence (learner-centred approach). The ability to direct their learning in a process called inquiry-based learning is perceived as very crucial in the twenty-first century (Toh & Kirschner, 2020:6). During inquiry-based learning learners design learning activities which should address their own needs, aspirations and set goals. SDL, the learner-centred approach, is regarded as a twenty-first-century demand due to the aforesaid socio-economic milieu.

As reflected in Figure 2.3, BL forms part of the twenty-first-century learner-centred approach. Although self-directed, the learner still needs to interact face-to-face with the educator. BL is a fusion of online or computer-mediated (Vahedi *et al.*, 2019:4) and face-to-face contact time between the educator and the learner. As portrayed by Lim and Wang (2016:12), the advantage of BL is that it provides for and creates a learning environment that offers quality, equitable life-long learning opportunities.

BL, as well as SDL, lay an explicit level for metacognitive knowledge which depicts the learner's knowledge of him-/herself, performance and utilisation of learning strategies (Mok & Mo, 2018; Tan, Liu & Low, 2017). Therefore, metacognitive regulation relates to self-assessment since it involves the learner's censoring of their own intellect, planning of activities, task awareness or comprehension, performance, measurement and evaluation, as well as scrutinising processes and strategies of their learning (Toh & Kirschner, 2020:9). To make provision for metacognitive knowledge and strategies, the ICT-evaluation instrument should contain MIs that enable evaluators to select ICTs that advance the learner's metacognitive knowledge and strategies for suitability towards SDL and BL.

In collaboration with the earlier-mentioned attributes of the learner, the twenty-first-century learner-centred approach, also depicted in Figure 2.3, annotates attainment of own resources, under the educator's guidance, as one of the requirements. The demand is that the twenty-first-century learner needs to choose their required resources based on own set learning goals. However, as stated earlier, the learner needs to socially collaborate with others, especially the educator, to gain access to a variety of resources (Vahedi *et al.*, 2019; Knowles, 1975). It is for this reason that the ICT-evaluation instrument needs to be centred on the needs of both the educator and the learner because they are the end-users of ICTs in the learning environment.

From Figure 2.3, the notable salient features of the SDL approach are those of a learner who is self-paced, autonomous, innovative, sets own learning goals and assessment activities. The learner-centred approach is also characterised by BL, Metacognition, involvement of the learner in ICT resource selection supported by the educator, social collaboration with others, an educator who assumes various roles to cater for the learner's during various SDL levels of development. These educator roles are dealt with more extensively in the next section in which the demands made in the twenty-first century on both the learner and the educator are portrayed.

2.4.3 Implications of self-directed learning to a twenty-first century learner

Due to the rapid advancement of ICT-development and -utilisation in the twenty-first century, specific kinds of learning activities or approaches determine or provoke the learners' forms of cognitive encounter, which in turn persuade learning, i.e. what learners remove from learning activities (Chase, Marks, Malkiewich & Connolly, 2019:17). Thus one may deduce that whereas the learner is a significant participant, the teaching approach applied, or educator's input, has some implications for the twenty-first-century learner. Following is a discussion on some of those implications.

2.4.3.1 Exposure to a convergence of educational practices

To pose challenges to the learner, BL is the prominent approach. As already indicated, BL fuses face-to-face and online learning approaches. In a face-to-face learning approach, the learner encounters an educator who is considered an instructor. According to Graham (2019:146), the educator's face-to-face role is to provide structure and immediate feedback to the learner whereas in online learning environment organises communication via different platforms like emails, discussion boards, chats and web conferencing. However, learning outcomes that involve BL, the 'convergence of educational practices', outperform those in purely online or face-to-face models because collaboratively online teaching holds the potential of enriching, enhancing and expanding face-to-face teaching (Graham, 2019:146). The next section describes how and why the twenty-first century learner is demanded to collaborate with others when utilizing ICTs.

2.4.3.2 Utilization of ICTs in social collaboration with others

In congruence with BL and in order to be effective human citizens who are effective within their country's diverse economy (Sang, *et al.*, 2018:307), learners of the twenty-first century need to be self-directed (Zhu, Bonk & Doo, 2020:15). Thus the twenty-first-century learner is engaged in SDL activities in which they, as stated earlier, take charge. Whereas emancipated from traditional teacher-centred limitations, as stipulated in Section 2 under the SDL concept, for perspective and informed decision-making the learner is demanded to use ICTs in collaboration with others. Social collaboration is useful because it equips the learner with a multiplicity of opinions and exposes them to various perspectives. The purpose of social collaboration is not mere information-sharing. Information-sharing merely is exchange of different information types, yet social collaboration is more complex and requires adequate resources (e.g. time) as well as co-operative high-level policymaking from the SDL partners (Wu & Chiu, 2018:6). Social collaboration is demanded in both BL and SDL as these have a common objective of shaping up the learner's attributes. The next section explains competitiveness as a demand on the twenty-first century learner.

2.4.3.3 Competitiveness

In the next paragraph, an architype of the twenty-first-century SDL learner attributes is presented in the form of the Singapore Ministry of Education's desired outcomes model (Tan et al., 2017:1 54). In the mentioned model, Geography is used as an exemplar. However, as stated earlier, this study aspires to produce a generic ICT-evaluation instrument which is not subject-specific. Development of subject-specific sections of the instrument is an education department's competence. Should an education department such as the GDE engage in that development process, they may use the generic ICT-evaluation instrument as an architype.

As outlined above, in its desired outcomes model, the Singapore Ministry of Education grouped the learner attributes into four categories, namely: "(a) confident person, (b) self-directed learner, (c) active contributor and (d) concerned citizen" (Tan *et al.*, 2017:146). Concerning this study, these learner attributes seek to yield the self-directed, competitive, independent, socially collaborative world-class citizen (UNESCO, 2015:18). So, although in Figure 2.4, Geography is used as an exemplar, these categories may apply in development of generic criteria and evaluation instrument. Therefore, the ICT-evaluation instrument MIs should consider integrating these attributes.

Figure 2.4 (below) endeavours to discharge how the above attributes mentioned earlier are utilised to cast an evaluation instrument as well as evaluation criteria.

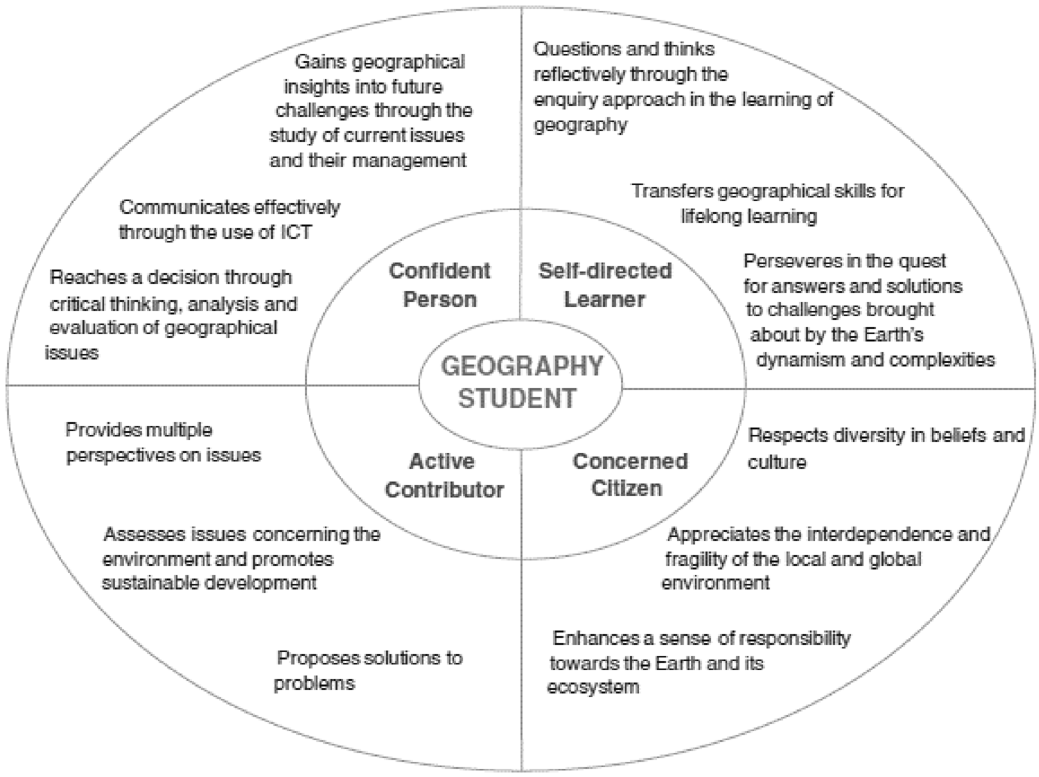


Figure 2-4: The desired outcome of education in Singapore using Geography student as an example (Tan et al., 2017:1 54)

It is clear from Figure 2.4 that the learner is placed in the centre of the learning process with SDL skills to be a confident person, self-directed learner, active contributor and concerned citizen. The learner is emancipated to be a "confident person" who has gained insights into the future, communicates effectively and, through critical thinking, reaches decisions. The "self-directed learner" questions and thinks reflectively, transfers learnt skills towards life-long learning, perseverance to achieve dynamism and face complexities in life. The SDL learner is an "active contributor" who grants various perspectives on matters, assesses problems and provides workable development and actively offers solutions to problems. Lastly, the SDL learner is a "concerned citizen" who respects diversity in beliefs, appreciates interdependence within the local and global environment and enhances a sense of responsibility towards the earth and its ecosystems. ICTs selected with the guidance of MIs should therefore empower the educator to support the learner to be a confident, self-directed, active and concerned citizen.

Demands made by the twenty-first century on the educator are explored more extensively in the following section. The educator is demanded to navigate among several roles while being sensitive to the learners' level of self-directedness. The typical educator is demanded to use set evaluation criteria to establish ICTs that are viable to assist in emancipating learners towards complete self-directedness.

2.4.4 Self-directed learning demands on a twenty-first century educator and evaluator

As mentioned earlier, while adopting and applying BL and SDL, it is recommended for the educator to optimally emancipate the learner to execute learning tasks with limited interference (Lai, 2015). Since emancipation comes with responsibility, the learner and educator work collaboratively in the interest of the attainment thereof. The implication is that although aiming to liberate the learner, the educator takes a stance not to abdicate their pedagogical responsibilities (Du Toit-Brits, 2019; Lemmetty & Collin, 2016:59). The next section explores steps that educators should take in order to support learners towards fully fledged self-directedness.

2.4.4.1 Taking learners step-by-step towards fully fledged self-directedness

ICT-evaluation criteria and -instrument should strictly adhere to the learner-centred approach in which the learner and educator co-exist as partners who socially collaborate as the learner progresses towards actualization of self-directedness. Such progression takes place step-by-step as the educator withdraws to allow the learner to actualize self-directedness. Selected ICTs should support the educator to execute that step-by-step progression of the learner with ease. The ICT-evaluation instrument should thus be embedded with MIs that direct selection of ICTs congruent to that goal of emancipating the learner. Figure 2.5 (below), based on inputs in Tredoux (2012), endeavours to sketch the steps in the process of learner progression towards self-directedness.

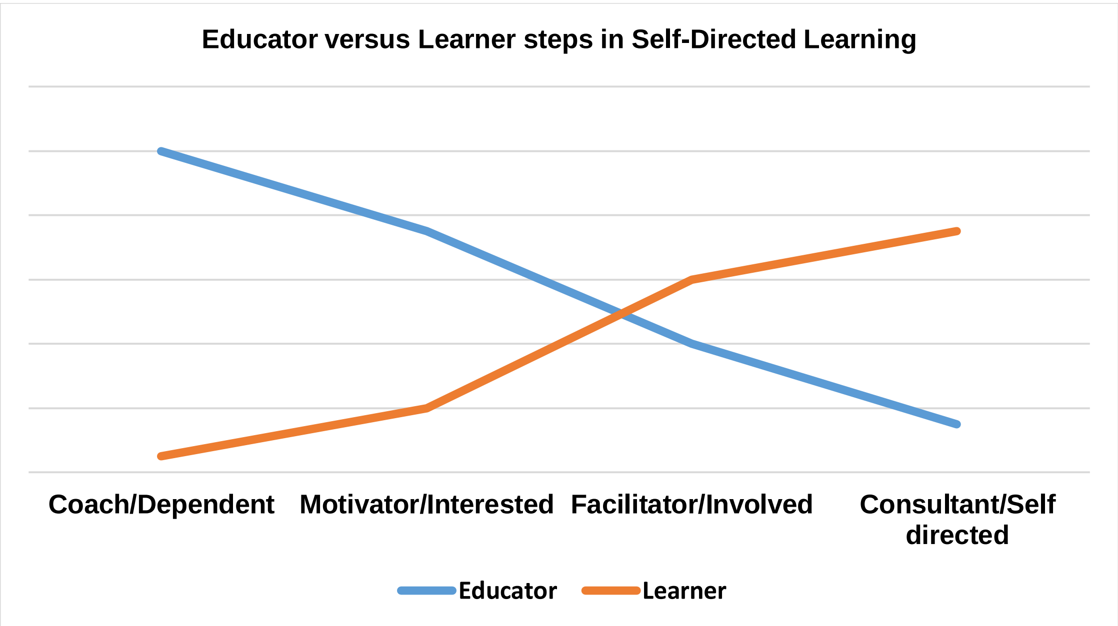


Figure 2-5: Educator's steps in guiding the learner towards SDL readiness (Tredoux, 2012)

Source: Author's own

As illustrated in Figure 2.5, as the teacher determines the level of the learner's self-directedness, they slowly withdraw and allow the learner to be self-driven. The respective general trends of involvement of the educator and learner in this process are reflected utilizing solid blue and red lines respectively. In the spirit of social cooperation, the teacher's dominance subsides, but their involvement remains in the periphery. Selected ICTs should support the educator to be able to set a learning environment that accommodates this journey with the learner until complete self-directedness has been actualized. The recent factor to the context is whether, with the advent of COVID-19, the GDE was prepared for home-schooling in which learners could learn offsite at their homes or quarantine venues. Such offsite learning demands the learner to have progressed towards self-directedness requiring only minimal peripheral guidance from the educator.

Towards the achievement of self-directedness, the learner goes through a step-by-step process over time. As outlined in Grow (as cited by Tredoux, 2012:37), the educator starts this journey as: 1) authority coach; then (2) motivator; then (3) facilitator; and finally (4) consultant, while the learner progresses through steps of being: (1) dependent; (2) interested: (3) involved: and finally (4) self-directed. See the author of this document's own rendition of the said process in Figure 2.5. These steps directly correspond. For example, step 1 of the educator (authority coach) corresponds with step 1 of the learner (dependent). When the fourth step is reached, the learner should ideally be self-directed and emancipated from traditional teacher-centred limitations. The educator's role is to observe the student's level of self-directedness and adopt the corresponding educator step for appropriate learner support. To simplify Figure 2.5 further, when the learner is entirely dependent (step 1), the educator plays a full role as the authority. Once the learner shows the interest (steps 2), the educator steps back slightly and plays the role of motivating the learner to continue exploring his learning environment. Once the learner tightens his grasp and becomes more involved in his learning experience, the educator assumes the role of facilitator (step 3). Finally, the learner becomes entirely self-directed (step 4), and the educator takes on the role of a consultant. At this final step, the learner is emancipated from traditional teacher-centred limitations and takes complete responsibility for his learning experience, plans his learning outcomes and is entirely autonomous.

In short, Figure 2.5 illustrates that as the educator's input or control (in blue) decreases, the learner's self-directedness (in red) increases. As seen in Figure 2.6 (below), Kwan (as cited by

Tredoux, 2012:37) uses phases instead of steps and further annotates the varying SDL levels of the learner as Low (Stage 1), Moderate (Stage 2), Intermediate (Stage 3) and High (Stage 4).

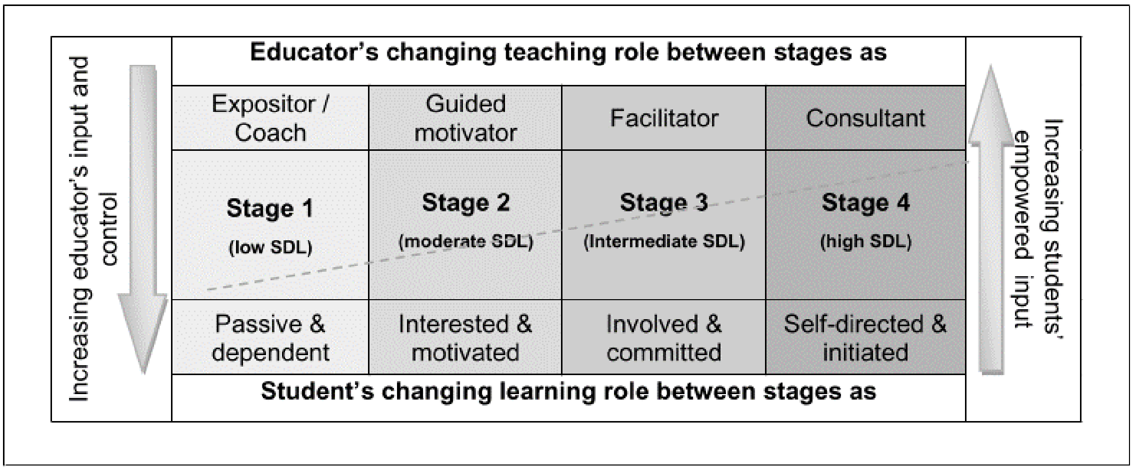


Figure 2-6: Grow's changing roles of educators and learners (Kwan cited by Tredoux, 2012:37)

Figure 2.6 illustrates four stages of self-directedness in which both the educator and the learner's SDL roles change over time. During the first stage of the learner's self-directedness, the learner is passive, and dependent on the educator, the expositor or coach. Towards the second stage, via the educator's guidance, the learner gradually gains interest or motivation. The educator is a guided motivator. The educator migrates to the third stage of being a facilitator and the learner becomes more involved and committed. In the final stage, we have a self-directed, self-initiated learner and the educator serves as a consultant since the learner is emancipated. At the beginning the educator has control but towards the final stage the learner is in full control.

As suggested by Du Toit-Brits (2015:54), for the learner to meaningfully transit through the above-stated steps and achieve SDL skills, the educator supports the learner by: (a) assisting the learner in setting and endorsing performance goals (higher-performance goals will more likely assist the learner in achieving self-directedness); (b) optimally seeking synergy between learning needs to accentuate personal growth and education essentials to connect to students' lives, emotions and learning experiences; (c) sharing their human experiences and invoking the learner to be conscious of their own experiences. This appeals to social collaboration (intrapersonal, interpersonal and interconnections); (d) developing the learner's SDL potential holistically; and (e) laying a foundation for students to base their learning on their own intrinsic and extrinsic goals and aspirations to perform learning tasks, and while they are engaging in SDL tasks they are likely to set performance goals.

Congruent to the above-stated educator support measures for SDL, the educator sets a learning environment that assist the learner to create a balance between new and existing body of knowledge (Du Toit-Brits, 2018a; Shakir, Akhtar & Khan, 2016:169). Also consistent with the above-stated typical twenty-first-century milieu, educator support measures equip the educator to set a learning environment that assists the learner to create a balance between a new and existing body of knowledge (Shakir *et al.,* 2016:169) to give meaning to their own learning experiences. This occurs with decreasing educator interference and increasing learner self-directedness. As illustrated in Figure 2.5 (above) and based on the inputs of Tredoux (2012), the educator can, during the initial stages of SDL, become a coach and gradually withdraw to be a consultant. This gradual withdrawal is key in unshackling the learner to migrate from the traditional curriculum teacher-centred (Kidane, Roebertsen & Van der Vleuten, 2020:9) phase of dependency through to fully-fledged self-directedness. Selected ICTs should support the educator to emancipate the learner towards self-direction. Self-direction also, amongst other things, appeals to the learner's consciousness of their full learning potential.

The next section unfolds the twenty-first-century demands on the educator to participate in ICT-evaluation with a view to achieve SDL objectives. Since the educator requires an appropriate instrument in order to participate, some of the SDL objectives are highlighted for possible adoption in the process of ICT-evaluation instrument development.

2.4.4.2 Evaluating ICTs to achieve SDL objectives

ICTs that are selected using a valid evaluation instrument could guide the educator in his quest to achieve the SDL objectives. In this passage the following aspired for SDL objectives are highlighted, namely: a) expanding the learners' intellectual readiness; (b) supporting learners towards self-initiated goal-setting; (c) catering for individual learners' level of development; and (d) implementing SDL-compatible assessment strategies.

2.4.4.2.1 Expanding learners' intellectual readiness

As stated formerly, the emancipation of the learner requires that the provisions of an ICT-evaluation instrument should include SDL principles. Such emancipation is made possible by the learner's engagement in self-initiated learning, personal autonomy and control (Beach, 2017:60). ICT evaluators should ensure that the learning environment they set up poses a challenge to the learner's self-initiative and intellectual readiness. This notion correlates with the earlier statement that a twenty-first-century learner is expected to be intrinsically motivated and have an interest in ICTs.

2.4.4.2.2 Supporting learners towards self-initiated goal setting

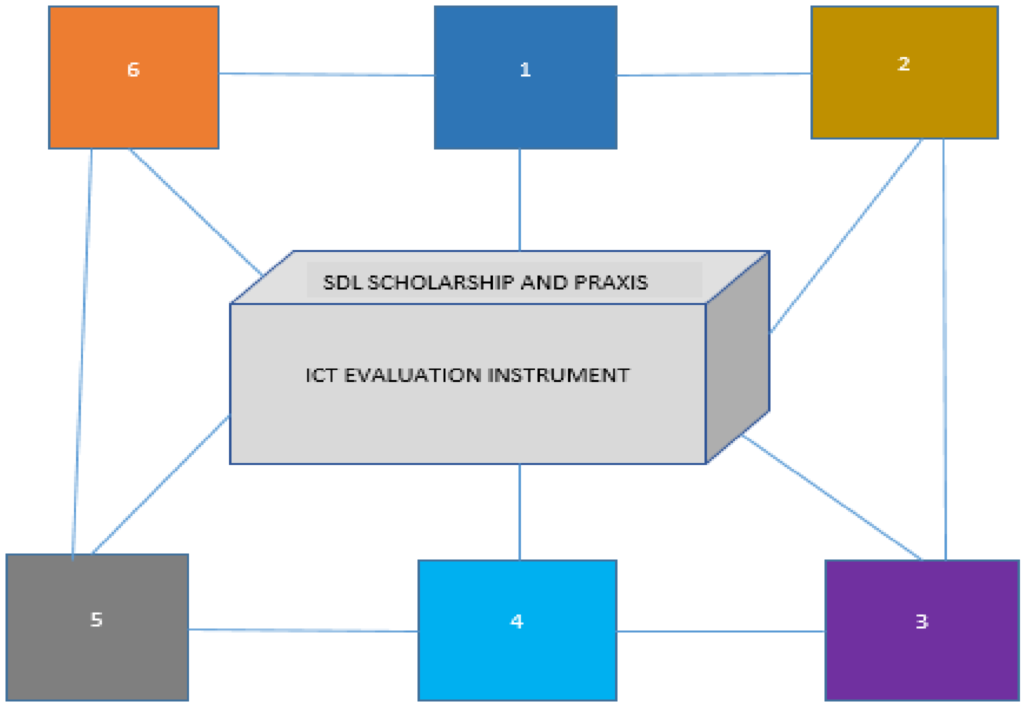
As stated formerly, emancipation of the learner implies that the provisions of an ICT-evaluation instrument should include SDL principles. The suggested three principles towards attainment of self-directedness are a self-initiated procedure of learning, a sense of personal self-sufficiency, and stronger learner control (Beach, 2017:60). ICT evaluators should ensure that the learning environment they set up poses a challenge to the learner's self-initiative. This notion correlates with the earlier statement that a twenty-first-century learner is expected to be intrinsically motivated and have an interest in ICTs. Since learners are emancipated to select their own individual learning goals based on their unique needs, they should not hesitate to actively initiate their learning process, with the support and guidance of the educators. Once the learners are emancipated to set their own goals, that situation translates to self-autonomy. In other words, the processes of goal setting and self-autonomy are interdependent. Greater learner control implies that the learner takes control of the learning process by setting values, setting goals and further engaging in self-planning and self-monitored learning strategies (Du Toit-Brits, 2017). A learner's self-initiated goal correlates with the individual learner's level of development which is being discussed below.

2.4.4.2.3 Catering for individual learners' level of self-directedness

Another principle is that in an SDL environment, programs or instructional designs should intellectually challenge and match the learner's stage of self-direction (Nasri, 2017:3). Matching the learner's self-direction makes it possible to implement SDL steps as per Grow's model in section 3.3.3.1. Thus, to further implement SDL principles globally, the developed ICT-evaluation instrument should be utilised to select ICTs that aim at creating a learning environment that is challenging to the learner, for instance being congruent to the learning objectives as set out in the CAPS curriculum, and relevant to the learner's stage of development within SDL. Although some of the provisions and indicators of the proposed ICT-evaluation instrument may be generic, particular caution should be taken to ensure that they are relevant to the learners' level of self-directedness. Hence the ICT-evaluation instrument should contain Measurement Indicators (MIs) which enquire about whether ICTs do cater for SDL. Toh and Kirschner (2020:10) emphasize the adaptation of SDL principles to suit the learner's unique interests and motivation. Motivation alludes to both the already-existing intrinsic motivation of the twenty-first-century learner and the educator's input or extrinsic motivation. A learner's interest can for example be measured in case of converting computer games which the learner already uses into educational ICTs. Catering for the individual learner's level of development informs the educator on how to approach the assessment of the learner's performance and what strategies to implement. Thus the next sub-section describes some SDL-compatible strategies to be considered, depending on the learner's intellectual readiness, set goals and a development level.

2.4.4.2.4 Implementing self-directed learning assessment strategies

Although specifically rooted in the "*BL to Support SDL" research subarea*, in order to optimally cover all or most curricular needs, the ICT-evaluation instrument should remarkably encompass SDL principles. Some of these SDL provisions are stated in other research sub-areas as well as other education policies on ICT. Figure 2.7 below endeavours to explain that although BL *to Support SDL research subarea* is predominantly prioritized and utilized, a relation with other research sub-areas still exists. The blue lines indicate interrelatedness of the subareas and the ICT evaluation instrument. Each subareas' provisions could be infused in the instrument. The ICT evaluation instrument is depicted in a three-dimensional block to illustrate how it relates to all the subareas.



1	2	3	4	5	6
Assessment to support SDL	Blended Learning to support SDL	Cognition to support Metacognition to enhance SDL	Cooperative learning to enhance SDL	Indigenous knowledge and contextualised learning to enhance SDL	Problem-based learning to enhance SDL

Figure 2-7: Development of ICT–evaluation instrument per provisions of BL to Support SDL research subarea, (adopted from www.nwu.ac.za (n.d.)

Source: Author's own

From Figure 2.7 it becomes evident that due to the allocated subarea of this study, the ICT-evaluation instrument is largely influenced by BL to support SDL, but interrelationship (indicated with blue interconnecting lines) with the other subareas is considered, as explained hereafter. First, as professed in an earlier paragraph of this section, Lombard (2018), when clarifying SDL, employs key adjectives such as "self-paced", "autonomous", and "innovative". He further emphasizes assessment and its related terms such as measurement and evaluation. This current research focuses entirely on the development of a generic ICT-evaluation instrument. Subject specialists could therefore develop subject-specific ICT-evaluation instruments in which they would have to consider and cater for SDL assessment strategies some of which are discussed below:

- **ICT Measurement and Evaluation**

The first two main assessment strategies are measurement and evaluation, which, although interrelated, do not bear the same meaning. Measurement is expressed in terms of assigning scores or numerical values, whereas evaluation indicates a qualitative description of performance (Lombard, 2018:2). One may synopsize that measurement is quantitative, and evaluation is qualitative. In this study, both measurement and assessment are applied since the proposed ICT-evaluation instrument caters for both measurement and evaluation of ICTs. ICT evaluators are required to express both quantitative and qualitative values when measuring and evaluating the compatibility of ICTs. Additionally, some of the MIs in the assessment section of the developed ICT-evaluation instrument should relate to self-assessment and others (including educator assessment) which are explained in the next section.

- **ICT Learner self-assessment and educator assessment MIs**

As alluded to earlier, within SDL parameters, measurement and evaluation of a learner's work are performed mainly by both the learner (self-assessment) and educator (educator assessment) (DoE, 2011:47). Furthermore, as an active participant the learner assesses his/her progress in a process known as self-assessment. During self-assessment, the learner measures the level at which his/her own set goals are achieved. In that process, the learner should be at liberty to work at own pace, autonomously and innovatively with minimal or limited interference (Lai, 2015:74). When the set goals are achieved, the intrinsically motivated twenty-first-century learner will have a sense of psychological satisfaction (Tan *et al.*, 2017:291). Although not interfered with during self-evaluation, the learner is also mediated by others, mainly educators

(Lai, 2015). The point is that the instrument should enable educators to select ICTs that enable the educator's mediation or mentorship. In the absence of the educator's mentorship or supervision, self-directed learners may compound errors/uncertainties while executing their learning activities (Rashid & Asghar, 2016:609). To minimise error, the educator does not abdicate the pedagogical responsibility of guidance and assessing the individual learner's achievement of set goals and curricular outcomes. The educator exploits the learner's intrinsic urge to achieve set goals and also complements it by extrinsically motivating the learner. Self-assessment and educator assessment work together harmoniously. To sum up, selected ICTs should therefore empower the educator to set the scene for both self-assessment and educator assessment. Assessment is perceived and explained as a pedagogical goal in the next section.

- **Assessment as a pedagogical goal**

Assessment serves as a pedagogical vehicle for both learner and educator in an SDL environment. (Lombard, 2018:28). To enhance and encompass the above-stated assessment strategies, selected ICTs should also support educators in evaluating ICTs that are compatible with specific examination strategies and methods that are stipulated in the CAPS. Formal assessment provides educators with a logical method of assessing how well learners are progressing in a grade and a particular subject. Formal assessments include tests, examinations, practical tasks and projects and All assessment tasks that comprise a formal program of assessment for the year are regarded as a formal assessment (Lombard, 2018).

On the other hand, informal assessment is the daily monitoring of learners' progress (DoE, 2011:47). The said strategies and methods of assessment are in line with the views of Boud (as cited by Lombard, 2018:6) that assessment should be formative, immediate or summative; and attend to the learning process as well as to substantive content. In order to achieve assessment goals, selected ICTs should cater for formative, immediate and summative assessment as well as for SDL goals. Some of the assessment goals include assigning tasks to learners, setting criteria for learner performance, setting values on learner performance, modelling information on learner performance, reviewing learner performance, providing feedback to learner performance and monitoring outcomes of the assessment of students (Brandmo, Panadero & Hopfenbeck, 2020:320). Assessment of the learner should take precedence over the learner's innovativeness. Hence the next section demonstrates that selected ICTs should support the educator in his quest to facilitate learners' innovativeness.

2.4.4.2.5 Facilitating learners' innovativeness

To substantiate the earlier notion of autonomy, Bosch (2017) and Du Toit-Brits and Blignaut (2019), similarly to Lombard, supports autonomy and innovativeness as being some of the elements of SDL. At this point, the author of this document would like to highlight that BL and SDL are two approaches that are not exclusive to each other. Their interrelatedness is made more vivid when Garrison and Kanuka (in Bosch, 2017:1) describe BL as learning that combines internet-based or computer-assisted and face-to-face learning. Face-to-face learning is characterized by direct contact between the learner and educator in a physical classroom. On the contrary, online learning is web-based in a virtual learning environment (Bosch, 2017).

Autonomy, as alluded to earlier in Bosch (2017:10), means that in SDL learners are emancipated to be metacognitive, motivationally (intrinsically) and behaviourally active, in their learning process as they determine their own goals and learning strategies, and select own relevant resources. It is of the essence to note that such autonomy does not imply aloofness (Becker & Palenberg, 2018; Du Toit-Brits & Van Zyl, 2017). To curb aloofness, SDL students are encouraged to engage in cooperative learning by socially constructing knowledge and thus boosting their intrinsic motivation (Du Toit-Brits & Van Zyl, 2017). The above statement can be cemented by the proclamation that group success is essential for the individual to achieve their own set goals (Bosch, 2017:198). Based on the above-stated, one may conclude that autonomy and innovativeness are key in SDL within the world of a twenty-first-century learner (Du Toit-Brits & Blignaut, 2019).

2.4.4.2.6 Realising Self-directed learning benefits

As stipulated earlier, the twenty-first-century educator is a guide to the learner towards SDL. However, as a participant, the educator also benefits from SDL provisions and encounters in order to cope with life demands. As suggested by Du Toit-Brits (2018b:37), some twenty-first-century SDL attributes and benefits include: (a) educators use own discretion on application of SDL, contingent on individuals' (in this case educators') personal traits such as attitudes, values and capabilities (Knowles *et al., 1975:18)*; Wang, as cited by Du Toit-Brits, 2018:377); (b) SDL equips learners with the ability to extend and improve their professional development and ways of managing problems. Educators also gain skills such as critical thinking, problem-solving, learning to learn, and self-directedness as suggested (Kirk, Shih, Smeltzer, Holt & Brockett, as cited by Du Toit-Brits, 2018b:377); and lastly (c) educators also benefit their way of living through SDL.

2.5 CHAPTER CONCLUSION

In conclusion, in this chapter, the author of this document highlighted that the advent of the digital revolution has re-accentuated SDL in education and contextualised it to the current twenty-first-century socio-economic milieu (Rashid & Asghar, 2016:606). The twenty-first century demands existence of self-directed learners who are emancipated to determine their learning requirements and goals, select own resources to achieve their goals, decide upon and employ their preferred learning strategies and assess the outcomes of the learning process (Vahedi *et al.*, 2019:4; Tredoux, 2012). Production of these emancipated, self-directed learners boosts the hope of the education departments' intentions to ultimately produce world-class; effective and accountable members of the workforce that can compete in the ICT-dominated world and optimally positively contribute to their country's GDP (UNESCO, 2015:18).

However, emancipation or autonomy of the learners from traditional educator-centred limitations does not mean that the educator's support is invalidated. A balance should be maintained between learner autonomy and educator's support or involvement (Bosch, 2017; Du Toit-Brits; 2018c; 2019, Lombard, 2018; Tan *et al.*, 2017; Beckers *et al.*, 2018). The emancipated SDL learner is the one who is self-paced, autonomous, innovative and proactive and applies SDL in their own life-long experiences (Knowles, as cited by Du Toit-Brits, 2018b:376). In social collaboration with each other, the educator and learner are free to display innovativeness coupled with creativity and novelty (Kalyani & Rajasekaran, 2018:3). Over time, the self-directed learner gains confidence and increased competence (Biemiller & Meichenbaum, 2017:89) mostly when emancipated from traditional teacher-centred limitations and taken as a partner in social collaboration with the educator. An intrinsically motivated educator is likely to increase their impact on learners' self-directedness (Louws, *et al.*, 2017:174) and integrate classroom resources to support the learner offsite (Khaloufi & Laabidi, 2017:57). ICTs assist the SDL partners in designing and executing their inquiry-based learning, which is very crucial in the twenty-first century (Toh & Kirschner, 2020:6).

For integration with reviewed literature, SDL was further interrogated in the methodology laid down in Chapters four and five. Such interrogation covered the following salient areas which form a link between literature and methodology:

2.5.1 Link to survey

As detailed later in Chapter three, section 4.3.1.1, the survey aimed to answer research sub-questions 1-6. Using the survey, the study sought to understand if participants (a) regarded SDL as an effective teaching strategy (survey question 18); (b) thought that learner's participation in SDL activities using ICTs was essential in vain of the DD (survey question 19); (c) valued educator participation and awareness of evaluation and to, among other things, select ICTs that enhance SDL (survey question 8); and (d) thought that procedures are being followed and key during evaluation to select SDL enhancing ICTs. Chapter four details collection methods, tools, and techniques for the relevant data. Analyses of participant responses to the above-listed questions were done in Chapter five, sections 5.21 (Group statistics) and 5.2.7 (Descriptive statistics).

2.5.2 Link to semi-structured individual interviews

Also, as detailed later in Chapter three, section 4.3.1.1, the semi-structured individual interview aimed to answer research sub-questions 2,4,5 and 6. Through the semi-structured individual interviews, the study sought to understand the participants' views regarding (a) whether SDL should form part of ICT- evaluation instrument characteristics (interview question 3); (b) whether SDL is regarded as one of the qualities of a good ICT- evaluation instrument (Interview question 1); whether educator involvement is critical for SDL friendly ICT selection; (d) whether educators thought SDL should be integrated into the curriculum employing a valid instrument.

2.5.3 Link to focus-group interviews

As clarified later in Chapter three, section 4.3.1.1 aimed to answer research sub-questions 2,4,5 and 6. Through the semi-structured individual interviews, the study sought to understand the participants' views regarding (a) their value of broadcasting of ICT evaluation to involve educators to select SDL-enhancing SDL (interview questions 1 and 2); whether they thought qualities of an ICT evaluation instrument should include SDL.

Participant responses to the interviews were utilized in organising data; reading data; coding data, generating a description and themes; and representing the themes (Creswell & Creswell, 2018:193 –195) in Chapter 5, section 5.3. Next, Chapter 3 of this research work further discusses and explores various perspectives regarding ICT-evaluation. In that chapter, SDL is expanded on and applied in the centre of other concepts. Such concepts include the digital divide and social collaboration as guidelines for the development of an ICT-evaluation instrument.

CHAPTER 3: ICT EVALUATION PERSPECTIVES

3.1 CHAPTER OVERVIEW

Since this research work is about an evaluation of ICTs in the FET-Phase to enhance SDL, it was indispensable to discuss the concepts SDL and *Information and Communication Technologies* (ICT). To adhere to this, Chapter two defined, described and analysed SDL, its models and theories. In collaboration, Chapter three aims to focus on ICT-evaluation perspectives in its quest to answer the overarching, two-pronged question: *To what extent do Gauteng Department of Education (GDE) managers and educators implement policy-based processes and procedures during ICT-evaluation and -selection in the FET-Phase; and what is the ideal, all-inclusive set of criteria for an evaluation instrument suitable for self-directed learning environments?* In this chapter, some ICT-evaluation perspectives were factored in for crafting ICT-evaluation criteria and Measurement Indicators in order to develop an instrument. The developed ICT-evaluation instrument could be used for selecting sound ICTs in the FET to meet curriculum, pedagogical as well as SDL needs. Sound ICTs could be utilized towards an education department's ultimate agenda to produce world-class, competitive and accountable citizens in the ICT-dominated world (UNESCO 2015:18). However, pursuance of the above-stated aspirations might be hindered or nullified by the digital divide (DD). It is then the opinion of the author of this document that pursuance of the DD would serve as ammunition for ICT-evaluation instrument developers and implementers to be vigilant. Such vigilance is vital since the DD could be a hindrance. Thus the DD thus is extensively discussed in the next section.

3.2 THE DIGITAL DIVIDE

The DD could be defined as a "gap between people who do and do not have access" to ICTs (Van Dijk, 2017:1). It is associated with minimal ICT usage and accessibility to some and could be ascribed to social stratification (Ragnedda, 2017:4). However, the DD is not limited to physical access. It also occurs due to a number of factors such as inequitable supply or availability of ICT infrastructure (Liu, Zhang & Tian, 2019:281) for example, within a single state as it was explicated in the case of the Arab States in Chapter one, section 1.4 (UNESCO, 2015:18). Due to the DD, ICTs become popularized in some physical geographical locations and remain rare in others that are often disadvantaged (Enriquez, 2019:11). Van Dijk (2017) further asserts that in various locations, the DD could also prevail in gender, age, marital status and educational level. As prompted in Chapter one, section 1.4, in order to counter the DD, society needs to continuously respond with strategies to increase levels of ICT skills amongst its users (Chetty, Aneja, Mishra, Gcora & Josie, 2017:15). As discussed later in this chapter, in the context of this study, the DD is deduced as one of the potential deterrents to pedagogical proceedings including ICT-evaluation (Van Dijk, 2017:7; Dziuban, Graham, Moskal, Norberg & Sicilia, 2018:4). Thus recommendations are made to arm education decision makers with strategies to counter the impact of the DD. These recommendations are based on literature reviews as well as empirical findings of this study. Following are some perspectives of the DD based on literature reviews. DD perspectives based on empirical findings are displayed in Chapter five, section 5.2.6.

3.2.1 Perspectives of the digital divide based on reviewed literature

In this section, the author of this document explored perspectives of the DD based on literature reviews. These perspectives are packaged into subsections which explore variables such as Physical Access (including Geographical location), Demographics (Socio-economic status and Gender) and Social Inequity (Language and Ethnicity, Motivational Access and ICT skills). As a point of departure, the next passage deals with physical access which will be followed by other variables.

3.2.1.1 Physical Access

As introduced above, in his definition, Van Dijk (2017:3) stresses physical access as a determinant of the first-level DD, which buffers those who do and do not have ICT access. According to this dichotomous definition, unlike the disadvantaged, the advantaged have physical access to the best ICTs, fastest internet services, wealth of ICT content and ICT training. In Nigeria, for instance, the developed industrialised countries of the North have more physical access than the less developed countries of the South (Chinecherem, Awodele, Kuyoro, & Izang, 2015:1). To illustrate the first-level DD, Van Deursen and Van Dijk (2017:3) draw a comparison between different world regions. In that comparison, the southern countries, as compared to their northern counterparts, were more impacted by the DD. Irrespective of various intervention programmes to diffuse ICTs across all world regions, there is still a disproportionate ownership and utilization that favours developed countries, especially the United States of America (USA), United Kingdom, Germany, Italy, Japan, the Republic of Korea, China, and Mexico (World Internet Statistics, 2020).

The aforementioned generalizations imply that regions or countries are isotropic with an equal distribution of resources. However, the author of this document's opinion is that in reality, the converse is true. Even among people who live within the same geographical location, e.g. region, country, town, city or even township, the 'imaginary gap' caused by disproportionate distribution or physical access to resources will exist (Van Dijk, 2017:7). In the context of the

GDE, although in the same province of Gauteng or same city, disproportionate ICT distribution could exist among schools in different poverty indices or quintiles. To cement the physical access variable of the DD, the next subsection explores disparities in ICT physical access due to geographical location.

3.2.1.1.1 Geographical location as a digital divide factor

Based on the analogy drawn in the previous passage, it is evident that the DD implies inequity and heterogeneity which prevails within and between different countries in the same or different regions across the world. This assertion is also supported by World Internet Statistics (2020) in Table 3.1 (below), to be discussed in more detail in the next paragraphs.

Table 3-1: 2019 World Internet Usage and Population Statistics (World Internet Statistics, 2020)

WORLD INTERNET USAGE AND POPULATION STATISTICS 2019 Year-End Estimates						
World Regions	**Population (2020 Est)**	**Population % of world**	**Internet Users 31 Dec 2019**	**Population Ratio (% Pop)**	**Growth (2000-2020)**	**Internet World %**
Africa	1 340 598 447	17.2%	526 374 930	3.93%	11.559%	11.5%
Asia	4 294 516 659	55.1%	2 300 469 859	5.36%	1.913%	50.3%
Europe	834 995 197	10.7%	727 814 272	8.72%	592%	15.9%
Latin America/ Caribbean	658 345 826	8.5%	453 702 292	6.89%	2.411%	10.0%
Middle East	260 991 690	3.9%	180 498 292	6.92%	5395%	3.9%
North America	368 869 647	4.7%	348 908 868	9.46%	222%	7.6%
Oceania/ Australia	42 690 838	0.5%	28 775 373	6.74%	277%	0.6%
WORLD TOTAL	7 796615 710	100.0%	4 574 150 134	58.7%	1.167%	100.0%

Based on Table 3.1, one may however further assert that the DD is both an intra-country (within the same country) and inter-country (among different countries) phenomenon. In the case of intra-country DD, comparisons could be drawn between rural and urban, rich and poor, cultural relativism, socio-economics, provinces etc. To counter the intra-country DD in particular geographical locations, education departments should consider designing policies aimed at enhancing technical ICT competency and lowering access costs to ICTs and connectivity (Kumar & Best cited by Hanafizadeha, hosravia & Badieb, 2019:325). Those policies would therefore consequently stimulate ICT demand and interest among learners and educators in the affected geographical locations (Hanafizadeha *et al.* 2019).

In order to demonstrate the patterns of the inter-country DD in different geographical locations, Table 3.1 (above) illustrates world internet usage in the year 2020. According to the World Internet Statistics (2020), considering the respective threshold population ratios, Asian internet use rate is at the highest 50.3 percentage, followed by Europe at 15.9 percent, Africa at 11.5 percent, Latin America/Caribbean Islands at 10.1 percent, North America at 7.6 percent, the Middle East at 0.9 percent and lastly Oceania/Australia at 0.6 percent. Worth noting is that irrespective of its population, highest in the world at 55.1 percent, Asia leads in provisioning internet to its people. Africa's population is the second largest at 17.2 percent. The above-quoted figures in Table 3.1 imply that there is no direct association between a country's world population percentage and its internet usage rate.

Educationists could be concerned about the extent to which the DD affects teaching and learning in various countries. This concern could be based on the aspiration for advanced, far-reaching, qualitative teaching and learning. Consequently, better citizens who will compete more vigorously and positively impact their respective countries' or regional National Domestic and Gross Domestic products (UNESCO, 2015:18). However, the figures also imply that African countries still trail behind the rest. To comprehend the DD intensity, a statistical formula is used to describe computer density which can be measured using the learner-to-computer ratio (LCR). The LCR computes the average number of learners using a single ICT medium. As indicated earlier, the other often marginalized DD factors are discussed in the next sections starting with demographics.

3.2.1.2 Demographics

The Demographic factors of the DD include socio-economic status and gender. Each of these factors is discussed below to unveil some author's points of view regarding the nature and origin of the DD.

3.2.1.2.1 Socio-economic status

Significantly, the general trend per capita per country is that younger, higher educated males exceed other sections within their respective populations in terms of ICT access (Van Dijk (2017:4). However, irrespective of gender, ICT utilization levels also rely on the age of the users. As an example, Figure 3.1 (below) illustrates the relationship between age and ICT utilization across the two genders in North American and North-western European countries as illustrated by Van Dijk (2017).

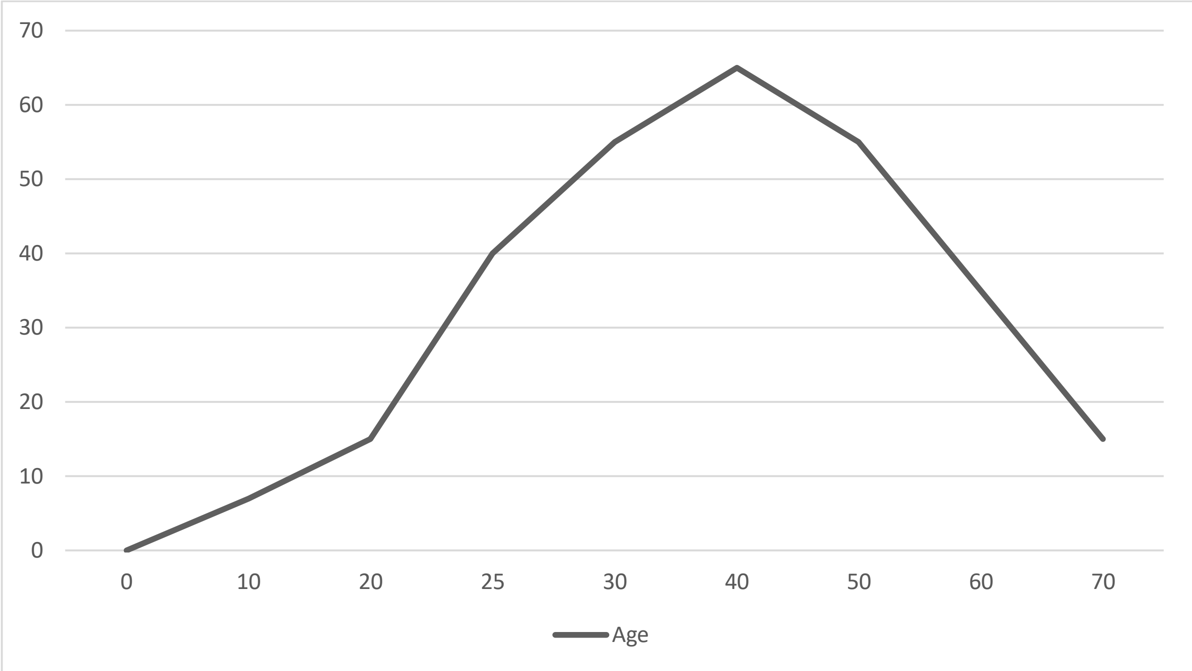


Figure 3-1: A curved diagram to illustrate growth and reduction of ICT utilization in different age-groups in North America and North-western Europe (Van Dijk, 2017:6)

According to Figure 3.1, considering age, the relationship assumes a curved graph. Physical access to ICTs culminates in the age group of 25–40 and sharply declines after the age of 40. This applies in both sexes. Considering the above-stated facts, it is safe to conclude that age and life-stage are essential factors to determine the DD intensity (Kania-Lundholm, 2019). Some educators need ICT training to become comfortable using the said ICT- evaluation instrument and ICT in general. Figure 3.2 (below) illustrates more socio-economic factors that influence ICT use employing gadget ownership as a measure in the USA in the year 2020. The assumption is that those people who are in higher socio-economic standing are likely to afford and own capable ICTs and have more access to connectivity.

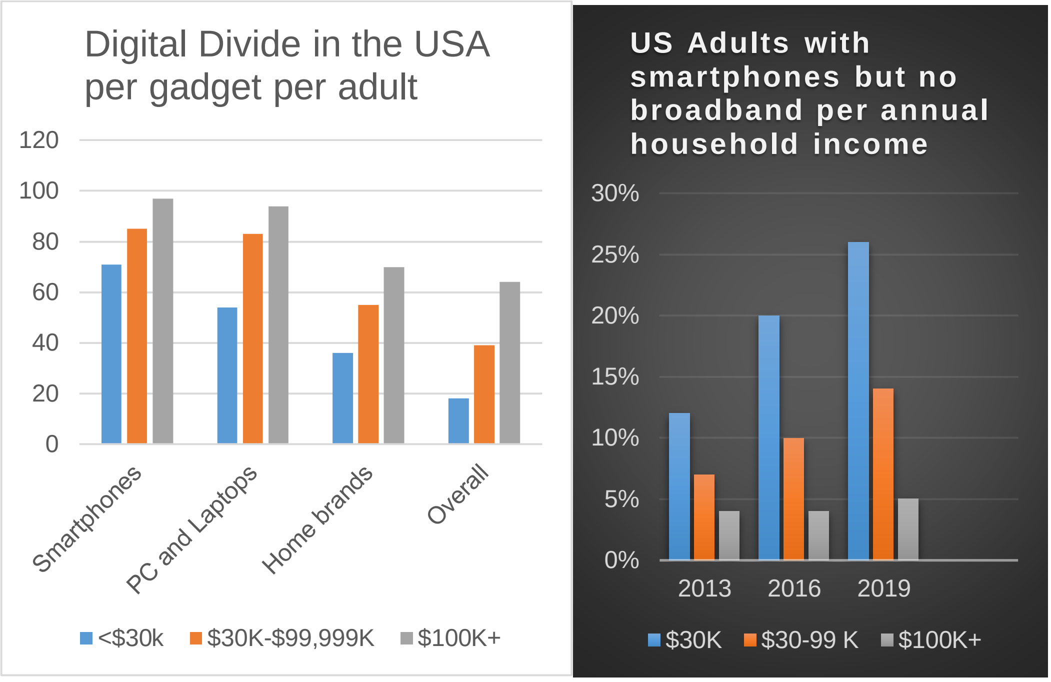


Figure 3-2: The digital divide due to socio-economic factors influencing gadget ownership in the USA (World Internet Statistics, 2020)

Figure 3.2 illustrates that those earning high incomes who are most likely living in major urban areas, with better education and advanced communication links with their counterparts in developed countries, have more ICT-access than those who live in the periphery or deep rural areas (Warschauer, 2016:63). The higher the income, the more people are likely to afford ICTs (World internet statistics, 2020). The above-quoted figures reflect a significant gap in the DD. However, between 2013 and 2019 there has been a rapid increase in numbers of low-income earners accessing the Internet via smartphones in the USA. In the same period, the percentage of low-income earners reporting to possess smart-phones yet lacking broadband is higher than middle- and high-income earners (World internet statistics, 2020.) Therefore, since accessible by most, one could suggest utilization of the smartphone as a powerful tool for SDL. Association between possession of smart phones and increased internet access could apply in South Africa as well. To cement that hint, Figure 3.3 (below) indicates the growth curve to display internet utility rates among South Africans over years between 2009 and 2019.

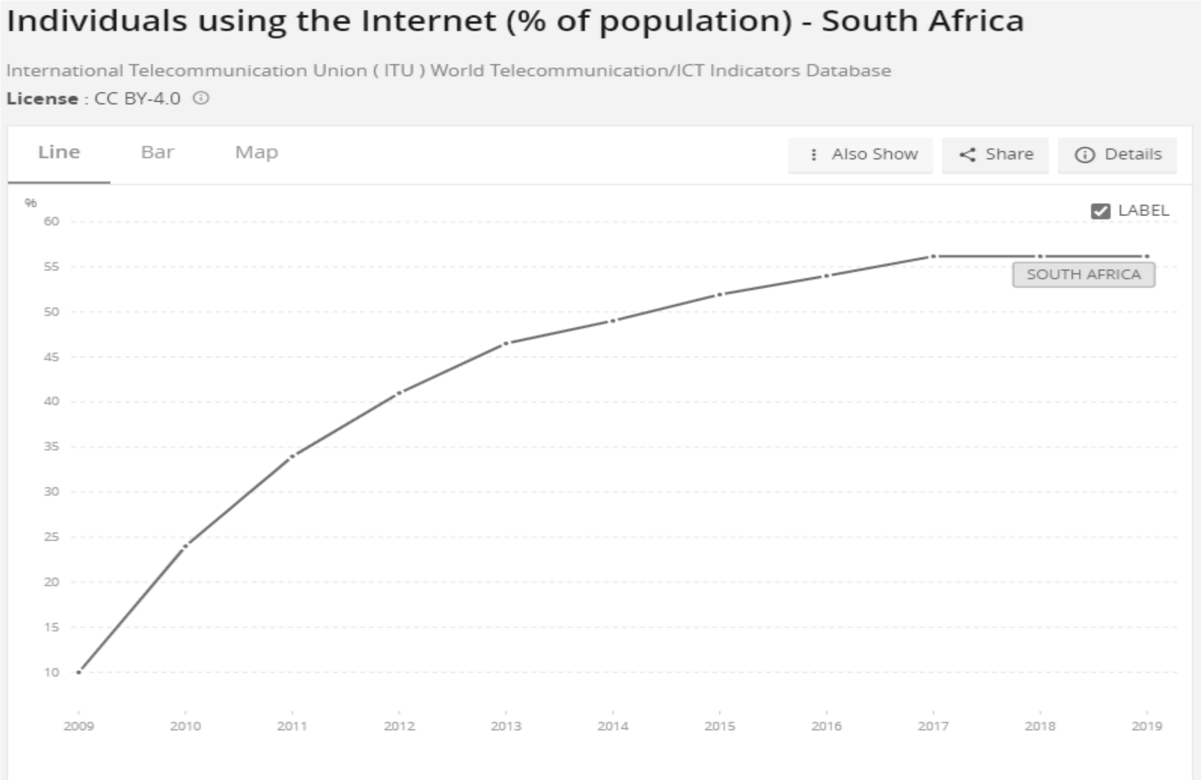


Figure 3-3: Percentage population of internet use in South Africa during 2009 and 2019 (International Telecommunication Union, World Bank, 2020)

Figure 3.3 reflects that South Africa showed a rapid increase in internet usage from 2009 at a population percentage of 10% to 56.1% in 2017. However, between 2017 and 2019, there was no significant change in the figures; thus the curve is now flattening. In short, the facts laid in the last paragraph imply a possible positive relationship between socio-economic status and ICT and internet access. The higher the socio-economic status, the greater the chance of internet connectivity and ICT access. The next section deals with Issues of gender and the DD including its potential causes and intervention strategies.

3.2.1.2.2 Gender

At this stage, one may maintain that the DD has been portrayed as a buffer among people in different locations. The buffer has a negative impact on many factors, including world economies. In this section, the author of this document adds gender to the tally of DD variables. Based on a study centred on British Muslim girls, Hardaker, Sabki, Qazi and Iqbal (2017:6) cite significant gender differences in ICT utilization in all learning environments. However, due to intervention strategies, such disparities may decrease or even diminish. Gender is one of the categories of stratified classification that influences ICT access and worsens the DD (Ragnedda, 2017:58). Should women, due to probable marginalization, not reap ICT revolutionary benefits as much as their male counterparts, that would pose a severe deterrent to pedagogical processes including ICT-evaluation and -utilisation. Due to marginalization, female educators, as well as girls, might find it difficult to execute some economic and ICT-evaluation functions or apply SDL learning strategies. Asongu and Odhiambo (2018:3) express concern over gender inequality in the formal sector in Africa but propose the use of ICTs as a channel to promote gender inclusion (increasing women welfare and mitigating poverty) and gender equality. Gender inequality is exacerbated by gender stereotypes which, in some parts of the world, are reproduced among young people e.g. pre-schoolers and ninth grade learners in Portugal (Ferreira, 2017:124).

According to Dolch (2020), in contrast to a generalisation that females have ICT or computer anxiety, a recent German survey draws a different conclusion. Apparently the survey results reveal that male learners show high acceptance value for the more wide-ranging web, yet females show higher acceptance values in e-learning-related tools. Furthermore, male learners younger than 24 years use e-learning tools more than their female counterparts, whereas females older than 24 years use e-learning tools more than males. There is a switch between the two genders after the 24 age-line (Dolch, 2020:105). However, it is hoped that gender anxiety differences may be reduced by intensive use of ICTs (Cussó-Calabuig, Farran & Bosch-Capblanch, 2018). In other words, as earlier suggested, ICTs could be used as a channel for mitigating gender stereotypes. Supposing ICTs perpetuate the DD, the education department needs to intervene using ICTs as a channel (Asongu & Odhiambo, 2018:3). With a view to further pursue the discussion on the DD perspectives, the next section deals with language and ethnicity.

3.2.1.2.3 Language and ethnicity

Awaworyi, Okai and Posso (2016:6) argue that ethnic diversity could affect ICT access and use in the following ways: (a) people from ethnic-minority backgrounds often have less affinity for and experience of ICT (These individuals might not be in this predicament due to their ethnicity but other factors such as poverty and low education levels); (b) geographic locations associated with specific ethnic groups could have poor ICT infrastructure; therefore affecting their access and use of ICTs; (c) higher levels of ethnic fractionalization could harm broadband subscriptions or ICT access and utilization; however (d) ethnic fractionalization could be less disruptive in democratic states where homogeneity is encouraged.

The implication of the above discussion is that the effect of ethnic fractionalization hampers societal progress, maintenance of ethnic identity as well as preservation of culture and language through ICT use (Vartanova & Gladkova, 2019:208). Considering the above input one may deduce that since ethnic fractionalization within the school community hinders ICT access, it affects the prospects and plans made by education departments to use ICTs to deliver curriculum objectives. Amongst other things, enhancement of SDL becomes complex when ICT access is limited, and the DD prevails. The next section deals with motivational access, yet another factor ascribed to social inequity.

3.2.1.3 Motivational access

Whereas physical access receives the central focus and blame towards the DD, motivational access is another variable which is likely to be overlooked. Motivational access could be described as the individual's wish to own ICTs and have internet connectivity (Van Dijk, 2017:4). Furthermore, motivational access may be equated to intrinsic motivation (Azeez, *et al.*, 2019:20). Motivational access, such as intrinsic motivation, originates from internal psychological processes (both conscious and sub-conscious). Age or life-stage, as formerly portrayed in section 3.2.2.2, could influence the level of the individual's motivation (Kania-Lundholm, 2019).

From the above discussions, one may expect end-users with high motivational access to participate more in ICT-evaluation. One may therefore conclude that for technology-based SDL and successful ICT-evaluation, educators and learners should be intrinsically motivated. Motivational access also inspires ICT evaluators to carry out their plan in which ICTs are integrated as tools for curriculum delivery (Adegbenro, Gumbo & Olakanmi, 2017:85). Motivational access counters the DD impact, a potential deterrent to curriculum delivery. However, motivational access is not the end to stop. Over and above motivation, one still needs to acquire instrumental and operational skills to deal with and maintain ICTs. Lack of such skills is another factor towards the DD. Thus the next section is devoted to ICT and Internet skills also required for ICT-utilization as a steppingstone for curriculum delivery. Next, ICT and internet skills level as a DD factor are looked into.

3.2.1.4 ICT and internet skills

As earlier alluded to, in this twenty-first-century information age, people's dependence on ICTs as tools is rapidly increasing (Tindowen, Bassig & Cagurangan, 2017:3). ICT and internet skills are indispensable for navigating these ICTs. ICT and internet skills include software installation, web design software, creating a database using electronic resources for teaching as well as necessary, email and Internet navigation (Adegbenro, *et al.*, 2017:79). Conversely, Steyaert (as cited by Laureano, Shmatko & Meissner, 2018:5) enumerates "instrumental skills (the operational manipulation of technology), structural skills (related to the structure in which information is contained), and strategic skills (proactively looking for information, information-based decision-making, and scanning for relevant information)" to complement the list of ICT skills. Internet skills could be categorised as: (a) Operational internet skills (skills necessary for using internet technology); (b) Traditional internet skills (navigation and orientation); (c) Information internet skills (fulfil user's own information needs); and (d) Strategic internet skills (reaching particular goals and for the general goal of improving the user's position in society) (Van Deursen & Mossberger, 2018:127) are another addition to the list. To counter the DD and produce towards the GDP, ICT users need to acquire some of these ICT-internet skills.

The aforementioned implies that lack of ICT skills could give way to the DD. Inequitable physical access could give rise to a divide in ICT skills (Finnish Institution for Health and Welfare, 2020:9). Limited or no physical access to ICTs could cause limited or no ICT skills which could deter attainment of ICT-based SDL and participation in evaluation of ICTs. In short, a positive relationship exists between ICT access and ICT skills acquisition (Aziz, 2020:6). One would therefore recommend that while the gap or backlog of access is being addressed, the GDE, as the pivotal leading agency (Tan et al., 2017:15), should highly consider skills acquisition for their educators. This would create a balance between ICT access and the skills gap. Practically, providing educators and learners who lack skills with ICTs could be futile and deter professional performances and curriculum delivery (Enakrire, 2019:15). According to the above-discussed hints, the department of education should supply ICTs and internet connectivity to schools, train the end-users (educators and learners) on how to use ICTs (ICT skills acquisition) in order to enhance ICT-based SDL and curriculum delivery. ICT skill possession could equip educators with confidence and knowledge to partake in ICT-evaluation and -utilisation.

In summary, the DD is indicted for causing aggradation of the day-to-day ICT-based pedagogical proceedings among educators. The DD therefore requires some educational solutions, some of which are mentioned in the Education White Paper. DD variables were broadly classified as physical access, demographics, and social inequity. The DD is caused by a rift between those with limited ICT and internet access compared to their counterparts in affluent parts of a country or region (Karakara & Osabuohien, 2019:119). Mostly rural dwellers are denied ICT contents due to lack of affordability, marginalization and ethnical fractionalization (Chinapah & Odero, 2016:120). The DD density depicts the learner-to-computer ratio (Wallet & Melgar, 2015; Cate, 2017:15).

Furthermore, gender stereotypes across different age groups (Ferreira, 2017:124) have also been identified as yet another factor which exacerbates the DD. In other parts of the world, women are not reaping ICT revolutionary benefits on par with their male counterparts. Instead, gender stereotypes act as an antecedent of ICT anxiety among females. Language and ethnicity factors highlight that those who are not native English speakers or users are marginalised.

Regarding motivational factors, it was argued that some people are ICT refuters who are not intrinsically motivated (Van Dijk, 2017). They lack acceptance of ICTs and attitude towards ICT-based SDL (Pan, 2020). However, some people are intrinsically motivated and accept computers but lack relevant ICT and internet skills.

In the final analysis, one may conclude that the DD describes inequality and inequity in the distribution of ICT resources. Classical sociological concepts of the DD including inequality in terms of "possessions (Marx), status and profession (Weber) or relationship and power (Simmel and Dahrendorf)" also apply (Van Dijk, 2006:221). The DD is a deterrent to implementation of curricular objectives and pedagogical practices. Education managers and curriculum implementers should be concerned about the impact of the DD to explore possible intervention strategies to counter it. Thus the next section deals with analysis of the impact of DD, which precedes a section on intervention strategies.

3.2.1.5 The impact of the digital divide on teaching and learning

Overall, the DD could have a substantial negative impact on a country's Gross Domestic Product (GDP) and curriculum-delivery outcomes. The DD acts as a stumbling block for teaching and learning endeavours, such as SDL, to achieve specific curriculum outcomes and ultimately boost the GDP. Figure 3.4 (below) sketches how intervention strategies could be used to evade the DD, how such evasion yields positive teaching and learning outcomes which consequently have a positive effect on the GDP, curriculum outcomes as well as SDL.

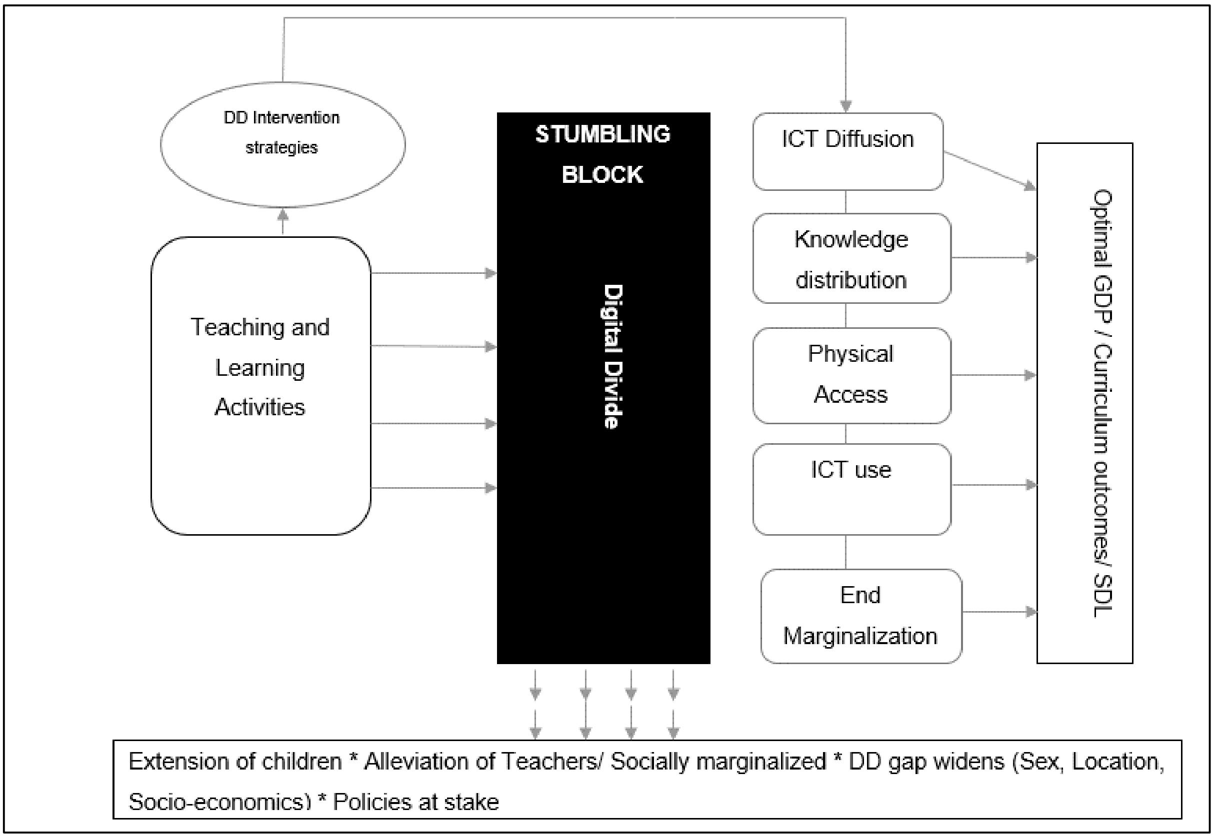


Figure 3-4: The digital divide impact and strategies

Source: Author's own

As portrayed in Figure 3.4, the DD counters teaching and learning endeavours such as diffusion of ICTs, knowledge distribution, physical access, ICT use and the end of marginalization which are meant to enhance SDL learning and boost GDP growth (Nipo, Bujang & Hassan, 2018). By deterring these teaching and learning endeavours, the DD is consequently becoming a knowledge divide. The DD centres on low ICT usage (Chinecherem *et al.*, 2015:4). However, intervention strategies could assist in countering or evading the DD to the benefit of ICT end-users. Based on the above perceptions, one could assert that the DD is rampant in communities that cannot afford ICT infrastructure, earn low income and have limited ICT literacy. As alluded to earlier and demonstrated by evidence in Figure 3.2, such communities have limited access to ICTs due to non-affordability or lack of relevant infrastructure such as intermittent or no electricity supply (Chetty *et al.* (2017:2). With the aid of Figure 3.5 (below), one can state that, if not countered, the DD could worsen the situation of the disadvantaged, marginalised people. This effect gives rise to what the author of this document terms the digital illiteracy vicious cycle.

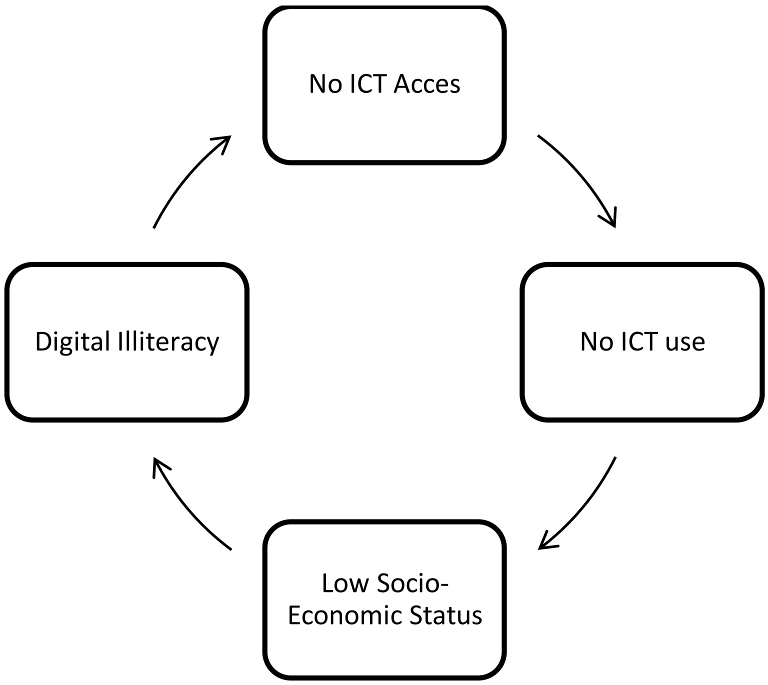


Figure 3-5: The digital illiteracy vicious cycle

Source: Author's own

From Figure 3.5 it can be deduced that the more people do not have ICT-access, the more digitally illiterate they will remain. Consequently, the digitally illiterate people will lose out on opportunities to compete in the ICT world. One may thus conclude that marginalised people are likely to become digitally illiterate because they do not own or access ICTs. The inverse could also apply, where people are digitally illiterate because they do not have ICT access. In this vicious cycle, lack of digital literacy leads to lack of ICT access, which leads to lack of ICT use, then low socio-economic status (associated with low income), and digital illiteracy worsens.

The DD also pertains to a balance between the level of ICT training and capital resources. Lack of training might result in abandonment of ICT infrastructure and internet, even where it is provided for (China Internet Network Information Center cited by Chetty *et al.*, 2017:5). Non-use of ICTs is often ascribed to lack of internet knowledge. This situation prevails irrespective of China having a low LCR compared to South Africa where, by the year 2015, 33 percent of households (mainly from disadvantaged communities) saw no relevance in accessing the Internet. Over the last five years, the gap between the two countries has since widened up as Asia, by the year 2020, leads the world with more than 50 percent internet users compared to Africa at just 11.5 percent.

Singh (2016:16) blames ICT electronic devices for what is termed 'extension of children' and 'alleviation of teachers from one another' as DD factors. In that case, learners preoccupy themselves and spend too much time operating their devices. Another assertion in connection with that case is that due to lack of training and ICT knowledge, some teachers are not comfortable with utilising these modern ICT gadgets/technological devices. Consequently, the latter are often socially marginalised and could be viewed as incompatible. Likewise, Chinecherem *et al.* (2015:1) quote Ukpebor and Emojorho also highlighting the DD to be more among teachers. This situation could negatively affect their ICT-based teaching and learning options including curriculum delivery as well as motivation to participate in ICT evaluation.

Also regarding the incidence of the DD, Konyana and Konyana (cited by Wallet & Melgar, 2015:14) point out that “in many developing countries such as Zimbabwe, computers may either not be used to their full potential or stored away. This situation could be the result of several factors, including weak school infrastructure, a lack of teacher training for ICT or general anxiety related to their use”. Furthermore, selective provisioning of ICTs (e.g. to a minority of learning centres) might also prove to make the DD more adverse. Having dealt with the impact of the DD, the next section regards its alleviation strategies in a bid to pave a way for curriculum delivery and enhance SDL.

3.2.2 Some strategies to alleviate the digital divide to enhance self-directed learning

Some governments and education departments have taken a robust stance to come up with strategies to curb the DD. Some of the DD alleviation initiatives based on literature reviews are highlighted in this section. As alluded to earlier in section 3.2.1.5., the DD receives such particular attention since it is identified as a potential stumbling block for teaching and learning endeavours, including SDL. DD alleviation is thus included as part of the criteria for an ICT-evaluation instrument. The author of this document selected the case of Nigeria as an exemplar since Nigeria is based in Africa and, like South Africa has high aspirations to e-supply its institutions with ICTs. Thus, Table 3.2 (below) depicts a decrease of DD using internet usage as a measure in Nigeria compared to the rest of the world (Chinecherem *et al.* (2015:3).

Table 3-2: Nigerian home internet use via various ICT devices (Mobile and fixed broadband (Chinecherem et al., 2015)

Year (July1)	Internet Users	User Growth (%)	New Users	Country Population	Population change (%)	Penetration (% of Pop. With Internet)	Country's share of Worrld Population (%)	Country's share of World Internet Users (%)	Global Rank
2014	67 101452	16	9 365590	178 516904	2.82	37.59	2.46	2.30	8
2013	57 753862	4	2 229563	173 615345	2.83	33.26	2.42	2.13	8
2012	55 506299	19	8 826250	168 883776	2.83	32.88	2.38	2.20	8
2011	46 680049	22	8 350181	164 192925	2.81	28.43	2.35	2.04	10
2010	38 329 867	23	7 253663	159 707780	2.78	24.00	2.31	1.87	10
2009	31 076 204	30	7 094603	155 381020	2.76	20.00	2.27	1.76	10
2008	23 981 601	141	14 017018	151 208080	2.73	15.86	2.24	1.53	15
2007	9 964 584	25	2 017720	147 187353	2.70	6.77	2.21	0.73	19
2006	7 946863	60	2 992743	143 314909	2.67	5.55	2.17	0.68	19
2005	4 954121	183	3 204983	139 585891	2.64	3.55	2.14	0.48	19
2004	1 749138	136	1 008744	135 999250	2.60	1.29	2.11	0.19	20
2003	740394	79	326278	132 550146	2.57	0.56	2.08	0.10	20
2002	414116	266	300836	129 224641	2.56	0.32	206	0.06	20
2001	113280	44	34540	126 004992	2.55	0.09	2.03	0.02	20
2000	78740	60	29563	122 876727	2.54	0.06	2.01	0.02	20

As depicted in Table 3.2, in the year 2000, there were only 78 740 internet users in Nigeria (Nigeria ranked 20th in the world) but in 2014 there were 67 million users (Nigeria then ranked 6th in the world). The rapid improvement in internet use is due to the initiatives of the Nigerian government to curb the DD. Table 3.3 (below) labels and identifies intervention initiatives that the Nigerian government put in place to counter the DD. These initiatives could be ascribed to the level of success Nigeria obtained in alleviating the DD.

Table 3-3: Nigerian Federal Government ICT initiatives (Chinecherem et al., 2015)

Initiative	Wire Nigeria (WiN) Project	State Accelerated Broadband Initiative (SABI)	Universal Service Provision	The Digital Bridge Institute (DBI)	Digital Awareness Programme (DAP)
Objective	To facilitate the build out of fibre optic cable infrastructure	To simulate demand on internet services and drive affordable home broadband	To provide ICT access in unserved and underserved areas	To increase the number of skilled Nigerians in the telecoms sector	To encourage the use of ICT in primary, secondary and tertiary institutions
Achievement strategy	Subsidies and incentives to encourage rapid deployment of fibre transmission cables	Subsidy to build braodband infrastructure in all 36 state capitals and urban and semi urban centres	Subsidies to the private sector	ICT Training for over 2000 local and international students intended to privately run	Computer and internet facilities, basic ICT training for teachers and students

From Table 3.3, it is evident that the initiatives used to curb the DD in Nigeria included the Wire Nigeria Project to deploy fibre as rapidly as possible; the State Accelerated Broadband Initiative to build broadband infrastructure for all 36 states; the Universal Service Provision to provide subsidy to areas without ICT access; the Digital Bridge Institute to provide ICT training to the population; as well as the Digital Awareness Program to provide training to schools (teachers and learners) and provide ICT facilities. As earlier suggested, Figure 3.4 depicts that the DD does not only affect ICT access but a number of other aspects. Chetty *et al.* (2017:3) warn against policies that focus on physical ICT offerings (Vial, 2019:5) and neglecting ICT training, i.e. digitization versus digital transformation (Bloomberg, 2018: 5).

As contained in the PDFDL (2019), the South African government, via the department of education, has as its DD alleviation strategies embarked on: (a) programs to fight for emancipation against poverty, under-development, marginalisation and ICT DD; (b) Presidential

National Commission on Information Society and Development to advise the government on the optimum use of ICTs; (c) Presidential International Advisory Council on Information Society and Development to advise the government on addressing the DD; (d) Electronic Communications and Transactions Act (2002) that leads all ICT initiatives in South Africa; and (e) an undertaking to roll out ICT infrastructure that is specifically suited to conditions in Africa and can proactively handle future developments to deal with the DD.

Other strategies to curb the DD include: a) focusing on ICT use for advanced functions rather than simple word processing (Singh, 2017:16). This tallies with the ICT skill development as well as technophobia (Chetty *et al.*, 2017); (b) ICT-access in education should not only be measured at an institutional level but also at the admission level (Hafkin & Huyer, UNESCO, 2015); (c) loaning ICT gadgets to needy learners in order for them to engage in SDL even at remote learning environments and to bridge this DD gap (Ping & Libing, 2016:12); (d) training and developing educators and learners on ICT (Chinecherem *et al.*, 2015); (e) improving technical competency, dropping the cost of access and stimulating demand (Kumar & Best as well as Turkman & Turk, as cited by Hanafizadeh *et al.*, 2019); (f) have a computer laboratory offer access to ICT support services (UNESCO, 2015:21); and (g) software manufacturers to produce gender-neutral educational software and increase software that appeals to girls as much as it is currently the case with boys (Cunningham, Hinze & Nichols, 2016:4).

In the South African context, the GDE is popular for taking a lead in establishing ICT schools equipped with high- calibre ICT media like, amongst other things, the interactive smart board. Known to be a flexible versatile teaching tool, the interactive smart board is trusted for allowing the learner to develop twenty-first-century high-order skills such as thinking, communication, cooperation, problem-solving and ICT-usage skills (Mihai, 2020:320). The white board addresses the access part of the DD, yet the skills development or training (Sznigir, as cited by Mihai, 2020:321) could still be neglected and still pose problems that counter effective teaching and learning. The situation of ICT access and availability makes it more practical to offer individual learners an opportunity of collaboratively performing SDL-based activities with ease.

Digitization or provisioning of a school with ICTs has to be complemented by educators' positive attitude and ICT skills acquisition which form part of digital transformation (Bloomberg, 2018: 5). Such a complement is vital for an ICT school's performance and enhancement of SDL.

To sum up, the DD impact is not only limited to computers and the internet but ICTs in general. Exploring the DD and its impact is therefore relevant to this research work which concerns ICT-evaluation. As alluded to earlier, should the DD impact the process of ICT-evaluation, -selection, -approval and -utilisation, teaching and learning will consequently inherently be deterred.

Evaluators and educators should be equipped with skills to deal with the DD impact. Optimistically, the DD is also an opportunity to challenge the whole world, particularly the developed countries, to practise equity standards and evade, minimize or even eradicate the evils of the DD (DoE White Paper (2004:9). The DD is occurring in a world undergoing increasing disproportions between the rich and modest, among and within nations. Such disparities allude to the imaginary gap among people in the same geographical environment, as explained in the previous passage (DoE White Paper, 2004:9). Following is a discussion of guidelines for the development of an ICT-evaluation instrument based on a literature review performed in this and previous chapters. Education departments could adopt such guidelines globally when developing generic and subject-specific ICT-evaluation instruments in the future.

3.3 GUIDELINES FOR DEVELOPMENT OF ICT-EVALUATION INSTRUMENT

The following models have been selected to contextualize the theoretical background against which ICT-evaluation criteria and an instrument suitable for SDL could be developed globally. First, the Social Collaboration Model (SCM) was opted for since it matches the interpretivist philosophical conviction that reality is socially constructed (Thanh & Thanh, 2015:25). The author of this document is a disciple of the SCM since he appeals implementation of social collaboration during the development of an ICT-evaluation instrument. Furthermore, the author of this document opted for the Evaluation Indicator model which could also be vital during the formation of MIs for an ICT-evaluation instrument. MIs are either qualitative or quantitative measures of an instrument which directs evaluators to select appropriate ICTs (Popovic, Kraslawski, Barbosa-Póvoa, & Carvalho, 2017:11) for inclusion in the school system. The aforementioned models may be applied in conjunction with one another during ICT-instrument development. Elements of these models could also be considered for ICT policy formulation or overhaul. The SCM will be discussed first.

3.3.1 The Social Collaboration Model

Although primarily designed for higher education institutions, some elements of the SCM also apply to the FET-Phase (Rabah, 2016). As earlier stated, the provisions of the SCM match the interpretivist philosophical conviction that reality is socially constructed (Thanh & Thanh (2015:25). Contextually, the educator’s evaluation knowledge and experience are socially constructed during development of an ICT-evaluation instrument. During that process, the educator – the knowledgeable techno-pedagogue (Sasirekha & Sasthya, 2017:249) – is regarded as a key stakeholder. Notwithstanding such regard, the educator works in social collaboration with other stakeholders such as peers, school management and district officials. Social collaboration in task performance is vital, as advocated by Svilla (2014:36).

Key to the above-stated process, all ICT evaluation stakeholders should never lose focus but always consider the needs of the learner. Mainly the learner in SDL needs to be emancipated from the traditional teacher-centred approach to plan own goals, learning requirements, choose own resources, set own strategies and assess own learning outcomes (Vahedi *et al., 2*019:4). If these learners' needs are met, selected ICTs will lay a fertile ground for the twenty-first-century ICT-based SDL in which the educator is enabled to produce a learner who is self-paced, autonomous and innovative. Being conscious of the learners' needs indirectly becomes the learners' 'voice' considering that they are not part of stakeholder teams that develop an ICT-evaluation instrument. Thus considering the above-stated learners' needs could be regarded as a paradigm shift from the teacher- to the learner-centred approach (Mok & Mo, 2018) and propagated by CAPS.

Overall, in order to optimally achieve ICT-related functions such as development of ICT-evaluation instruments, a school must establish an ICT-selection committee, have a decision-making process in place as well as a set policy (Wright *et al.,* as cited by Rabah, 2016:88). Fortunately, in harmony with the objectives of this study, the GDE does emphasise establishment of ICT-committees in its schools to ensure optimal involvement of all stakeholders (GMUIP, 2010). Furthermore, for the context of this study, the developed instrument should support evaluators to select ICTs that enhance SDL. Next is a discussion of the provisions of the Evaluation indicator model also for possible application in the development of an ICT-evaluation instrument.

3.3.2 Evaluation Indicator Model

The purpose of evaluation is to analyse the immediate or direct effect or merit of a program to bring about change (James, 2020) and to measure performance and make decisions (Mapitsa & Tsotsotso, 2019:29). The GDE via the MGUIP (2010) does indeed stipulate that ICT-evaluation will be used as part of the assessment of educators. As a point of departure, the central elements of evaluation are indicators and assessment instruments. In the context of this model, an indicator is a code which describes a particular requirement, or gives warning to the users or beneficiaries, yet an assessment instrument provides minimum required information for the particular piece of work. The latter correlates with the aspired ICT-evaluation instrument which possesses criteria or indicators that enable the evaluator to quantify, measure, test, analyse, scrutinise, assess and render reports (information) on ICTs that are selected for utilisation in the classroom to enhance SDL in the FET-Phase of the GDE (context). As stipulated earlier, indicators can either be expressed in both quantitative and qualitative formats (Popovic *et al*., 2017:11); thus the aspired for instrument possesses both qualities. The two types of evaluation indicators that are described by Rodríguez, Nussbaum, López & Sepúlveda (2009:2) are Input indicators and Process indicators. These are both discussed in the next paragraphs.

3.3.2.1 Input indicators

Input indicators often serve as a baseline for the ICT-evaluation process. These indicators measure the more basic or elementary conditions for the process of evaluation. One could state that input indicators occasionally form part of an accession audit whereby the availability of particular essential infrastructure or supportive ICT media is checked on a register or by ocular inspection, e.g. educators' skills, availability of bandwidth, LCR per desktop computers, ICT laboratory, interactive smart board etc. Absence or shortage of ICT media might exacerbate the DD. Adverse DD could either completely inhibit the ICT-evaluation process, limit it or optimally support it. Input indicators could form the first part or section of an evaluation instrument and should advisably be used to assess the school's compatibility and conformity right at the beginning of the process to also evaluate its sustainability over time.

3.3.2.2 Process indicators

According to the classification by Rodríguez *et al.* (2009) process indicators track the evolution of the process; in the context of this study, the ICT-evaluation process. There are two types of process indicators, viz. Intervention indicators and Adoption indicators (Rodríguez *et al.*, 2009:2).

3.3.2.2.1 Intervention indicators

Intervention indicators measure the extent to which the evaluated ICT media (new as well as those that already exist in the schools) comply with the set criteria or indicators. These indicators assess pedagogical qualities that are possessed by the ICTs. As alluded to earlier, these indicators should, amongst other things, express compatibility with the CAPS curriculum (Rodríguez *et al.*, 2009:7).

3.3.2.2.2 Adoption indicators

Adoption indicators measure the extent to which actors have acquired program implementation skills (Rodríguez, *et al.* (2009:7). Contextually, the 'program' is ICT-evaluation and the 'actors' are ICT evaluators/educators/facilitators/managers. Furthermore, adoption indicators assess whether evaluators or educators have acquired evaluation skills and knowledge. These skills could also include utilisation of selected ICTs, e.g. to achieve the pedagogic or strategic goals in the classroom. These goals encompass employment of SDL skills in order for the educator to set the scene in which the learner is emancipated to take charge of own learning. So adoption indicators assess whether educators utilise selected ICTs to deliver curriculum and perform SDL activities. To sum up, in order to measure program effectiveness (Rodríguez, *et al.* (2009:2), adoption indicators monitor the teachers' professional or pedagogic obligation of delivering curriculum and, in the context of this study, also using ICTs as a channel and tool. These factors determine the outcomes of the program, which is manifested in learner achievements. The next section explains how outcomes could be utilised to measure self-directedness during ICT evaluation.

3.3.2.3 Outcomes used to measure self-directedness

Both the terms *outcomes* and *impact* are relational and ubiquitous in evaluation discourse (Belcher & Palenberg, 2018:478). As simplified by Rodríguez *et al.* (2009:3), outcomes reflect the impact of a program. If, for instance, learners' SDL achievements are high, it implies that the ICTs used and educator skills are positively impactful and the evaluation process is valid. Such correlation could therefore imply that MIs and criteria on the ICT-evaluation instrument are valid. One can conclude that there is a direct ripple causative effect in the relationship among ICT-evaluation MIs or –criteria; ICT-evaluation instrument; educator skills; and learner achievement and self-directedness. These are interdependent variables. How outcomes are expressed could either be quantitative (expressed as threshold values) or qualitatively expressed by narrative means. It is for this reason that instruments for education programs including ICTs need to cater for both quantitative and qualitative expressions. This assertion is further described in the next section wherein learning models are applied to develop an ICT-evaluation instrument.

3.4 APPLICATION OF LEARNING MODELS TO DEVELOP AN ICT-EVALUATION INSTRUMENT

Without consistent criteria and MIs, education managers, evaluators and policymakers are disempowered (Chetty *et al.*, 2017:3) and will not be able to implement their respective sectorial ICT policies. It is for this reason that this study seeks to develop criteria which will form the basis of MIs which will be merged into an ICT-evaluation instrument. As explained in Chapter one, Section 1.5.1.1, development of the ICT-evaluation instrument and -criteria was performed by selected GDE participants during Strands 4A - 4C of the DBR. These MIs embedded in the ICT-evaluation instrument will guide GDE managers and evaluators in their effort to select ICTs that comply with the CAPS and also make SDL and BL optimally practical in various learning environments. To lay the foundation and as an architype for the casting of evaluation criteria and MIs, tenets of Garrison's Comprehensive Model (GCM) and National Institute of Technology Tiruchirappalli (NITT) Taxonomy of Blended Learning Models are adopted. It is important to note that utilizing one or both of these models for the purpose of development of ICT-evaluation criteria is not mandatory. Hence it is suggested that developers of ICT-evaluation instruments use their discretion as to whether they will apply one or both models or only some elements thereof. As implied earlier, once crafted, finalised and accepted, MIs are then added to the ICT-evaluation instrument. These MIs would guide evaluators on which ICTs to select for inclusion in the education system. Figure 3.6 (below) illustrates an archetype of development of an ICT-evaluation instrument by applying GCM and NITT Taxonomy of Blended Learning Models.

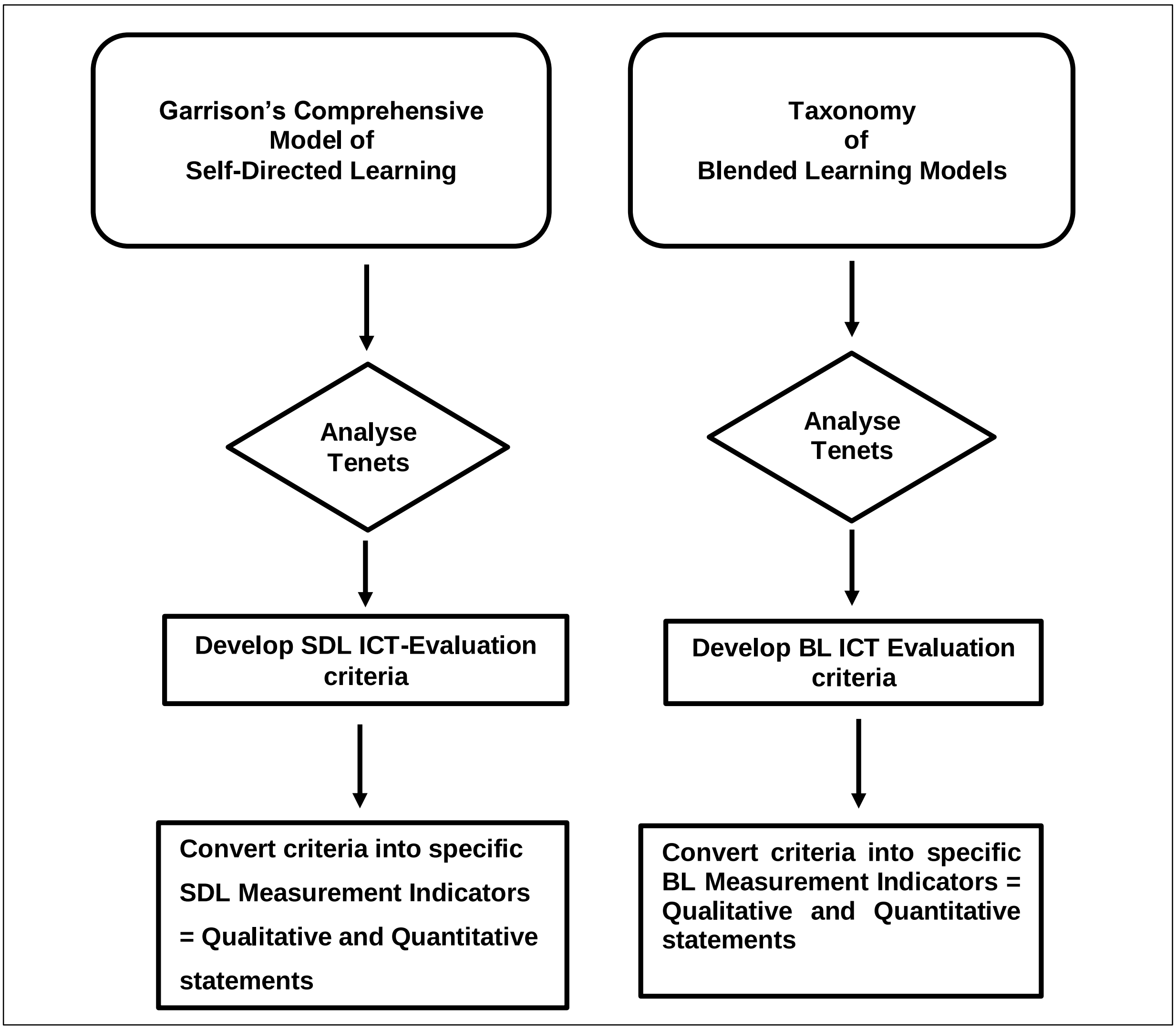


Figure 3-6: ICT-evaluation instrument development applying Garrison's Comprehensive Model and NITT's Taxonomy of Blended Learning Models (Dziuban *et al.,* 2018; Garrison, 1997; Valiathan, 2002)

Source: Authors own

Figure 3.6 clearly sets out the researcher's suggestion that ICT managers should develop an instrument for evaluation using both SDL and BL models or paths. First, the decision made is to select relevant learning models for developing an ICT-evaluation instrument. Both GCM and NITT's Taxonomy of Blended Learning Models are selected and juxtaposed. Each model respectively specifies salient tenets of SDL and BL. The ICT-evaluation instrument developer then develops evaluation criteria based on the tenets of the models. Since evaluation criteria are broad, they are split into numerous MIs which are coined in the form of quantitative and qualitative statements. The MIs are presented in the form of statements/questions which are inserted to the ICT-evaluation instrument to incite the evaluator to respond. Responses are based on the evaluator's assessment of the ICT media that are being evaluated.

In the next passage, it is endeavoured to identify salient tenets of the said models and apply those in the development of ICT-evaluation criteria and MIs. First, an analysis is done of tenets of the Garrison's model and of how it applies in the development of SDL-related MIs. Then later, tenets of the NITT's taxonomy of models for BL.

3.4.1 Garrison's Comprehensive Model: The theoretically overlapping dimensions of Self Directed Learning applied in ICT evaluation

As portrayed in the above deliberations, SDL is seen as an approach which one can follow to cultivate a higher level of self-directedness among learners. SDL nevertheless is a natural tendency for learners who are increasingly inclined towards self-directedness (Knowles, 1975). To expatiate on this natural tendency, other related factors, viewpoints and perspectives on SDL, Garrison's (1997) Comprehensive Model was identified. Such identification was explicitly because the GCM is regarded as relatively practical and relevant to the intended objective of this study. It is for this reason that salient features of the model will be analysed and applied. Figure 3.7 (below) portrays three dimensions of SDL as portrayed by Garrison (1997) in his Comprehensive Model.

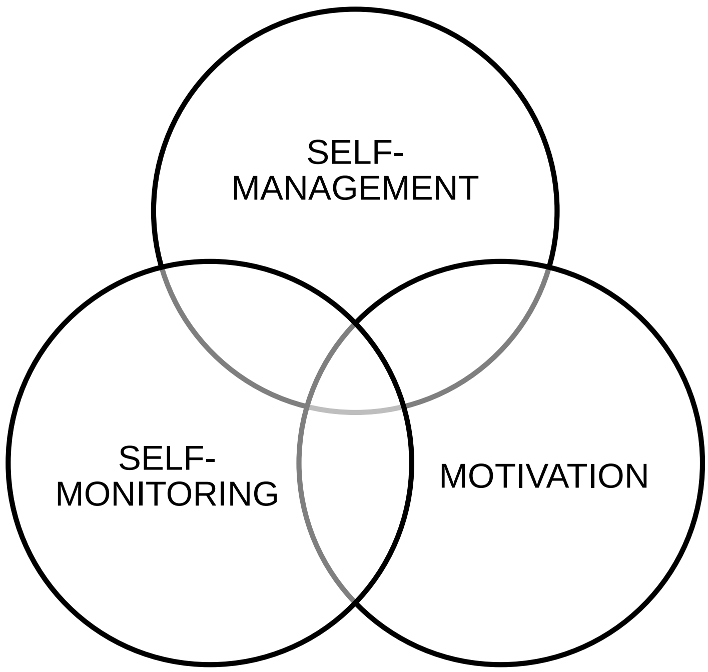


Figure 3-7: The theoretically overlapping dimensions of Self Directed Learning applied in ICT evaluation (adapted from Garrison's Comprehensive Model, 1997)

As depicted in Figure 3.7, the three dimensions of SDL from GCM are self-management, self-monitoring, and motivation. Hereunder, the author of this document singles out and explains each of these tenets or dimensions of Garrison's model. In the later sections of this passage, an exposition is given of how the dimensions can interactively be applied during the development of ICT-instrument criteria and MIs. Their application also models a conception that the dimensions are, in practice, intimately connected and could be applied in SDL environments concurrently. Self-management (contextual control), self-monitoring (cognitive responsibility), and motivational (entering and task) dimensions are integrated to reflect a meaningful and worthwhile approach to SDL (Garrison, 1997).

3.4.1.1 Self-management (task control)

Self-management is related to task control, (Zhu et al., 2020:4) a mechanism that facilitates selection of activities that are directed towards specific tasks (Kalanthroff, Henik, Simpson, Todder & Anholt, 2017:603). Self-management focuses on social, rather than internal, cognitive aspects. It regards factors such as (a) social and behavioural implementation of learning intentions; (b) enactment of learning goals and management of learning resources; and (c) management of learning resources and support (Zhu et al., 2020). Each of these factors is briefly clarified below.

3.4.1.1.1 Social and behavioural implementation of learning goals

Social and behavioural implementation of learning goals implies appeals for social collaboration. This self-management dimension factor therefore implies that GDE educators and managers who are involved in the ICT evaluation need to be socially collaborative. There should be a spirit of reciprocal social interaction among ICT stakeholders, including the learner and the educator. As earlier alluded in section 2.3.1, the learner and educator, as SDL partners are encouraged to engage in cooperative learning by socially constructing knowledge and thus boosting their intrinsic motivation (Azeez, Fapohunda & Jayeoba 2019; Du Toit-Brits & van Zyl, 2007). The two partners interact socially and negotiate their learning intentions and goals. Although learning outcomes are clearly stipulated in the CAPS, the learner who is regarded as central in the learning environment is expected to set his learning goals in line with the curriculum and communicate with the educator. The aforementioned goal setting and negotiation implies a transactional collaboration to negotiate task identification and execution among all the stakeholders involved. The behavioural aspects of SDL may either affect or constrain students' self-monitoring, cognitive and meta-cognitive activities (Zhu et al., 2020:28). Next is description of *Enactment of learning goals,* the second factor of self-management dimension.

3.4.1.1.2 Enactment of learning goals

As earlier alluded in Chapter two, Section 2, the learner equally needs to have positive intentions to learn and set his/ her own learning goals, which could be classified as Garrison's model's *Enactment of learning goals*. Although emancipated to be innovative (Lemmety & Collins, 2020) and determine own outcomes (Vahedi *et al.*, 2019:4), due to the Interpretivist and Functional pragmatism convictions, the learner still has to avoid haphazard conduct and select or enact his/ her own learning goals (Keller, Fleig, Hohl, Wiedemann, Burkert, Luszczynska & Knoll, 2017:54) with caution and responsibility (Garrison,1997).

Based on the above, one may assert that goal setting is not the end but the beginning and precedes goal enactment and achievement. Since the SDL learner is still obligated to operate within specific pedagogical and philosophical parameters (Nasri and Mansor, 2016, Tan & Liu, 2017), the implication is thus that the educator's support is indispensable in the SDL environment. The educator's support to the learner comes through ensuring that ICTs that are selected for utilization in the learning environment opens room for such emancipation. The indicators on the ICT-evaluation instrument should comply and give support to the educator to select ICTs that enable him/her to make fertile the grounds for self-management of learning tasks. The learner is emancipated to decide on and manage his/her learning tasks responsibly.

However, as discussed in the next section, both the SDL learner and educator as partners are demanded to partake in the management of learning resources which is described next.

3.4.1.1.3 Management of learning resources and support

The joint venture in which all the stakeholders build towards ICTs also involves *Resource Management.* As explained in Chapter two, section 2.3.2.1, even in an SDL environment, learners still rely on educators to select appropriate ICT resources (Khaloufi & Laabidi, 2017:57) and decide on learning venues or environments (Lai, 2015:75). Learning environments other than the traditional classroom, include online and home learning. As mentioned earlier on the identified gaps, in Chapter One Section 1.1, the thrust of this study is to promote evaluation of ICTs prior to selection and utilization in the learning environment. These processes from part of learning resource management. The above concludes a discussion of the self-management dimension and next is self-monitoring.

3.4.1.2 Self-monitoring

Self-monitoring dimension is related to cognitive and metacognitive developments which include the skill to supervise one's learning tactics as well as the capability to think about thinking (Garrison, 1997; Zhu et al., 2020:4). It illustrates how the learner takes conscientiousness for the composition of personal meaning by incorporating new viewpoints and perceptions with previous knowledge; and formation of meaning through critical thinking and collaborative validation. Self-monitoring implies the learner's level of 'self-awareness', 'self-appraisal of learning progress' and 'consideration of alternatives towards reaching specific learning goals' (Du Toit-Brits, 2015; Garrison, 1997). For these to prevail, the learner should be emancipated with responsibility attached. However, as illustrated earlier in Chapter one section 1.4 and Chapter two, section 2.3, emancipation does not imply lack of responsibility (Barber & King, 2016:29; Lemmety & Collins, 2015:59), nor does it mean educator abdication or complete absence of the educator. Thus, instructional supports from educators or peers could enhance SDL learners' self-monitoring capabilities (Zhu et al., 2020).

Furthermore, pursuit of self-monitoring within learning environments poses a challenge to ICT evaluators. Thus selected, approved and procured ICTs should be measured utilizing evaluation criteria that ensure that the learner is emancipated to engage in self-monitoring by applying their mental (cognitive and metacognitive) capabilities. Towards that goal, MIs on the ICT-evaluation instrument should specifically accommodate, and aim to select, ICTs that holistically promote self-monitoring within SDL environments. In addition, selected ICTs should also enable learners to self-appraise their levels of self-monitoring. To execute this demand, it is recommended that

ICTs have online self-monitoring interactive tools such as checklists, questionnaires, or review questions (Zhu et al., 2020: 13). However, social collaboration with others, as was stated under self-management, is necessary since the learners also require feedback on their self-monitoring from others (e.g. peers, educators) (Garrison, 1997). To accommodate that reciprocity, the ICT-evaluation instrument should also have MIs that aim for a selection of ICT media that either enable others to give external feedback or have relevant in-built systems.

Whereas it is positively influenced by motivation (delved into in the next section), self-monitoring has a significant impact on self-management in ICT-learning environments (Zhu et al., 2020:12). This implies that learners need to be motivated (intrinsically and extrinsically) so as to increase their cognitive and metacognitive (self-monitoring) skills and possess a drive towards self-management.

3.4.1.3 Motivation

Motivation plays a sizeable role in the origination and conservation of effort towards learning and attainment of cognitive goals (Azeez et al., 2019:23; Du Toit-Brits & Van Zyl, 2017). Motivation also reflects the perceived value and anticipated success of learning goals at the time learning is initiated (Costley & Lange, 2017). It mediates between perspective (control) and perception (responsibility) during the learning process. Simply put, motivation is a desire to learn. The desire could either be driven by internal (intrinsic) or external processes, social and behavioural factors (extrinsic) (Azeez et al., 2019). In summary, GCM attempts to integrate contextual, cognitive, and motivational dimensions of the educational experience (Garrison, 1997) which are vital for ICT-evaluation processes and procedures to get under way. Since Garrison's model is perceived as instrumental, the subsequent section is dedicated to the development of ICT criteria, MIs and instrument, applying the principles of the GCM.

Once a learner is motivated, their self-control increases. Increased self-control, in turn, increases or enhances levels of self-management. In their study, Zhu et al. (2020:2), using structural equation modelling, found empirical evidence that motivation directly affects self-monitoring and indirectly influences self-management through self-monitoring. Thus students' motivation influences their self-monitoring skills and self-management. Added to this. self-monitoring skills impact self-management in learning environments.

Motivation, a prerequisite for SDL (Du Toit-Brits & Van Zyl, 2017; Fournier et al. 2014; Zhu, 2020), comes into effect at different stages of the learning task: at the beginning (entering motivation) and during action (task motivation). Entering motivation, initiates the action of e-learning, and task motivation maintains the effort towards learning and realizing set cognitive goals (Garrison, 1997). Motivation influences cognitive and metacognitive strategies of learners (e.g. setting learning goals and tracking their learning progress) which in turn influences their behavioural schemes e.g. time management and knowledge exploration (Zhu et al., 2020).

Furthermore, there are various types of motivation (based on their origin) that influence initiation and maintenance of learning such as self-efficacy, goal-orientation, intrinsic and extrinsic motivation (Crippen et al., 2009; Joo et al. in Zhu et al., 2020:9). In addition to having the required motivation to seek needed learning resources so as to be effective, the learner must possess skills in self-management and self-monitoring. For logical theoretical reasons, the three SDL dimensions were described separately in the above sections. However, in practice, one expects the dimensions to apply in conjunction with one another without any particular order. This is also due to their interrelatedness (Du Toit-Brits & Van Zyl, 2017; Zhu et al., 2020) which is illustrated in the next section.

3.4.1.4 Relationship among the three dimensions

The three dimensions are interrelated to and interdependent on one another. Zhu et al. (2020:13) sums up interrelatedness of the three dimensions as follows: a) motivation positively affects self-monitoring, b) motivation positively affects self-management, c) self-monitoring positively affects self-management, d) self-monitoring mediates the relationship between learning motivation and self-management. In an empirical study, Zhu et al. (2020) found that motivation directly influenced self-monitoring and indirectly inspired self-management through self-monitoring. Thus one may conclude that motivation affected cognitive and metacognitive strategies of learners (e.g., establishing learning objectives and tracing their learning development) which in turn influenced their behavioral strategies (e.g., time management and information search) in sequence.

In addition to having the obligatory motivation to pursue desirable learning resources, to be effective, the learner must develop skills in self-management and self-monitoring. In effect, they need a high-pitched level of SDL to be noteworthy human beings of the twenty-first century

Based on Garrison's (1997) model, learner motivation influences their self-monitoring and self-management and the cognitive component of self-monitoring and self-management influence each other. Theoretically, their relationship should be reciprocal. However, critical decisions in education should be made by educators. Such critical decisions include (a) which ICTs should be selected for teaching and learning (i.e. curriculum-related matters); (b) how to select ICTs (i.e. instructional strategies and methods); and (c) where to use ICTs (e.g. traditional classrooms or remote learning environments). Hence the behavioral aspects of SDL (i.e. self-management supported externally by prompts and feedback) may affect or constrain students' cognitive and meta-cognitive activities (i.e. self-monitoring). As pronounced earlier, in Tables 3.4 to 3.6 the author of this document gives an archetype of development of evaluation criteria and MIs for an ICT-evaluation instrument using the three GCM dimensions respectively.

Table 3-4 Illustration of development of ICT-evaluation criteria to cater for Self-Management dimension based on Garrison's Comprehensive Model (Garrison, 1997)

DIMENSION 1 : SELF-MANAGEMENT (TASK CONTROL)		
SALIENT TENETS	**EVALUATION CRITERIA (DERIVATIVES)**	**MEASUREMENT INDICATORS (to enhance SDL)**
1. Social Aspects	(a) Transactional and collaborative control of external tasks (b) Reciprocal social interaction.	Determine whether the ICT medium: (a) stimulates learner to work collaboratively/ transactional/ interactively with others during external task negotiation and control (b) allows the learner to reciprocate (respond to the educator's stimuli/ responses) during the execution of SDL tasks.
2. Behavioral Aspect	(a) Social collaboration between learner and others (peers and educators) (b) Social collaboration between educator and others (learners, colleagues) (c) Negotiation of learning goals and intentions (learner, peers, educator).	Ascertain whether the ICT medium: (a) permits the learner to collaborate with peers/ educators during SDL activities (b) enables the learner to collaborate with other learners and educators during task control (c) caters for learner, peers and educators to responsibly negotiate, perform and review learning goals and intentions towards SDL.
3. Enactment of learning goal	(a) Selection of learning goal (b) Responsibility when selecting learning goals (c) Enactment of goals (d) Achievement of goals (e) Educational and philosophical parameters (f) Learner support by educator or resources (g) Emancipation of learner to self-manage learning tasks.	Establish whether the ICT medium: (a) has widespread databases or mechanism for self-directed goal development (b) empowers learners to take charge and act responsibly when selecting their own learning goals (c) allows the learner to independently execute self-directed learning goals (d) has in-built enablers to assist the learner to achieve and complete set SDL goals (e) fundamentally complies with specific educational, curricular and philosophical parameters (f) makes room for adequate holistic learner support by educator (g) emancipates individual learner to independently, with minimal interruptions, self-managed learning tasks.
4. Management of learning Resources	(a) Learner emancipation to select own resources under educator guidance (integration) (b) Stakeholders select other resources (integration) (c) Resources supporting online, face-to-face and home learning environments (d) Development of strategies to manage resources.	Verify whether the ICT medium: (a) emancipates the learner to independently select and integrate the ICT medium with other media and resources (b) makes it possible for the learner to obtain support from educator and other GDE stakeholders to select and integrate resource (c) is practical for implementation of BL (online and face-to-face) and SDL (including home learning). (d) supports both learner and educator to develop resource management activities/ strategies.
5. Management of Support		Authenticate whether the ICT medium:

DIMENSION 1 : SELF-MANAGEMENT (TASK CONTROL)		
SALIENT TENETS	**EVALUATION CRITERIA (DERIVATIVES)**	**MEASUREMENT INDICATORS (to enhance SDL)**
	(a) Stakeholders offer ICTS to support educators (b) Educator offers support.	(a) Cater and/ supports the involvement of stakeholders in the learner and educator support programs (b) has systems that enable the educator to offer adequate support to the emancipated learner.

Table 3-5: Illustration of development of ICT evaluation criteria to cater for Self-Monitoring dimension based on Garrison's Comprehensive Model (Garrison, 1997)

DIMENSION 2:SELF-MONITORING (COGNITIVE AND METACOGNITIVE)		
TENETS	**EVALUATION CRITERIA (DERIVATIVES)**	**MEASUREMENT INDICATORS (to enhance SDL)**
1. Construction of personal meaning	(a) a) integration of new ideas with previous knowledge (b) b) engagement in critical thinking to construct meaning (c) c) engagement in collaborative confirmation of meaning.	Determine whether the ICT medium: (a) enables the learner to integrate new and previous concepts, ideas and knowledge (b) emancipates learner to think critically and construct new meaning, concepts, ideas and knowledge (c) will create a learning environment in which the learner collaboratively confirms new and previous meaning.
2. Appraisal on self-awareness	(a) a) appraisal about the level of self-awareness (b) b) appraisal about learning progress.	Ascertain whether the ICT medium: (a) caters for the learner to appraise his/ her self-awareness (e.g. self-concept, self-esteem) (b) b) allows the learner to appraise his/ her learning progress against own set learning goals.
3. Appraisal about learning progress	(a) Finding alternatives on reaching learning goals.	Establish whether the ICT medium: (a) emancipates learner to find own new alternatives to reach the set learning goals.
4. Emancipation of Learner to think critically	(a) Employment of cognitive and metacognitive capabilities.	Verify whether the ICT medium: (a) emancipates the learner to independently develop and use his/ her own cognitive and metacognitive capabilities to construct meaning and execute tasks in a self-directed manner.
5. Interactive feedback	(a) Interactive feedback form peers and educators (b) Interactive feedback from the ICT medium.	Authenticate whether the ICT medium: (a) caters for learner to obtain feedback from others (educator, peers, stakeholders) (b) has in-built or online self-monitoring tools for feedback to/ from learner e.g. questionnaires, checklists, review questions.

Table 3-6: Illustration of development of ICT evaluation criteria to cater for Motivation dimension based on Garrison's Comprehensive Model (Garrison, 1997)

DIMENSION 3: MOTIVATION (DESIRE TO LEARN)		
TENETS	**EVALUATION CRITERIA (DERIVATIVES)**	**MEASUREMENT INDICATORS (to enhance SDL)**
1. Initiation, monitoring and maintaining efforts towards learning	(a) Motivation to initiate efforts towards self-direction in learning (Entering motivation) (b) Motivation to monitor and maintain efforts towards learning (Task motivation).	Determine whether the ICT medium: (a) attracts the learner to independently initiate learning using the ICT-medium (b) will consistently maintain the learner's interest.
2. Achievement of cognitive goals	(a) Motivation towards the setting of cognitive goals (b) Motivation to achieve set cognitive goals.	Ascertain whether the ICT medium: (a) Motivates learner to set cognitively learning goals (b) supports the learner to achieve set cognitive goals.
3. The perceived value of learning goals	) (a) influence to set and maintain the value system (b) Value attainment of learning goals.	Establish whether the ICT medium: (a) Has the capacity to assist the learner to value the set learning goals (b) Has the capacity to motivate the learner to value full attainment of learning goals.
4. Mediation between context and cognition	(a) Flexibility to apply new and existing ideas, knowledge and content in real-life contexts (control) (b) Development of cognitive processes and reasoning.	Verify whether the ICT medium: (a) challenges learner to apply new and existing ideas, knowledge and content in real-life contexts (control) (b) matches appropriate learner's level of cognitive development.
5. Various types of motivation influence learning	(a) Influence of internal factors (Intrinsic) (b) External factors influence (Extrinsic) (c) Self –efficacy motivation (d) Goal orientation motivation.	Authenticate whether the ICT medium: (a) complements and appeals to the already motivated learner (b) fallows for other peers and educators to collaboratively complement the learner's efforts (c) is user-friendly and developmental to increase or boost the learner's self-perception of effectiveness, efficiency and worth (d) enables the learner to set own learning goals which in turn motivate the earner to be positive towards self-direction in learning.

The next discussion concerns the application of the NITT's Taxonomy of BL Models in the development of ICT-evaluation criteria and MIs for instrument development.

3.4.2 NITT taxonomy of Blended Learning models

As stated earlier, this section endeavours to analyse and apply knowledge based on the NITT's taxonomy of blended learning towards the development of an ICT-evaluation instrument and criteria. The following analysis of some BL models hinges on its definitions, impact, the role of educator, the learner as well as other stakeholders, including the education department. Before that analyses, it is essential to first put into perspective and explain the concept of BL. Thus the next sub-section presents an overview of BL.

3.4.2.1 Blended learning overview

BL is commonly described as the integration of face-to-face (in-class) instruction and online (electronic or internet-based) instruction with some element of student control over time, place, path, or pace (Pandit, 2015). Whereas BL could be famous for promoting ICT utilization which has become widespread, it aims to reduce the time students spend in the traditional classroom (Abdian, 2019:4; Dziuban *et al.,* 2018:3). Whereas balancing the two is significant, in the twenty-first century, online learning has become more widespread than face-to-face learning. This surge may be ascribed to the fact that online learning provides convenient access to information. This surge also raises the suspicion that face-to-face environments may decrease over time (Dverim & Orhan, 2016).

BL is used to describe a conglomeration of different delivery methods such as collaboration software, web-based courses and knowledge management practices (Dziuban, et al., 2018:5). Blending techniques includes, amongst other things, laboratory assessments, online instruction, e-mail, class web sites, computer laboratories, mapping and scaffolding tools, computer clusters, interactive presentations and e-mail, handwriting capture, evidence-based practice, electronic portfolios, learning management systems, and virtual apparatuses (Dziuban, et al., 2018:5). Additionally, BL describes learning that fuses diverse event-based activities, including face-to-face learning environments, live e-learning and self-paced learning (Dziuban *et al.,* 2018*;* Valiathan, 2002). Once adopted, the positive effect of BL could be motivation of education departments to increase access to ICTs, thereby alleviating the impact of the digital divide on disadvantaged learners (Dziuban et al., 2018:2). The author of this document thus recommends that crafting an ICT-evaluation instrument should cater for BL features for evaluators to select ICTs suitable for SDL environments. Catering for such implies that ICT-evaluation instrument developers need to develop criteria and MIs that are BL compatible. Next is a glimpse at the taxonomy of BL models as portrayed in NITT (Dziuban *et al., 2018;* Valiathan, 2002). Having put into perspective the concept of BL, a discussion on the three NITT BL models, viz. Skill-Driven Model, Attitude-Driven Model and Competency-Driven model follows.

3.4.2.2 The Skill-Driven model

According to the Skill-driven model, learning takes place in either advanced synchronous online learning laboratories or traditional classrooms (Dziuban *et al.,* 2018*:* Valiathan, 2002). The author of this document recommends for the ICT-evaluation instrument to be designed to make fertile the ground for application of this model which stresses synchronisation of the educator and learner's role and activities within the SDL environment. Such synchronization would make more vivid the role of each of these partners and increase the level at which the educator offers the learner oversight in their path towards self-directedness. Synchronization implies that the learner should feel confident to explore the learning world without feeling completely lost or left alone. In other words, the educator does not abdicate responsibility but continues to be synchronously a source whenever required. Figure 3.8 (below) is an exemplar on how education departments could use these skill-driven tenets to craft ICT evaluation criteria and respective MIs.

SKILL-DRIVEN MODEL

TENETS

1. Regular feedback
2. Self-paced Learners
3. Educator oversight
4. Synchronisation

EVALUATION CRITERIA

1. Learner should get regular feedback
2. Learner to work at own pace
3. Educator should be present
4. Learner and educator should synchronise with other learners and educators at own and other learning environments

MIs

1. Does ICT-medium"
   - have regular feedback features
   - Stimulate educator and others to give feedback to learners?
2. Allow learners to work at own pace through activities?
3. Have features that enable educator to oversee/assess learners' work progress?
4. Make it possible for learner to synchronise own work activities, goals, outcomes with others (learners and educators)?

Figure 3-8: Development of ICT- evaluation criteria based on the NITT Skill-Driven model (Dziuban *et al.,* 2018*;* Valiathan 2002)

Source: Author's own

From Figure 3.8, it is evident how the central tenets of the skill-driven model in the second block were considered in crafting ICT-evaluation criteria and respective MIs (in the right and far right block). The skill-driven tenets that were used to develop MIs are outlined as: a) regular feedback from the educator, peers, and other stakeholders; b) self-paced learning; c) educator's oversight; and d) synchronisation. Next follows the application of the Attitude-driven model.

3.4.2.3 The Attitude-driven model

The Attitude-driven model is characterised by content that deals with developing new attitudes and behaviours, peer-to-peer interaction and a risk-free environment (Dziuban *et al.,* 2018; Valiathan, 2002). In this model learners, amongst other activities, hold synchronous web-based meetings (webinars) and are assigned group projects (to be completed offline) and role-playing simulations. The selected ICTs need to make fertile ground for such activities. Selected ICTs should enable flexibility for the learner to work individually or in groups in collaboration with other learners here and afar. To accommodate the attitude-driven model tenets, one of the criteria in the developed ICT-evaluation instrument is group and individual work as it might apply in different global contexts. The author of this document thus encourages ICT-evaluation instrument developers to consider crafting MIs that appeal to typical attitude-driven activities such as the ones stated above. Figure 3.9 (below) is an archetype of use of these tenets to craft attitude-driven ICT evaluation criteria and MIs.

ATTITUDE-DRIVEN MODEL

TENETS

1. Content with new attitudes and behaviour
2. Peer-peer interaction
3. Risk-free learning environment conducive for activities
4. Flexibility for collaboration

EVALUATION CRITERIA

1. Learner should get regular feedback
2. Learner to work at own pace
3. Educator should be present
4. Learner and educator should synchronise with other learners and educators at own and other learning environments

MIs

Does / is ICT-medium"

1. have or give way for development of content that is in line with learner attitudes and behaviours?
2. Enable learner to interact with peers in a variety of ways/ paths?
3. Risk free or promoting risk-free learning activities?
4. Permit the learner to flexibly collaborate with others?

Figure 3-9: Development of ICT- evaluation criteria based on NITT Attitude-Driven model (Valiathan, 2002)

Source: Author's own

From Figure 3.9, it is evident how the central tenets of the Attitude-driven model in the middle block were considered in crafting ICT-evaluation criteria and respective MIs (in the far-right block). The attitude-driven tenets that were used are outlined as: a) content with new attitudes and behaviours; b) peer-to-peer interaction; c) conducive learning environment; d) fertile ground for learning activities; and e) flexibility of learner (to collaboratively work in groups and individually).

3.4.2.4 The competency-driven model

According to the Competency-Driven model, to capture and transfer tacit knowledge, learners must be practically engaged in activities in order to develop a knowledge repository (Dziuban *et al.,* 2018*;* Valiathan, 2002). Thus, contextually, the author of this document recommends that selected ICTs should cater for and expose learners to activities that could be applied in real life. Hence the ICT-evaluation instrument should be equipped with MIs that point to this tenet of the competency-driven model. The intended outcome is to allow the learner to explore the world and not be limited to the traditional brick-and-mortar learning environment. Figure 3.10 (below) is an indication of how education departments could use these tenets to craft competency-driven ICT-evaluation criteria and respective MIs.

COMPETENCY-DRIVEN MODEL

TENETS	EVALUATION CRITERIA	MIs
		Does / is ICT-medium”
1. Interact with and observe experts	1. Educator and learner should interact with and learn from experts	1. Make it possible for experts to be contactable when needed?
2. Assign/ appoint expert and mentors	2. Experts and mentors should be provided for?	2. Give information on mentorship?
3. Capture and transfer tacit knowledge	3. Tacit knowledge should be captured, transferred and safely kept	3. Provide or have features for knowledge capturing and record/ data saving (Memory space and speed capacity)

Figure 3-10: Development of ICT-evaluation criteria based on NITT Competency-driven model (Dziuban *et al.,* 2018*;* Valiathan, 2002)

Source: Author’s own

From Figure 3.10 it is evident how the central tenets of the competency-driven model (in the second block) were considered in crafting ICT-evaluation criteria and respective MIs (in the right and far right block). The competency-driven tenets that were used are outlined as: a) interaction and observation of experts; b) assign mentors to learners; and c) capture and transfer tacit knowledge.

3.5 CHAPTER CONCLUSION

Chapter three focused on the perspectives of ICT-evaluation based on some literature reviews. The chapter commenced with the definition of the DD, followed by discussion of various perspectives of the DD which include physical access, demographics and social inequity. Physical access was stressed as a determinant of the first-level DD which buffers those who do and do not have ICT access (Van Dijk, 2017:3). The author of this document’s perspective is that geographical locations are not isotropic; thus the DD could prevail in any location. Demographics was identified as another factor in which varying socio-economic status across age, life-stage (Kania-Lundholm, 2019), gender and location also cause disparities in affordability and ICT access, which results in the DD.

In addition to the aforementioned, the DD was also ascribed to ethnic diversity (Awaworyi, *et al.,* 2016:6), motivational access determined by the individual's wish to own and access ICTs (Van Dijk, 2017:4) or intrinsic motivation (Azeez, *et al.*, 2019:20. Inequitable internet and ICT-skills (Steyaert, as cited by Lavrynenko, Shmatko & Meissner, 2018:5) were also portrayed as a DD factor. Overall, The DD counters teaching and learning (Nipo, *et al.,* 2018) which challenges education departments to apply strategies to it. Based on motivational access, guidelines for an ICT-evaluation instrument were developed and recommended for education departments globally.

As a cornerstone to development of the ICT-evaluation instrument and -policy, the author of this document recommended application of models including the Social Collaboration model, the Evaluation Indicator model as well as Outcomes . In addition, to develop the ICT-evaluation instrument, the author of this document also applied a combination of the GCM(Garrison, 1997) and NITT's Taxonomy of Blended Learning Models (Dziuban *et al.,* 2018*;* Valiathan, 2002) to develop an archetype of an ICT-evaluation instrument. These models are, however, not prescriptive and thus ICT-evaluation instrument developers could use their discretion on which one(s) to opt for.

For integration with reviewed literature, ICT evaluation processes and procedures and the DD were further interrogated in the methodology laid down in chapters four and five. Such interrogation covered the following salient areas which form a link between literature and methodology:

3.5.1 Link to survey

As detailed later in Chapter three, section 4.3.1.1., the survey aimed to answer research sub-questions 1-6. Regarding ICT evaluation processes and procedures, using the survey, the study sought to understand if participants thought that (a) educators were aware of ICT evaluation (survey question 7); (b) educators were allowed to participate in ICT evaluation (survey question 8); (c) educators obtained training in ICT evaluation (survey question 10); (d) ICT evaluation was significant (survey question 11); (e) procedures are being followed during ICT evaluation (survey question 12); (f) ICT evaluation should take place at certain regular intervals (survey question 15). Regarding the DD, using the survey, the study sought to understand how adverse participants thought this problem was (survey question 7). Chapter four details data collection methods, tools and techniques for the relevant data. Analyses of participant responses to the above-listed questions were done in Chapter five, sections 5.21 (Group statistics) and 5.2.7 (Descriptive statistics).

3.5.2 Link to semi-structured individual interview

Also, as detailed later in Chapter three, section 4.3.1.1., the semi-structured individual interview aimed to answer research sub-questions 2,4,5 and 6. Through the semi-structured individual interviews, the study sought to understand the participants' views regarding (a) educators participation in ICT evaluation (Interview question 2); (b) components to form part of an ICT evaluation instrument (interview question 3); how they perceived integration of the instrument and ICTs with the curriculum (interview question 4).

3.5.3 Link to focus-group interview

As described later in Chapter three, section 4.3.1.1., aimed to answer research sub-questions 2,4,5 and 6. Employing the semi-structured individual interviews, the study sought to understand the participants' views regarding (a) educator participation roles in ICT evaluation (interview question 1); the significance of ICT evaluation (interview question 4); and (c) how often evaluation should be done (interview question 2). Participant responses to the interviews were done by organising data; reading data; coding data, generating a description and themes; and representing the themes (Creswell & Creswell, 2018:193 –195) in Chapter 5, section 5.3.

In the next chapter, the author of this document elucidates on the research design and methodology of the study in an endeavour to address the identified gap in the GDE education system and reach the specified aims and sub-aims.

CHAPTER 4: RESEARCH DESIGN AND METHODOLOGY

4.1 INTRODUCTION

In this chapter, the author of this document deliberates on the research design and methodology of the study. As discussed in Chapter one, this study aspires to address the identified gap in the GDE education system and achieve the specified aims and sub-aims. In order to achieve that aspiration, an endeavour is made to answer the corresponding main question coupled with its six secondary research questions. To map a way towards that endeavour, a mixed, multi-strand design approach was adopted. The overarching framework for the research is Design-based Research (DBR). In the research design section, the DBR and mixed multi-strand design was discussed using its quantitative and qualitative strands as leverage. Quantitative research is concerned with data that can be represented or measured numerically (Goertzen, 2017:12). On the other hand, qualitative research uses words rather than numbers to collect and describe data in detail (Creswell & Creswell, 2018:3; Bansal, Smith & Vaara, 2018:1189).

The author of this document in this chapter details research features under main headings such as purpose of the research; research design and methodology; data-collection methods; and ethical considerations. The clarified research features include sampling methods and techniques, development and validation of the data-collection tools, research paradigms as well as research methods and techniques.

In the previous chapters, the aforesaid identified gap was, via support of literature review, exposed as a rationale for this study titled: *"An evaluation of information and communication technologies in the FET-Phase to enhance self-directed learning."* The envisaged objective of the study was development of a global ICT-evaluation instrument and -criteria for the FET-Phase. Collected data also served as input towards the development of the ideal ICT-evaluation criteria and instrument. As explained in the earlier chapters and re-iterated in the later sections of this chapter, the study adopted a collaborative approach for all the processes including interviews, discussions as well as crafting, testing and finalisation of the ICT-evaluation instrument. The next section commences with the purpose of this research.

4.2 PURPOSE OF THE RESEARCH

As stated earlier in Chapter one, section 1.4.1.1., the main objective of this study was to answer the two-pronged research question, which is to establish whether Gauteng Department of Education managers and educators implement policy-based processes and procedures during ICT-evaluation and -selection in the FET-Phase. The further objective was to develop an *ideal,* *all-inclusive* set of criteria for an evaluation instrument suitable for self-directed learning environments. To address the objective in detail, six secondary research objectives were set, namely to:

1. Describe by means of a literature review whether managers and educators use ICT-evaluation procedures to select appropriate ICT and determine the main barriers within the process globally and in South Africa.

2. Determine what an ideal evaluation instrument should look like according to literature and educators in order to support the implementation of ICTs in the FET-Phase curriculum in self-directed learning environments.

3. Understand whether GDE managers and educators perceive the proposed ICT-evaluation instrument as being a viable tool for evaluation for the FET-Phase curriculum.

4. Determine whether education managers involve educators in the process of ICT-evaluation and -selection for the FET-Phase curriculum.

5. Gather suggestions from subject teachers and GDE curriculum specialists that can be infused in an ICT-evaluation instrument to make it suitable for self-directed learning in the FET-Phase.

6. Propose means to integrate and utilize a proposed ideal, all-inclusive ICT-evaluation instrument for the enhancement of self-directed learning in the FET-Phase curriculum.

As explicated in the next section, to map the way towards data collection, classification, analysis and conclusion, the researcher had to consciously consider all dimensions needed for selecting the research design and methodology. Research design pertains to designing, conducting and reporting on research findings (Johnson, Adkins & Chauvin, 2020:138).

4.3 RESEARCH DESIGN AND METHODOLOGY

In this section of the research work, the author of this document delves into research design and methodology. First the author of this document discusses the research design which exposes the study’s mixed-method design approach, the broad map of the entire research work, the philosophical paradigms as well as research methodology specific to each of the research strands. Later, section 4.5 deals with data-collection methods.

4.3.1 Research design

As declared in section 4.1 above, the researcher in this study opted for DBR and adopted a mixed-methods multi-strand approach or strategy of inquiry. The mixed-methods design approach of the study, the DBR as well as its adopted philosophical paradigms are discussed in the next passage. After that discussion, the research methodology with regard to quantitative and qualitative strands follows.

4.3.1.1 The Mixed-Methods design approach

As portrayed by Creswell and Creswell (2018:4), in a mixed-method approach the researcher collects both quantitative and qualitative data, and then integrates the two forms of data using distinct designs based on the selected specific philosophical assumptions and theoretical frameworks. Thus, a Mixed-method approach is perceived as a systematic integration and combination of quantitative and qualitative data with the aim to yield additional insight (Creswell & Creswell, 2018:4). A Mixed-methods research is an augmentation rather than substitute of quantitative and qualitative research; thus fulfilling the goal to draw from both the strengths and to reduce the weaknesses of a more traditional solo approach (Mitchell, 2018:106). Figure 4.1 (below) depicts the overall structural design of the mixed-method design approach adopted in this study.

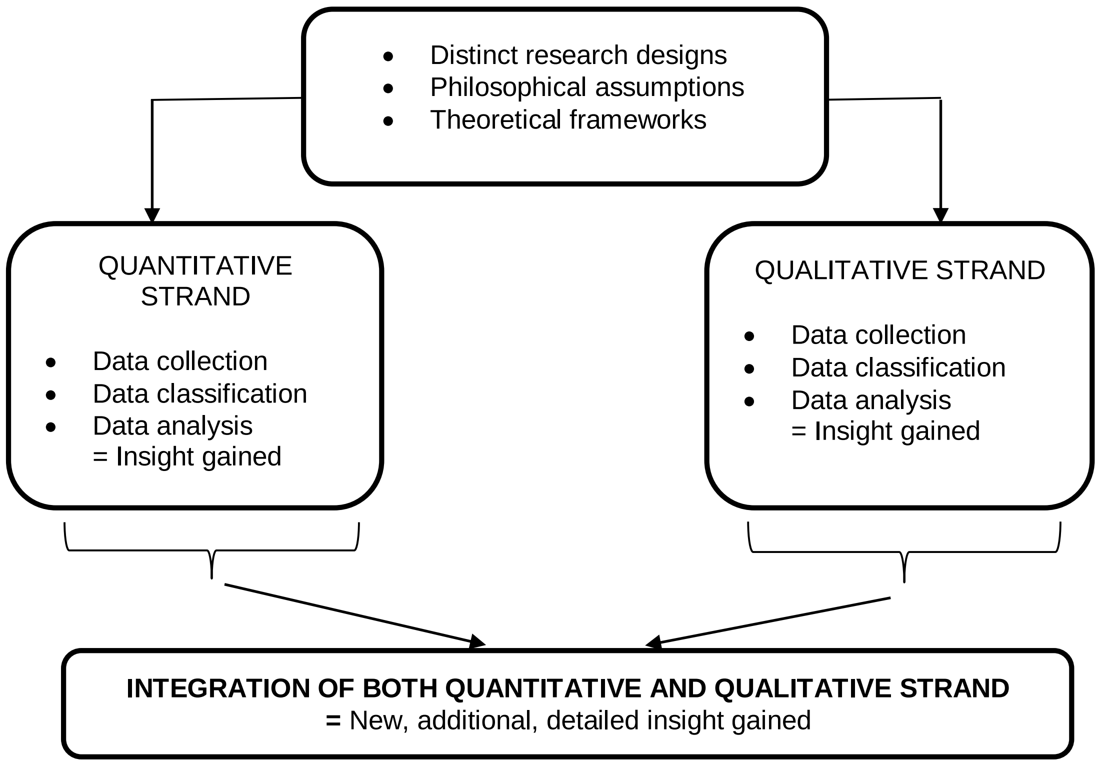


Figure 4-1: Mixed-methods research (Creswell & Creswell (2018:4)

Source: Author's own

From Figure 4.1 it is clear that the researcher initiated the process by planning a distinct research design for the mixed-research method. The researcher also adopted philosophical paradigms which influenced assumptions on which the research was based. The adopted philosophical paradigms were combined Functional Pragmatism and Interpretivism. Furthermore, the researcher engaged in a literature review to build a theoretical framework for the study. During the course of the research, quantitative and qualitative data were collected, classified and analysed. The results of both the strands were integrated to build new insights for application. In short, during the course of research for both strands, serious consideration was given to methodological issues, sequence of data collection, data analysis as well as data integration (Subedi, 2018:571). With regard to sequence of data collection, as illustrated in Figure 4.2 (below), this study opted for an explanatory sequential mixed-method design which is described thereunder.

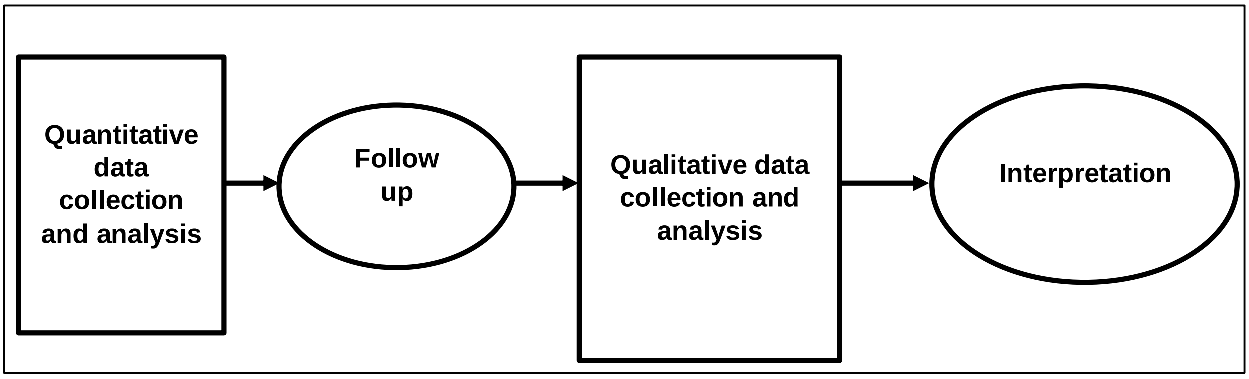


Figure 4-2: Explanatory Sequential design (Subedi, 2018:572)

Figure 4.2 clarifies the process followed in the explanatory sequential mixed-method design of this study. The process commenced with collection of data by means of a survey. The survey responses were analysed in detail and later substantiated with qualitative data collection and analysis (semi-structured face-to-face interviews and focus-group interviews). Finally, the relationship between the new findings from both quantitative and qualitative strands and existing theories was explored (Goff & Genet, 2017:107) and interpreted so as to draw conclusions.

To further substantiate the above explanation, during the explanatory-sequential research, the researcher followed up with qualitative research so as to explain any possible confusion or contradictory survey responses (Creswell & Creswell, 2018:222). In this study, although the researcher endeavoured to cover all six 9by means of a survey, sub-questions 2, 4, 5 and 6 required more detailed descriptive responses over and above quantitative responses (This allotment of questions is dealt with in section 4.4.5). The researcher therefore aimed to utilize qualitative interviews to address possible gaps. This approach is adopted simply because quantitative data results are said to provide a general representation of the research problem leaving some gaps. Qualitative data often further refines, extends or explains the results; thus closing possible gaps (Subedi, 2018:572). Particularly, choice of a mixed research makes it practical to investigate the research problem from multiple viewpoints and creating opportunities to adapt to change and increasing probability for credible results (Bazeley, 2018:4).

To further justify the choice of the explanatory-sequential method, the researcher was concerned that, due to the closed-ended character of the questions, the respondents of the survey were to be limited to verbally express their experiences in detail regarding issues around ICT-evaluation processes. The quantitative responses might have limited them. Also, to obtain further detail, the selected participants of the survey differed from those selected later for semi-structured individual interviews and focus-group interviews. Results of all the strands were thereafter consolidated and interpreted for application in the development of ICT-evaluation criteria and an ICT-evaluation instrument.

As alluded to above, deciding on research design, methodology and analysis is guided by the researcher's philosophical perspective or paradigm (Ryan, 2018:1). When that guidance takes place, methodological congruence exists (Willgens, Cooper, Jadotte, Lilyea & Langtiw, 2016:2380). Hence the next section dealing with Philosophical paradigms declares the approach of this study with a view to achieve philosophical congruence.

4.3.1.2 Philosophy Paradigms

As declared earlier, this study is mainly rooted in the principles of combined Functional Pragmatism and Interpretivism. Figure 4.3 (below) maps out how these two philosophies will be applied jointly to influence the course of this study.

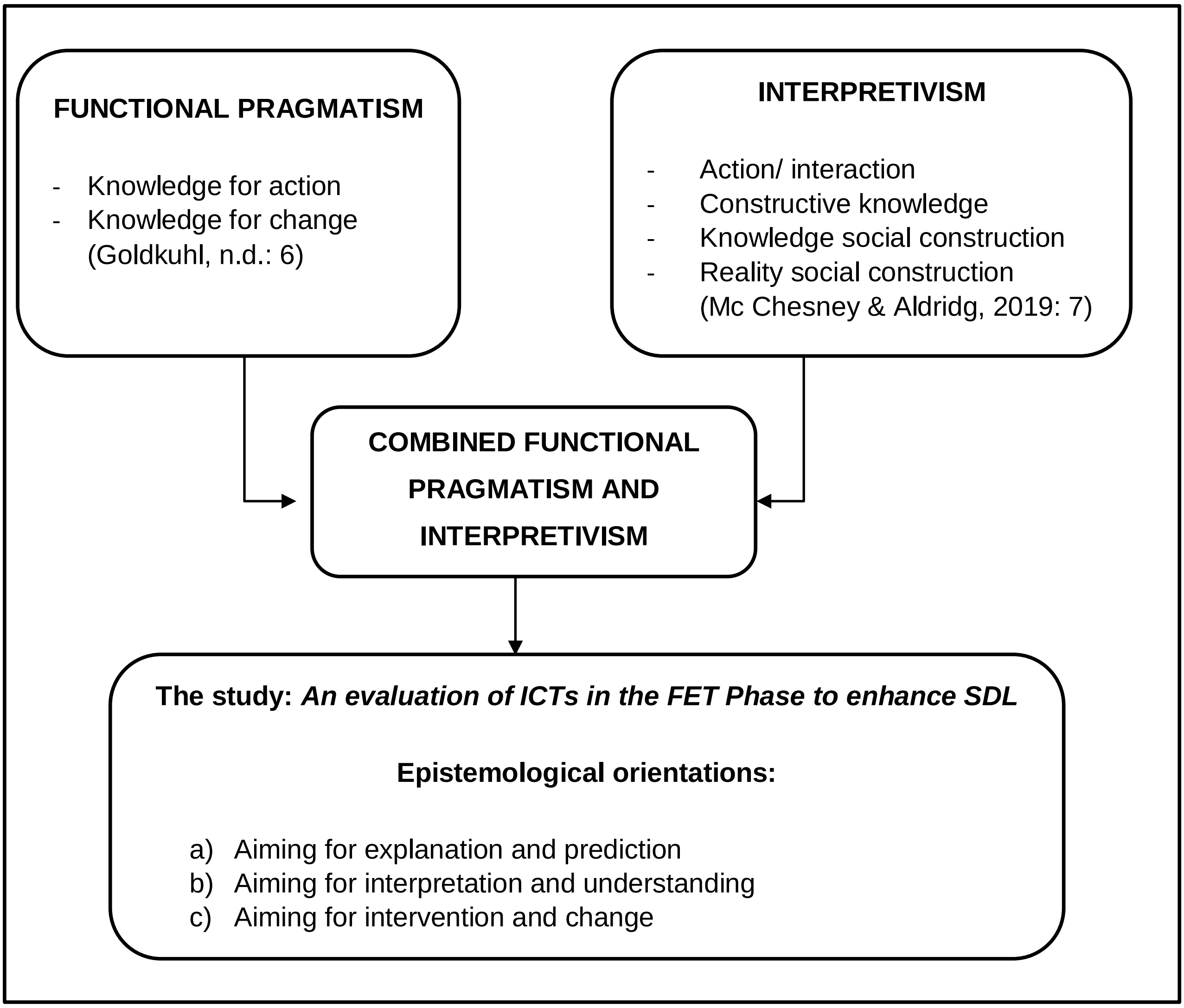


Figure 4-3: The Philosophical paradigm and epistemological orientations of the study

Source: Author's own

In Figure 4.3, it is portrayed that Functional Pragmatism specifies that knowledge should be used and useful for action and change (Goldkuhl, n.d.:6). On the inverse, Interpretivism is associated with action, intervention and constructive knowledge – that reality or knowledge is socially constructed (McChesney & Aldridge, 2019:7; Dean, 2018:1). This research-methodological framework which propels the study, an evaluation of ICTs in the FET-Phase to enhance SDL, consists of 3 epistemological orientations, namely: (a) aiming for explanation and prediction; (b) aiming for interpretation and understanding; and (c) aiming for intervention and change. Next, an account of these philosophy paradigms and how they apply to the study follows. First is an outline of Interpretivism.

4.3.1.2.1 Interpretivism

As implied in the above paragraph, the perspective of Interpretivism is "that truth and knowledge are subjective, as well as culturally and historically situated, based on people's experiences and their understanding of them" (Ryan, 2018:8). Figure 4.4 (below) depicts Interpretivism and its elements which are discussed in more detail thereafter.

INTERPRETIVISM:

- Adopts subjective truth and knowledge as a perspective
- Is based on culture and historical facts
- Considers human experiences and background understanding
- Focuses on humans versus physical phenomena (Alharasheh & Pius, 2020: 41)
- Values participants' views, perspectives and experiences (Thanh & Thanh, 2015)
- Discovers reality via participants' views (symbolic interaction) (Cowling, 2016: 53)
- Adopts inductive, exploratory approach (Constructivist variant) (Conrad, Bruce and Tucker, 2020:1)
- Values social interaction logic (social context)
- Values social order (Packard, 2017:536)

Figure 4-4: The perspective and elements of Interpretivism Paradigm

Source: Author's own

From Figure 4.4 it is learnt that Interpretivism concerns in-depth variables and factors related to a context whereby humans differ from physical phenomena (Alharahsheh & Pius, 2020:41). Thus interpretivist researchers appreciate "the world of human experience" and uncover reality through the participants' visions, milieu and experience which is referred to as symbolic interactionism (Thanh & Thanh, 2015:24; Cowling, 2016:53). The researcher constructs and interprets meaning from data gathered from the participants' experiences and perceptions concerning educators' involvement in ICT -evaluation, -selection and -utilization.

This study employed a constructivist variant which propels an inductive, exploratory approach to address and be sensitive to participant experiences in various contexts (Conrad, Bruce & Tucker, 2020:1). The researcher was cautious not to impose but construct meaning based on the internal logic obtained from social interaction among the participants as they engaged in the ICT–evaluation instrument development, testing and approval as well during semi-structured individual and focus-group interviews.

In short, Interpretivism is usually adaptive to various participant contexts, and its core belief is that reality is constructed within the ambits of social collaboration. Thus the socially constructed pedagogy (Sichula, 2018:243) needs to be integrated for sound educational practices. During social construction of reality, there emerges intentional action and interaction among the participants (Packard, 2017:536). This paradigm was therefore regarded as best suited for the study, which sought to explore, interpret and give meaning to the evaluation experiences and perceptions of evaluators of ICTs. The purpose thus was to uncover the realities of evaluation, for example whether GDE managers and educators adhere to ICT-evaluation processes and procedures. Next is a description of Functional Pragmatism which, for the purpose of this study, works in combination with Interpretivism.

4.3.1.2.2 Functional pragmatism

Pragmatism emerged through the writings of well-renowned scientists such as Peirce, James, Dewey and Mead. Figure 4.5 (below) depicts perspectives and elements of Functional Pragmatism.

FUNCTIONAL PRAGMATISM:

- Stresses purposeful action for change and meaningful life structure
- Life influenced by action and constant becoming
- Meaningful action via social interaction
- Efficiency/ Effectiveness of means
- Appropriateness or meaningfulness of means (Goldkuhl, 2012:7)
- Meaningful action for practical difference
- Scientific knowledge to improve action (Maarouf, 2019:5)
- Shared meaning and joint action (Juuti, Lavonen & Meisalo, 2016:38)
- Knowledge character (Forms)
    - Explanations (shared with positivism)
    - Understanding (shared with Interpretivism)
    - Prescriptive (giving guidelines)

Figure 4-5: Perspectives and elements of Functional Pragmatism

Source: Author’s own

From Figure 4.5, one learns that the ontology of Pragmatism is based on the premise that the life world of a human being is influenced by action and constant becoming or change. Based on Pragmatism, the philosophical partner of mixed research, without action any relational structure is meaningless (Goldkuhl, 2012:7; Mitchell, 2018:115). Another Functional Pragmatist perspective is that the purpose of scientific knowledge is to improve action and make a practical difference in life (Maarouf, 2019:5). Knowledge is never complete, final or absolute; it can therefore be revised and improved (Kaushik & Walsh, 2019:10). This conviction implies that action needs to be purposeful in order to change existence.

To cater for a pragmatist approach in this inquiry, the significant meaningful action entailed involving participants in social interaction with the researcher. In that social interaction, participants aired their views, shared their knowledge and experiences of practising ICT -evaluation, -selection, -approval as well as -application in the classroom. The researcher therefore deducted meaning and created knowledge as a consequence of that interaction with participants. Knowledge acquired through interaction with participants was used to make a difference and change existence, i.e. it influenced the crafting of an ICT-evaluation instrument and ICT-criteria. As expressed by Goldkuhl (2012), Pragmatism regards (a) application of socially constructed knowledge (i.e. knowledge action); (b) cares for both effectiveness and meaningfulness of means; (c) values explanations (key form of Positivism) and understanding (key form of Interpretivism); and (d) is prescriptive (giving guidelines), normative (exhibiting values) and prospective (suggesting possibilities).

DBR is well-aligned with the philosophy of Pragmatism which places prominence on shared meaning and joint action in order to determine what works optimally in practice (Juuti *et al.*, 2016:38). Such emphasis is also pivotal to this research-based study since it follows a design-based approach and aims for optimal realism, rationality and practicality of its findings. To optimally attain such realism, the researcher had to carefully consider data-collection methods, discussed next, which are specifically relevant to the context of the study. Overall, the study adopted DBR which is elucidated in the next section.

4.3.1.3 Design-based Research (DBR)

As stated above, this study adopted DBR, an approach that plays the role of generating knowledge concerning theory and practice by exploring the relationship between new findings and existing theories (Goff & Genet, 2017:107). Consequently, DBR makes it feasible to generate new knowledge and theories and to improve curriculum implementation strategies. DBR is regarded as compatible since it assumes a “complex learning system, allows for contextualisation of research findings, learning understanding, curriculum and pedagogical engineering and design" (Harlow, Dwyer, Hansen, Iveland & Franklin, 2018:3).

As directed by Meyer and Schultz (2020:195), the following DBR factors were applied during this research: (a) working collaboratively (interaction) with the participants is foregrounded; (b) emphasising how critical discourse analysis is done; (c) ensuring that a practical problem is identified, investigated through literature review, learning theory, and question posing; (d) seeking to understand how learning occurs; (e) prioritizing participant's process data such as video records and artefacts of participants' work; (f) shifting away from positivistic origins in which variables are well-known a priori; and (g) allowing for intervention while yet valuing the importance of social justice rather than social isolation as an outcome.

To apply the aforementioned, first in terms of working collaboratively with participants, a cordial socially interactive environment was set prior to and during the interview sessions, especially during the focus-group interviews. Participants were, via ground rules (also expressed earlier in Chapter 1, section 1.6.2 dealing with ethical considerations) assured of the collegial respect they were to be offered and encouraged to work collaboratively with fellow participants. They were made conscious that productive, respectful discourse was key and would form part of the analysis of the interviews. The researcher identified a practical problem which was expressed via the gaps in research (discussed earlier in section 1.3), set a research question, engaged in literature review (mainly Chapters 2 and 3) and established applicable theories to address the problem. The reviewed literature was also analysed to establish how learning, in SDL, occurs. Also as part of ethical considerations, the participants were guaranteed confidentiality and secure record-keeping for a specified period of interview transcripts and notes accessible only to the researcher. The research variables were not known a priori. Conclusions were not drawn from theoretical deduction but from social interactions with the participants. The researcher allowed the interactions to flow during the interviewing process, with minimal intervention. This reassured the participants of prevalence of social justice rather than social isolation.

Dialogue (Ryu, 2020) was also pivotal to mitigate possible perceived 'power relations'. In other words, iterative cycles of analysis, design, development, testing and refinement were conducted via collaborative efforts (Koivisto *et al.*, 2018:114) between the researcher, ICT educators, District and Head Office online facilitators within the GDE. The collaborative effort and iterative cycles, including dialogue and product adaptation, are vital methodological standards in DBR. The reason for collaborative effort is that, as stated earlier, knowledge is never absolute but relies on the participants to augment (Kaushik & Walsh, 2019:10). Also, because the draft instrument that was developed without any prior specifications had to be developed, tested and re-tested until it was finally adopted. In iteration, progress is easily measurable and product delivery or turn around (Okesola, *et al.*, 2020:29) is conspicuously realised. Also, in the study, the researcher was sensitive to potential ‘top-down’ syndrome; thus regarding the participants as an esteemed source based on their past experiences and existing knowledge.

Research design and methodology are interdependent, which makes it inevitable to discuss both as a continuum. In the next section, the researcher juxtaposes quantitative and qualitative strands to expound on their respective research methodologies that were applied during the course of this research work.

4.3.1.4 Research Methodology

Before adopting a research methodology, a researcher needs to acknowledge that collection and analysis of both quantitative and qualitative data is a lengthy, painstaking process (Creswell & Creswell (2018:11). As iterated earlier, consequently in order to endorse the rigour, a mixed-research multi-strand design approach was adopted in which quantitative research was done and supplemented with qualitative research. Mixed research could benefit the study because: (a) its methodological diversity can lead to superior research; (b) it merges statistical and cognitive logic that leads to a best resolution; (c) it leads to better research and subsequent management resolves reflecting both the social and scientific aspects of world-views; and (d) it provides researchers with the ability to design a single research study that replies questions regarding the nature of the phenomenon from the participant’s point of view (Mitchell, 2018:103). Data differs in terms of open-endedness, exploring topics in depth, understanding processes, and identifying potential foundations of observed correlations (Weller, Vickers, Bernard, Blackburn, Borgatti, Gravlee, & Johnson, 2018) or “close ended-ness” (limiting the respondents to brief, subjective responses) which determines the quantitative or qualitative nature of an inquiry (Creswell & Creswell, 2018), these two complement each other.

To capture the above-described relations, Figure 4.3 (below) portrays, in conjunction with Annexures A-C (data collection instruments), sequence and processes of data collection that were employed during research.

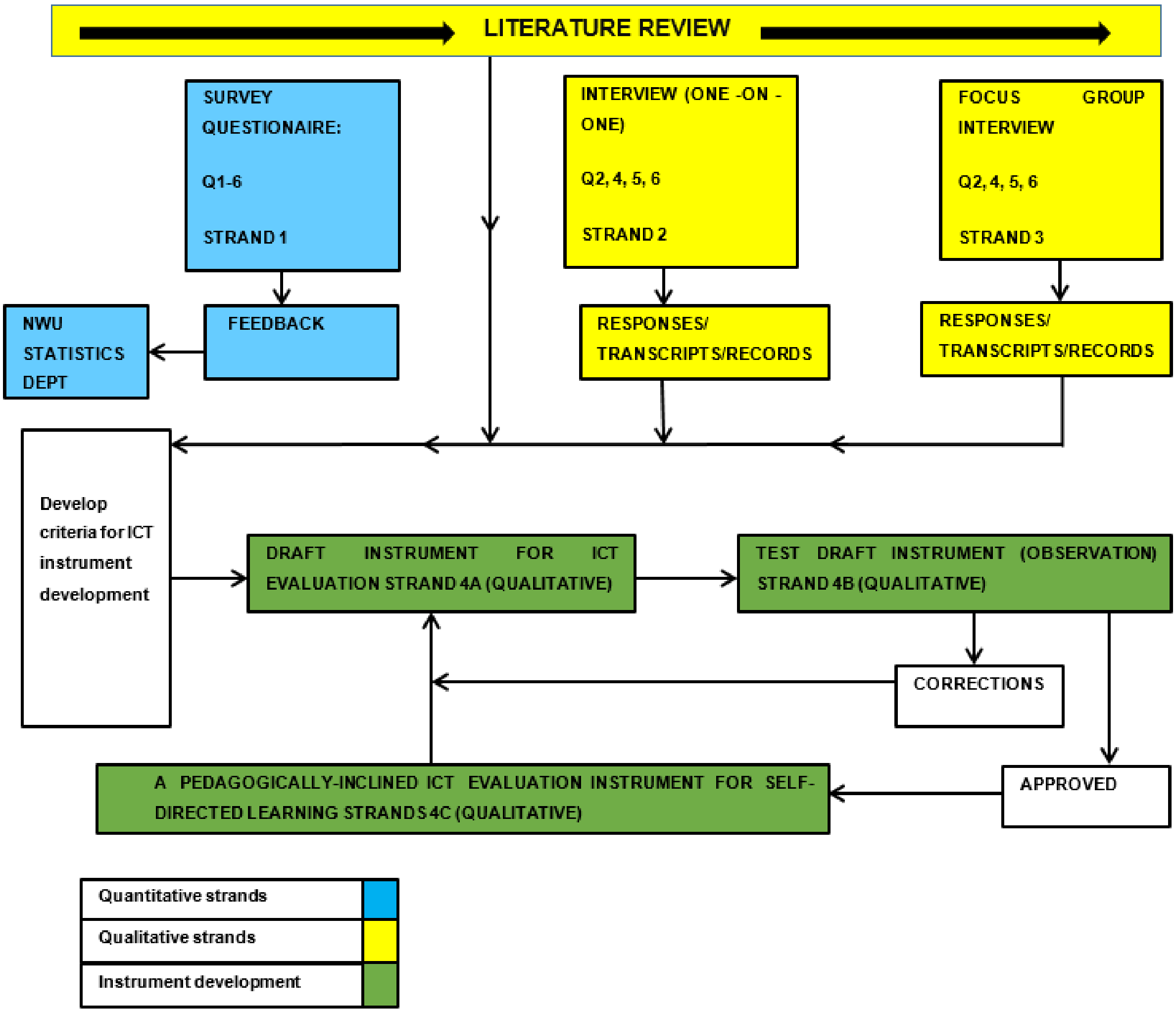


Figure 4-6: Data collection tools and processes in the Design-Based Research

Source: Author's own

From Figure 4.6, each of the data-collection methods is annotated as either quantitative or qualitative strand. Strand 1 represents the quantitative survey, Strand 2 qualitative semi-structured individual interviews and Strand 3 the qualitative focus-group interviews all coupled with the literature review which was used to build theoretical frameworks on an on-going basis across the research process. Data from the three strands were consolidated and utilised for crafting the ICT-evaluation instrument, which was iteratively drafted, tested, adopted and finalised (Strand 4) in social collaboration with a working group composed from some of the sample participants. The end-product yielded was a pedagogically sound ICT-evaluation instrument to enhance SDL in learning environments within the FET Phase. In the next sections, the author of this document unfolds research methodology for each data collection strand. First, is the research methodology for the quantitative strand.

4.3.1.5 Research methodology for quantitative strand

The survey questionnaire, the quantitative strand, was utilised to collect data (participant responses) by means of closed-ended questions. Detailed in chapter five, section 5.2, participant responses were classified, analysed, and interpreted using a combination of descriptive statistical phenomena and graphicacy. Descriptive statistics provide simple summaries of the sample, measures of central tendency and dispersion (Mishra, Pandey, Singh, Gupta & Sahu, 2019) and graphicacy is an ability to read, interpret and analyse graphs (Ng, 2019:59). In those said sections, collected data were then presented narratively to explain the gathered knowledge and the basis for drawn conclusions. The next section exposes research methodology for the qualitative strand.

4.3.1.6 Research methodology for qualitative strand

Both semi-structured individual interviews and focus-group interviews were allocated as qualitative strands. The interviews probed responses via open-ended questions. Participants' responses were recorded, transcribed via the Otter application, coded and analysed using thematic methods and interpreted for application in real situations. In the thematic analysis, the researcher examined data to identify common themes (topics, ideas and themes that came up repeatedly). The researcher, using social collaboration tools (Imran, Pireva, Dalipi & Kastrati, 2016) and research techniques, co-operated with participants to collect, classify and analyse qualitative data. For qualitative research methods, the technique used to select participants was purposive sampling in which the researcher chose participants due to their qualities, willingness to provide information by virtue of knowledge or experience, proficiency, availability and willingness to participate (Tadenhorst, 2016: 22; Etikan, Musa & Alkassim 2016:2). A discussion of data sampling methods follows next.

4.3.1.7 Sampling Methods

For both qualitative and quantitative strands of this mixed-research, the researcher opted for deliberate or purposive sampling. This option was chosen because the objective was specific and clearly defined (Davoudi, Nayeri, Raiesifar, Poortaghi & Shamsi, 2017:5). Seeking educators who teach in GDE ICT schools and with former evaluation experience or exposure, the researcher followed the logic of the study instead of an ad hoc approach (Punch & Oancea, 2014:164). Experience in evaluation and teaching in ICT schools were the key central phenomena (Creswell, 2009:217) which were considered during sampling of the participants.

Since it is purposive sampling, the experienced participants were selected based on: a) determined criteria by research purpose; b) under the guidance of a theory; and c) with the purpose of refining and elucidating the emerging theory (Davoudi *et al.,* 2017:5). They were selected by means of a combination of deliberate/purposive and theoretical sampling to participate in the quantitative and qualitative research strands. The sample group was heterogeneous in nature, as participants were drawn from: (a) various secondary schools across Gauteng; (b) previously advantaged and disadvantaged schools; (c) various quintiles per the school's poverty index; and (d) GDE District offices. During focus-group interviews, the participants were allocated in homogeneous groups in order to promote freedom of expression. This tallies with what Punch and Oancea (2014:235) suggest by saying that qualitative research should deal with the questions as to who and what will be studied and why.

The sampling design opted for was single stage as the researcher had access to names of participants and could sample them directly (Creswell, 2018:150). For the quantitative research strand, n=50 survey questionnaires were distributed to participants with former LTSM evaluation experience. For the focus-group interviews, n=120 participants were sampled to participate in a total of 12 focus-group sessions (approximately 10 participants per group). These participants were selected by means of precision-equivalent random sampling. The focus-group interviews were characterised by a shared social interaction; the participants and researcher shared pre-existing knowledge and experience in order to socially construct knowledge on issues that are pertinent to the evaluation of the FET ICT. Furthermore, n=15 participants were selected via precision-equivalent random sampling to participate in semi-structured individual interviews, drawn from a fair distribution among the GDE districts population of educators. Next is exposition of data collection methods.

4.4 METHODS OF DATA COLLECTION

Data collection is a process in which a researcher engages in the collection of information to be used to answer set research question(s) (Creswell & Creswell, 2018). The methods according to which data are collected appeals to the technique used to collect or acquire and analyse data (Groenland & Dana, 2019:163). As portrayed in section 4.3.2, research design, methodology and analysis are guided by the philosophical paradigm (Ryan, 2018:1). Hence this study was guided to utilise the survey questionnaire, semi-structured individual interviews as well as focus-group interviews to collect and analyse data. Each method of data collection is selected to attain the research objective of this study and answer the set research questions. Prior to data collection, the researcher engaged in an intensive literature review. Thus the author of this document describes the literature review first and then discusses each of the data-collection methods.

4.4.1 Description of literature review

Literature review is a systematic procedure for reviewing or evaluating documents – both printed and electronic – to give voice and meaning to the research topic (Bowen 2009:27) without questioning several people (Bathmanathan, Rajadurai & Sohail, 2018:5). Furthermore, literature review is often combined with other qualitative research methods as a reinforcement since it is efficient, affordable, cost-effective, stable and accurate, and offers comprehensive coverage (Safari, Seyedin & Jahangiri, 2020:2). The documents that were reviewed in this study sought to achieve the goal of answering secondary research questions 1-4 and 6. Literature relevant to the research topic that were reviewed are from a broad spectrum of mainly published media including newspapers, websites, journals, books, e-mails, government gazettes, electronic books, memoranda, circulars and policy documents. Of significance were also GDE policy documents that reflect a trend that had been followed regarding ICT-evaluations from as far back as during Outcomes-based Education (OBE, 1997), National Curriculum Statement (2000-9) and National Curriculum and Assessment Policy Statement (CAPS, 2010). As illustrated in Section 4.3.1.4 (Figure 4.2 above), literature review took place continuously through the research process in combination with other research methods. Next is a discussion of the survey questionnaire, its purpose, compilation, distribution and collection.

4.4.2 Purpose, compilation, distribution and collection of survey questionnaire

In the next respective sub-sections, the author of this document describes the purpose for which the survey questionnaire was utilized, how it was compiled, distributed and collected.

4.4.2.1 Purpose of survey questionnaire

To obtain relevant information most reliably and validly (Taherdoost, 2020:28), the researcher opted for the questionnaire method in the quantitative strand. With the support of the NWU-Statistical Consultation Services, a survey questionnaire (n=50) was crafted using a set of questions, usually closed-ended, in order to script the conversation (Krosnick & Presser, 2020:263). In the context of this study, the survey questionnaire was specifically designed to probe educators who previously partook in the evaluation of LTSM or ICTs to provide quantitative or numeric data.

As earlier mentioned, the survey questionnaire was designed in an attempt to find answers to secondary research questions 1 to 6 of this empirical study. Participant responses to those sub-questions were discussed in Chapter 5, section 5.2.1. Such responses enabled the researcher to give a description of trends, attitudes or opinions of the FET educators towards ICT-evaluation and -selection in the FET-Phase (Creswell & Creswell, 2018:12, 147). More specifically, the purpose of the survey was to establish the level at which FET educators are empowered, experienced, challenged and involved in the evaluation of ICTs for utilization in their learning environment. Participant responses were in turn used towards development of ICT-evaluation criteria, MIs and instrument to select ICTs suitable for SDL. In the next section, the author of this document describes how the survey questionnaire was compiled.

4.4.2.2 Compilation of survey questionnaire

As stipulated earlier, in the first strand of the design-based mixed research, the researcher opted for a survey questionnaire. The survey questionnaire comprised a set of questions to probe participants. The researcher's intention was to provide quantitative or numeric data which describe trends, attitudes or opinions of the population (Creswell, 2018:12, 147). To finalize the questionnaire, the researcher obtained professional support from the NWU-Statistical Consultation Services. Figure 4.7 (below) illustrates the steps that were undergone during survey questionnaire compilation.

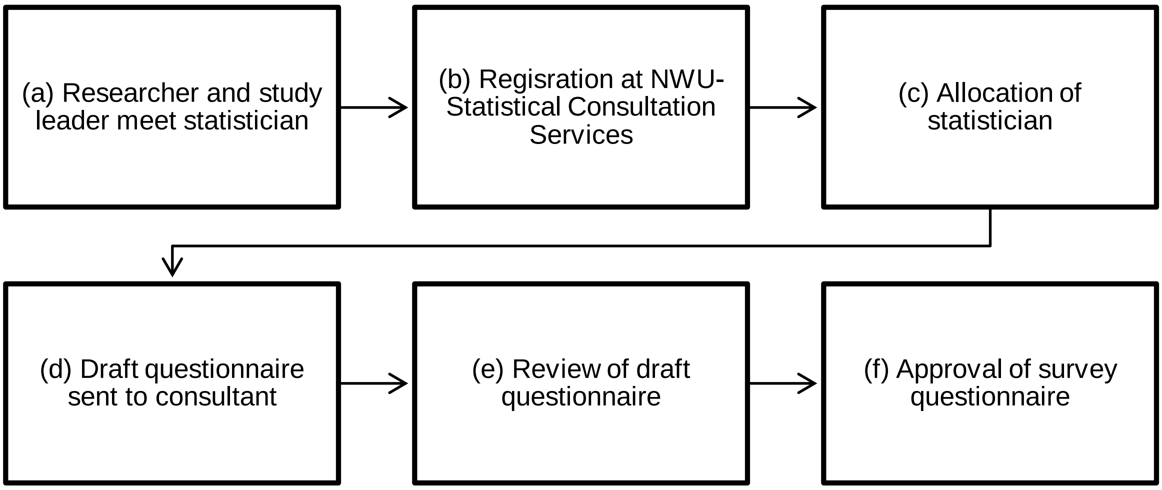


Figure 4-7: Process undergone during compilation of survey questionnaire

Source: Author's own

As indicated in Figure 4.7, the main steps of the process followed during compilation of the survey questionnaire were: (a) The researcher and study leader convened a meeting to brief the statistician; (b) The researcher completed a registration process; (c) The researcher was allocated a statistician (consultant); (d) The researcher was required to submit a draft survey questionnaire; (e) For several times, the draft questionnaire was reviewed, more advices were offered (based on structure and content) and circulated between the researcher and consultant; and (f) The final questionnaire, tested by the consultant was approved by the consultant. A copy of the letter of approval from the NWU-Statistical Consultation Services is displayed in Figure 4. 8 (below).

Health Research Ethics Application

Study Leader (Title, Initials & Surname)	Study Title
Prof C van der Westhuizen	An evaluation of information and communication technologies in the FET-phase to enhance self-directed learning

NWU Ethics Number

N	W	U	-						-			-		

8.2 Sec 8b: Statistical Consultant (If applicable)

The statistician of the Statistical Consultation Service of the North-West University completes this section (where applicable).

8.2.1 Have you ascertained that the statistical analyses to be used in this study is justifiable according to your judgement?

Please mark with X in the appropriate box and provide details.

Yes	No
☒	☐

Name (Title, Full Names & Surname)	Qualifications
Prof Susanna Maria Ellis Pr Sci Nat	PhD (Statistics)

SM Ellis

Signature

2 0 1 9 - 1 1 - 2 9

c c y y m m d d

Date

Figure 4-8: Letter of approval of survey questionnaire

Next is a discussion of how the formulated survey questionnaire was distributed.

4.4.2.3 Distribution of survey questionnaire

The initial plan of physically visiting schools to distribute survey questionnaires was aborted by the advent of the COVID-19 pandemic lockdown regulations which prohibited school visits. Prior to the lockdown regulations, the researcher had obtained approval to conduct research at GDE institutions (see Annexure G: GDE Approval letter). However, the GDE complied with regulations and prohibited researchers from visiting schools by means of a letter titled *NO school Access* (Annexure H: GDE No School Access letter). Consequently, the researcher did not visit the sampled GDE institutions physically, and instead resorted to administering the survey online via the Google Forms application. The original survey questions were without alteration loaded onto the Google Forms application. To distribute the survey, a link was sent to the sampled survey participants via e-mail and WhatsApp. More than n=50 survey questionnaires were distributed. The participants responded and submitted their survey with a click of a button on their cell phones or personal computers. The responses were instantly received on the Google Forms platform.

4.4.2.4 Collection of survey questionnaires

With the assistance of some district facilitators and courtesy of Google Forms effectiveness, all the n=50 surveys were received back from participants, district and school-based educators. The researcher had control over either opening or closing the survey. So, when the required number of responses was received, the researcher closed the survey. Completed surveys were from a group of participants across different ranks who are based at ten schools from seven districts of the GDE. The different ranks specified on the survey were subject educator, subject head, departmental head (school), deputy principal, principal, official (district office), and official (provincial office). Details of responses and the analysis thereof are dealt with in Chapter 5, section 5.2.1. Next is a discussion of the semi-structured individual interview method, its purpose, compilation, distribution and collection. First is a discussion of purpose, compilation and distribution of semi-structured individual interviews.

4.4.3 Purpose, compilation, distribution and collection of semi-structured individual interviews

In the next respective sub-sections, the author of this document describes the purpose for which the semi-structured individual interviews were utilized and how the interview schedules were compiled, distributed and collected.

4.4.3.1 Purpose of semi-structured individual interviews

The semi-structure individual interviews were organised in order to augment and close gaps that could have been left insufficiently answered during the survey. The semi-structured individual interview focused on the issues that are meaningful to the participant, in this case ICT-evaluation, -criteria and -instrument as well as implementation of SDL in the FET-Phase. The interview questions were based on participants' previous knowledge and experience and diverse perceptions regarding the research topic. The interview questions, expressed on an interview schedule, aimed at directing the interview dialogue towards the research question. The interview schedule consisted of main themes and follow-up questions (Kallio, *et al.*, 2016:11). The interview method is the art of soliciting responses from individuals using questions and follow-up questions (probes) and after that interpreting the responses (Roulston & Choi, 2018:233). Next is a description of how the semi-structured individual interview schedule was compiled.

4.4.3.2 Compilation of semi-structured individual interview schedule

The researcher conducted semi-structured individual interviews to collect data regarding GDE educators and managers' perceptions of ICT evaluation in the FET Phase. The interview questions were scripted on an interview schedule to conduct a total of n=15 interviews planned to each last about 15 minutes. The interviews were intended to take place during school or office hours. A total of 15 interviews (n=15 covering secondary research questions 2, 4, 5 and 6) with participants who have experience of evaluating learning and teaching materials were conducted further to explore specific details and aspects of that phenomenon of interest. Next is a plot of principles considered during compilation of the semi-structured individual interviews.

4.4.3.2.1 Principles considered during semi-structured individual interviews compilations

The researcher followed the following guidelines offered by Bearman (2019:4): (a) using meaningful, relevant prompts to generate complex, nuanced thoughts and descriptions of the phenomenon of interest, i.e. ICT evaluation; (b) asking open-ended questions that are clear and optimally non-ambiguous; (c) posing some probing questions since open-ended questions have a tendency to create valence; and (d) basing the interview questions on the phenomenon of interest, with a clear understanding of the focus of the inquiry as stipulated in the research aim and question. Furthermore, as suggested by McGrath, Palmgren and Liljedahl (2018:1004), during interviews, the researcher had to take caution to avoid contaminating or biasing data but become a co-creator of data together with the interviewees.

Over and above covering the research questions, the interview questions covered more aspects of the proceedings. The interview questions were systematically spread through the three parts of the interviews, namely (a) the introduction – which includes explanatory materials, consent and first questions; (b) exploration of the core phenomenon – main questions concerning the phenomenon; and (c) final reflections – abstract questions, opportunity for comments and closure (Bearman, 2019:7). In the next section, processes followed to distribute and collect interviews are discussed.

4.4.3.3 Distribution and collection of interview questions

As earlier stated, the originally planned school visits were aborted due to COVID-19 regulations, and researchers were prohibited from physically accessing GDE institutions. Consequently, the individual interviews were administered online via the Zoom-meeting application platform and recorded on Otter application (an application that records and converts voice recordings to text). The interviewer was guided by questions embedded in the semi-structured individual interview schedule. Informed consent forms were electronically signed, distributed and recollected by electronic means. In addition, prior to the interview sessions, the researcher sought permission from the participants to voice-record the conversations. The recorded interviews were instantly transcribed via the Otter application for the purpose of analysis and interpretation. The interviewer used the DocuSign application to administer the Informed Consent forms.

4.4.4 Purpose, compilation, distribution and collection of Focus-group interviews

In the next respective sub-sections, the author of this document describes the purpose for which the focus-group interviews were utilized and how the corresponding interview schedules were compiled, distributed and collected.

4.4.4.1 Purpose of Focus-group interviews

Focus-group interviews were conducted to consolidate responses of the survey and semi-structured individual interviews. In focus-group interviews, with distinct ethical challenges, the interviewer was concerned with participants' communication among themselves rather than with the interviewer who only acted as a mediator (Qu & Dumay, 2011:245; Sim & Waterfield, 2019:3003). According to Bernard, Wutich and Ryan (2017:88), focus groups are instrumental in obtaining stakeholder reaction to proposed programs, interpreting the results of a survey and stimulating discussion. Focus-group interviews were ideal for this study which took into cognisance educators as major stakeholders in evaluation of ICT.

Focus-group interviews were chosen as a data collection method in order to gain in-depth knowledge of the social issues and experiences from a purposively selected group of individuals (Nyumba, *et al.*, 2017:20). The reason for utilising focus groups was to promote discourse among evaluators regarding their experiences on ICT-evaluation, -selection and -approval. That kind of discourse is what Brock (2016:2) refers to as the cultural discourse that shapes our ICTs utilisation and the societal expectations about techno-cultural practices. Focus-group interviews were organised through a list of questions in an interview schedule which was informed by prior literature reviews. As mentioned earlier, there were 12 focus groups, each comprising approximately ten participants, a heterogeneous group consisting of district officials from e-learning and curriculum sections and school-based educators, each chosen across the seven districts of the GDE. Open-ended questions were asked in the focus-group interview schedule (Annexure C).

4.4.4.2 Distribution and collection of focus-group questions

Also the originally planned visits to visit schools were aborted due to COVID-19 regulations and researchers were prohibited from physically accessing GDE institutions (see Annexure H: GDE Letter: No School Access). Consequently, the interviews were administered online via the Zoom-meeting application platform and recorded on Otter application (an application that records and converts voice recordings to text). The interviewer was guided by questions embedded on the focus-group individual interview schedule. Informed consent forms were electronically signed, distributed and recollected by electronic means. The interviewer used the DocuSign application to administer the Informed Consent forms.

4.4.5 Analyses of Data

This study employed on-going, emerging and iterative or non-linear data analysis. The iterative approach focuses on more narrow data aspects with a potential to extend to specific theories where the researcher is encouraged to actively reflect on and capitalise upon their previous interests, past literature, and directives (Tracy, 2018:62). This approach was a further attempt to keep the study in line with the spirit of the adopted philosophical paradigms of this study. Both content or transactional and personal interactional attributes of sound quality (Weiste, 2018:44) formed part of the data analysis spectrum. In analysing the data, the researcher engaged in manual coding, sorting and organising themes where common characteristics could be detected and classified into main categories. Analysis was done based on theory and participant responses (Terry, Hayfield, Clarke and Braun (2017). Table 4.1 (below) summarizes lists and describes the data-collection methods, corresponding research questions that were covered by each method as well as the data analysis techniques that were applied in the study.

Table 4-1: Data collection methods, questions and analysis techniques applied in the study

Data collection method	Description of method	Research value of method	Analysis of data
Survey (Quantitative n=50)	Set of close-ended questions on a questionnaire.	- Answers Questions 1 -6 - Scripts conversations. - Describes Trends, Attitudes and Opinions of population.	- Statistical Analysis: - Cronbach scale, Factor Analysis to measure reliability and Correlations. - Questions 9,13 and 14 were grouped into three factors to measure correlations regarding leadership, viz. Participation (Question 9), Procedures (Question 13)

Data collection method	Description of method	Research value of method	Analysis of data
			and Leadership (Question 14). - Grouping, classification and interpretation of responses.
Semi-structured Individual interview (n= 15)	Set of open questions with probes on an interview schedule to elicit individual one-on-one responses. Questions based on previous knowledge and experience.	- Answers Questions 2,4,5,6. - Solicits detailed answers from individuals - Provides details to the phenomenon.	-Transcription of data - Coding of data, themes and analysis of data - Interpretation and description of data - Drawing theoretical generalisations - Steps to follow (Creswell & Creswell, 2018): 1. Organise data 2. Read Data 3. Code data 4. Generate Themes 5, Represent themes
12 Focus-group interviews (ten participants per group)	An interview of several individuals together as a group allowing discussions among them. The researcher assumes the moderator role and facilitates with Open-ended Questions and probes on an interview schedule.	- Answers Questions 2,4,5, 6. - Provides in-depth knowledge of social issues. - Promotes discourse. - Shapes ICT utilisation and societal expectations.	

From Table 4.1 it is clear that each of the data-collection methods (survey questionnaire, semi-structured individual interviews and focus-group interviews) used in this study focused on specific questions and was analysed differently. The survey, using a questionnaire (n=50) was meant to seek answers to questions 1 to 6. These questions scripted the conversation to describe trends, attitudes and opinions of the participants. The responses of survey were statistically analysed via Cronbach's scale. Questions 9,13 and 14 were grouped into three factors to measure correlations regarding Participation (Question 9), Procedures (Question 13) and Leadership (Question 14). The semi-structured individual interviews (n=15) consisted of open-ended questions to obtain answers to questions 2,4,5 and 6. The interview transcripts were classified via thematic approach after which generalizations were made. The focus-group interviews (n=120) consisted of open-ended questions to obtain answers from questions 2,4,5 and 6 from a group of participants where there was discourse.

4.4.5.1 Analysis for survey

As proposed by Creswell (2018:193), statistical analyses were used towards participants' responses. A five-point scale was used; then responses grouped, classified and interpreted.

With the support of the NWU-Statistical Consultation Services, Cronbach's alpha coefficient based on inter-item correlations was used to quantify internal reliability. The factor analysis was applied wherein several variables probably with a shared variance (Van Bork, Wijsen & Rhemtulla, 2018:586) were condensed into one factor and it was assumed that the measured variables were correlated because they were influenced by the same fundamental latent construct (Watkins, 2018:227). The factor analysis determined whether there was a substantial or low correlation between participants' responses to the five-point scale. Next, is the description of analysis of interviews.

4.4.5.2 Analysis for interviews

Semi-structured individual interviews and focus-group interviews are jointly discussed in this section because a similar approach was adopted for both analyses. In both, audio scripts were and transcriptions were analysed manually or by taking apart words, sentences, paragraphs, and then interpreting (organising, reducing and describing) that data. As suggested by Qu and Dumay (2011:245), interviews can contribute to other modes of generalisation such as theoretical generalisation. For optimum results, an interview involves prepared questions and probes directed by specific themes to gather extensive participant responses, should allow the interviewer to modify the style, pace and ordering of questions; liberated the interviewees to offer open responses.

In the study, content analysis using manual methods to code, organize data into themes and analyse qualitative data was used. Steps to analyse the interviews included organising data; reading data; coding data; generating a description and themes; and representing the themes (Creswell & Creswell, 2018:193 –195). Since data were dense, winnowing was implemented as per qualitative analyses procedures suggested by Creswell and Creswell (2018:193). In this data analyses the warning by Sim & Waterfield (2019:3006) was heeded that removal of data from the transcripts prior to analysis could undermined the inferences to be drawn.

During the interviews, data were sorted, coded and organised according to themes. Coding, for instance, peer coding, may simply be described as a process that enables collected data to be assembled, categorised, and thematically sorted, providing an organised platform for the construction of meaning (Williams & Moser, 2019:45). Yet Creswell and Creswell (2018:193) describe coding as "process of organising data by bracketing chunks of text and writing a word describing the category". So, the text from the interview transcripts were sorted and coded for analysis. These steps were succeeded by interpretation of data by means of summarising findings, comparing findings to literature, personal views discussion and focusing on the future implications of the findings. Then validation was performed to assess credibility and accuracy of the findings. This section served as last in this broad discussion of the study's research design and methodology and precedes discussion on Trustworthiness, a key factor in research ethics.

4.5 TRUSTWORTHINESS

Trustworthiness of both the researcher and the participants was highly regarded during research. The researcher had to ensure transparency, rigour, credibility, and trustworthiness by using the "self" but excluded himself from data (Shufutinsky, 2020:50). To maintain trustworthiness, the researcher also strove for transferability, credibility, conformability and dependability (Nowell *et al.*, 2020:3). To maintain credibility, the researcher aimed to measure what the research instruments were intended for in order to avoid discrepancy between the opinions and the actual participant responses (Nowell *et al.*, 2020:4). For dependability, consistency, logic, traceability and clear documentation of the research process key attributes (Pool, 2014:95) were adhered to. The researcher further endeavoured to strike a balance or consistency between data analysis and accepted standards for the design of this study (Korstjens & Moser, 2018:122). For confirmability the research interpretations were clearly derived from the original data and impartiality was avoided (Nowell *et al.*, 2020; Anny, 2014:279). Last, for transferability, data were analysed, conclusions were drawn and recommendations were made to education departments for application (Korstjens & Moser, 2018:122) in their mission of developing ICT-evaluation, selection, utilization and policy formulation.

Table 4.2 (below) is a synopsis of all the data collection information stated above in this DBR, specifying: (a) methods of data collection; (b) purpose of using the data sampling methods; (c) data samples; (d) data collection instruments; (e) how instrument was developed; (f) data analysis methods; (g) validation procedures; (h) credibility; (i) dependability; (j) confirmability; and (k) ethical issues.

Table 4-2: Synopsis of all data collection information for qualitative and quantitative strands

	QUANTITATIVE	**QUALITATIVE**	**QUALITATIVE**	**QUALITATIVE**	**QUALITATIVE**	**QUALITATIVE**
	STRAND 1	**STRAND 2**	**STRAND 3**	**STRAND 4A**	**STRAND 4B**	**STRAND 4C**
DATA COLLECTION	**SURVEY**	**INDIVIDUAL INTERVIEW**	**FOCUS GROUP INTERVIEW**	**DRAFT ICT-EVALUATION INSTRUMENT**	**TEST DRAFT ICT-EVALUATION INSTRUMENT OBSERVATION**	**FINALLY TEST AND ADOPT ICT-EVALUATION INSTRUMENT FOR SDL**
PURPOSE (ANSWERING QUESTIONS)	Q 1-6 Obtain participant quantitative responses as input	Q2,4,5,6 Obtain participant qualitative responses as input	Q2,4,5,6 Obtain participant qualitative responses as input	Q1-6. Use inputs from strands 1, 2, 3. Create evaluation criteria	Q1-6 Mock ICT Evaluation	Q1-6 Use inputs from strand 4A and 4B to finalize criteria

	QUANTITATIVE	QUALITATIVE	QUALITATIVE	QUALITATIVE	QUALITATIVE	QUALITATIVE
	STRAND 1	**STRAND 2**	**STRAND 3**	**STRAND 4A**	**STRAND 4B**	**STRAND 4C**
DATA COLLECTION	**SURVEY**	**INDIVIDUAL INTERVIEW**	**FOCUS GROUP INTERVIEW**	**DRAFT ICT-EVALUATION INSTRUMENT**	**TEST DRAFT ICT-EVALUATION INSTRUMENT OBSERVATION**	**FINALLY TEST AND ADOPT ICT-EVALUATION INSTRUMENT FOR SDL**
SAMPLE	Office and school–based ICT/LTSM/FET Educators (Stratified purposeful sampling) n=50	Office-based ICT LTSM coordinators (n=15) (Deliberate purposeful sampling)	Heterogeneous stake-holders group (n=120) (Deliberate purposeful sampling)	Office and school–based ICT/LTSM/FET Educators (Deliberate purposeful sampling)	Office-based and school Educators in FET (n=30) (Deliberate purposeful sampling)	Office-based and school Educators in FET (n=30) (Deliberate purposeful sampling)
INSTRUMENT	Survey questionnaire	Semi-structured interview schedule	Focus group interview schedule and questionnaire	COI ICT-evaluation instrument criteria, survey	Draft ICT-evaluation instrument; sample ICTs	Final ICT-evaluation instrument; sample ICTs
DEVELOPMENT OF INSTRUMENT	Questions emerging from literature review and document analysis	Questions emerging from survey questionnaire and literature review	Questions emerging from literature review, interviews, and observational notes	Input from semi-structured and focus group interviews, observation transcripts, document analysis and literature review	Re-designing based on draft evaluation instrument test analysis	COI adopted for this study's context
DATA ANALYSIS	Descriptive statistics (Applied Multivariate Data Analysis)	Interview records, transcripts; data codes, themes and categories	Interview records, transcripts; data codes, themes and categories	Data coding, organisation of themes, classification of categories	Input data coding, organisation of themes, classification of categories	Practical application of final ICT-evaluation instrument
VALIDATION	Validity and evaluation by statistician/ experts	Member checking	Member checking			
CREDIBILITY	Using feedback from the respondents	Spending optimal time in the field	Spending optimal time in the field	Using feedback from the respondents	Performing practical on-field application	
DEPENDABILITY		Verification through recording and transcription. Peer coding and verification & peer coding auditing	Verification through recording and transcription. Peer coding and verification & peer coding auditing			
CONFIRMABILITY		Member checking	Member checking			
TRIANGULATION	Compare results with data from other strands to draw conclusions and recommendation	Compare results with data from other strands to draw conclusions and recommendation	Compare results with data from other strands to draw conclusions and recommendation	Compare results with data from other strands to draw conclusions and recommendation	Compare results with data from other strands to draw conclusions and recommendation	Compare results with data from other strands to draw conclusions and recommendation
ETHICAL ISSUES	Ethics clearance, Letter of consent, voluntary participation,	Ethics clearance, Letter of consent, voluntary participation,	Ethics clearance, Letter of consent, voluntary participation,	Ethics clearance, Letter of consent, voluntary participation,	Ethics clearance, Letter of consent, voluntary participation,	Ethics clearance, Letter of consent, voluntary participation,

	QUANTITATIVE	QUALITATIVE	QUALITATIVE	QUALITATIVE	QUALITATIVE	QUALITATIVE
	STRAND 1	**STRAND 2**	**STRAND 3**	**STRAND 4A**	**STRAND 4B**	**STRAND 4C**
DATA COLLECTION	**SURVEY**	**INDIVIDUAL INTERVIEW**	**FOCUS GROUP INTERVIEW**	**DRAFT ICT-EVALUATION INSTRUMENT**	**TEST DRAFT ICT-EVALUATION INSTRUMENT OBSERVATION**	**FINALLY TEST AND ADOPT ICT-EVALUATION INSTRUMENT FOR SDL**
	withdrawal at any stage, confidentiality	withdrawal at any stage, confidentiality	withdrawal at any stage, confidentiality	withdrawal at any stage, confidentiality	withdrawal at any stage, confidentiality	withdrawal at any stage, confidentiality

After the above discussion of this study's research design and methodology, this point precedes conclusion of the chapter which is accomplished hereunder.

4.6 CHAPTER CONCLUSION

In synergy with Chapter one, this chapter entailed an in-depth discussion of the adopted research design and methodology backed by more literature studies. In the initial stages of the chapter, adoption of a mixed, multi-strand design approach was pronounced. The mixed research consisted of both quantitative (concerned with data that can be represented or measured numerically) (Goertzen, 2017:12) and qualitative strands providing detailed descriptions, challenges existing theories and exposes new theoretical directions (Bansal *et al.*, 2018:1189). It was also specified that this study adopted an explanatory sequential mixed methods design in which the researcher conducted a survey, analysed the responses in detail and then further explained gaps in the results with qualitative research (semi-structured individual interviews and focus-group interviews).

Furthermore, to appropriately decide on research design, methodology and analysis, the researcher opted for a specific philosophical paradigm (Ryan, 2018:1), a methodological congruence (Willgens *et al.*, 2016:2380); thus adoption of Interpretivism and Functional Pragmatism. The data-collection methods opted for were survey questionnaire, semi-structured individual and focus-group interviews. The survey questionnaire comprised a set of closed-ended questions that scripted the conversations (Krosnick & Presser, 2020:263). The semi-structured individual interview was meant to solicit responses from individuals using questions, follow-up questions and probes (Roulston & Choi, 2018:233). Lastly, the focus-group interview was to gain in-depth knowledge of the social issues and experiences from a purposively selected group of individuals (Nyumba *et al.*, 2017:20). In the overall data analyses, the iterative approach focusing on more narrow data aspects with the potential to extend to specific theories (Tracy, 2018:62) was used. Each of the above-described results of data-collection methods was analysed using different strategies.

In the next chapter, the researcher further gives a detailed account of how the collected data from both quantitative and qualitative strands were analysed, presents findings and draws conclusions. In the case of quantitative analysis, the group statistics, descriptive statistics, *t*-tests and correlations were done. For qualitative strands, the method of coding was explained as well as the interview results concerning the necessity of an instrument, leadership, qualities of an instrument, educator involvement levels, components of an instrument and technical aspect of evaluation.

CHAPTER 5: ANALYSIS OF DATA, RESEARCH FINDINGS AND ICT–INSTRUMENT DEVELOPMENT INPUTS

5.1 INTRODUCTION

Chapter four provided a detailed discussion regarding justification of methodological selection as well as research methodology and design of this study. During that discussion, in section 4.3.1.7, there was also elaboration of the method that was followed for selecting samples. The method used was homogenous, purposive sampling technique, a deliberate, non-random choice of participants due to the qualities they possess (Etikan, *et al*., 2016:2). In the discussion, there was also description of data-collection tools, strategies, methods and analyses. Data was collected using tools pertinent for each strand within the DBR and in line with the study's strategies and methods. Noteworthy was that DBR requires intensive, long-term collaboration between researchers and practitioners, solutions to practical problems as well as application of theory in practice (Goff & Getenet, 2017:108). Hence contextually, in order to comply with the afore-stated DBR requirements, the researcher aimed for continued collaboration with GDE ICT and e-learning practitioners and curriculum educators to solve identified problems relating to ICT evaluation.

As a complement, Chapter five explicates the collected data, its findings and analyses in order to address the two-pronged main question and six secondary questions of this study (declared in Chapter one, section 1.4.1). These explications lead to the research conclusions that are proclaimed in chapter six. Chapter five further advances the journey towards answering the two-pronged main question of this study, which is: *"To what extent do Gauteng Department of Education (GDE) managers and educators implement policy-based processes and procedures during ICT-evaluation and -selection in the FET-Phase; and what is the ideal, all-inclusive set of criteria for an evaluation instrument suitable for self-directed learning environments?*". In this chapter, the author of this document also aspires to answer the six secondary research questions of this study.

As pronounced earlier in this chapter, collected data, findings and analyses of each strand, both quantitative and qualitative will be analysed. Quantitative methodology employs numerical data to quantify social phenomena (Ong & Puteh, 2017:14) yet qualitative research is about systematic collection, organization, description and interpretation of textual, verbal or visual data (Hammarberg, *et al.*, 2016:499). First, in the next section, is the quantitative analysis of the survey.

5.2 QUANTITATIVE ANALYSIS: STRAND ONE

Strand one of the mixed multi-strand design research was comprised of survey results which were classified with the support of North-West University (NWU) Statistical Consultation Services. Conducting the survey was challenged due to the COVID-19 lockdown regulations. As formerly declared in Chapters one and four, due to lockdown restrictions, researchers were prohibited from physically accessing GDE schools (see Annexure H: GDE letter: No School Access). Consequently, the researcher did not visit the sampled GDE institutions physically and instead administered the survey online via the Google Forms application. The electronic survey questionnaire was transmitted to participants via e-mail and WhatsApp. The consent form was automated as part of the survey (Singer & Couper, 2017:125). When the required number of responses (n=50) was reached, the electronic survey was closed to avoid exceeding the required number of responses.

The twenty survey questions were classified into five sections, namely: (a) Demographic information); (b) Educator involvement in ICT-evaluation; (c) Evaluation procedures; (d) Qualities and viability of an evaluation instrument; e) The digital divide. The purpose of the survey was to establish the level at which educators are empowered, experienced, challenged and involved in the evaluation of ICTs and to obtain inputs towards development of criteria for an ICT-evaluation instrument. The next section lays down the group statistics based on the survey as advised by the NWU-Statistical Consultation Services.

5.2.1 Group Statistics

To test for reliability and validity of the survey questionnaire, participant responses were collated by the North-West University – Statistical Consultation Services using Cronbach's Alpha Reliability Statistics. Survey questions wherein the Likert scale was used were considered for that exercise. As illustrated in section 5.2.8, factor analysis was applied to abridge variables with a shared variance (Bork, Wijsen & Rhemtulla, 2018:586). In factor analyses, it is assumed that "measured variables are correlated because they are influenced by the same underlying latent construct or common factor" (Watkins, 2018:227). In accordance with factor analysis, questions 9, 13 and 14 of the survey were converted into three common factors. The three factors in this study are: Participation (Question 9), Procedures (Question 13) and Leadership (Question 14). These factors are explicated in detail later, in section 5.2.8.

Also in the factor analysis, regarding the gender group statistics, a p-value, which is used to indicate statistical significance (Mertens, Pugliese & Recker, 2017:152) was calculated. In the case of this study the p-values of the three factors exceeded 0.904. This p-value translates to a

95% Confidence Interval, a fair idea of the population parameter as a range of values (Hazra, 2017). This confidence interval implies that it is more than 95% incorrect to assume that there is a difference between responses made by male and female participants. Pertaining to this survey, it means that the responses made towards factor participation are not influenced by gender. In other words, the gender of the respondents did not influence their response values regarding participation, procedures and leadership pertaining the GDE ICT-evaluation processes and procedures.

Furthermore, the Effect sizes, which are widely used to estimate the magnitude of effect independent of the sample size (Aoki, 2020:2), were in this study used to measure performance difference among groups of respondents. The effect sizes were small (less than 0,5). A small Effect size means a small difference in performance between male and female respondents (0,2 means small, 0,5 means medium and 0,8 means large). Thus, in this study's survey, there is a small variance in performance between male and female respondents.

However, since the participants were required to specify their rank, correlation in that respect was measured. There is only one correlation indicating that school principals agree more than educators regarding effectiveness of procedures. The Correlation between variables implies that the more educators participate in management, the more likely will they agree with effectiveness of procedures. In the next passage, participant responses to sections of the survey questionnaire were being analysed. First, is the demographic information. As alluded to earlier, details of these factors are explained in section 5.2.8. The next section gives a representation of the demographic profile of the survey respondents.

5.2.2 Demographic Profile

As indicated earlier, the sample size for the purpose of this quantitative survey was n=50, and a full complement of 50 responses were received, courtesy of the Google Forms platform. Thus the electronic survey accomplished 100 percent response rate which highly exceeds the South African average of 25 to 38 percent (Claassen, 2015:52). Next is a discussion of the demographic information of the 50 respondents who answered survey questions pertaining to the study's variables of participation, procedures and leadership. Later in this quantitative analysis, section 5.2.8., there is analysis of possible relationships between the research variables of participation, procedures and leadership by means of factor analysis and correlation coefficients.

5.2.2.1 Gender and age distribution

Figure 5.1 (below) indicates participants' responses (n=50) to survey questions numbers 1 and 2 in which they were requested to indicate their respective gender and age. The statements were intended to establish the proportion of gender and age among the survey participants. On part one of the distribution regarding gender, the blue section indicates the proportion of males and the red section, females. However, part two illustrates age distribution among the participants irrespective of gender.

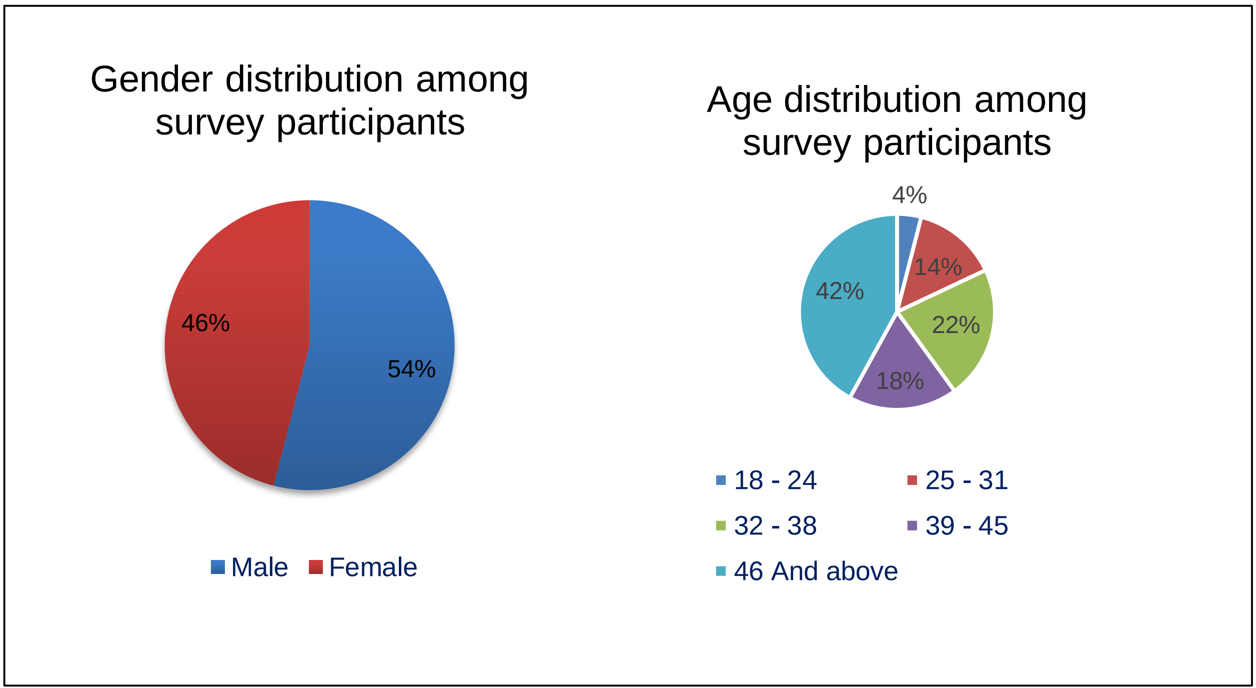


Figure 5-1: Gender and Age distribution of the survey respondents

Figure 5.1 depicts the gender and age distribution of the 50 respondents as 23 (46%) female and 27 (54%) male. Majority of the respondents, 22 (44%) are above the age of 46. These are educators who are nearest to retirement age. On the converse, educators below age 31 are few (n= 8, only 16%).

As discussed earlier in Chapter three, section 3.2.1.2.1, the older generation is likely to be confronted with the Digital Divide (DD) either through lack of motivation or technophobia which is characterised by resistance to ICT innovations. Since the DD has been asserted to cause unequal participation in society (Ziemba & Becker, 2019:6), if it persists amongst some educators, progress in terms of ICT processes and procedures could be hindered. What is worrisome is that the majority of participants' ages have progressed and are likely to be more confronted with the DD and not conversant with ICTs as much as the younger participants. As a consequence, educators whose ages have progressed are likely to resist participating in ICT-evaluation committees as part of the duties GMUIP (2010:24). As a further consequence, that could negatively influence the socially collaborative involvement, in ICT-evaluation of these invaluable knowledgeable techno-pedagogues (Sasirekha & Sasthya, 2017:249). Next is presentation of the distribution of respondents' highest qualifications.

5.2.2.2 Highest qualifications distribution

Figure 5.2 (below) indicates participants' responses (n=50) to survey question number 3 in which they were requested to indicate their highest qualification. The statement was intended to establish the highest and type of qualifications (Diploma, Bachelor's degree or Postgraduate) possessed by the participants, irrespective of gender and age.

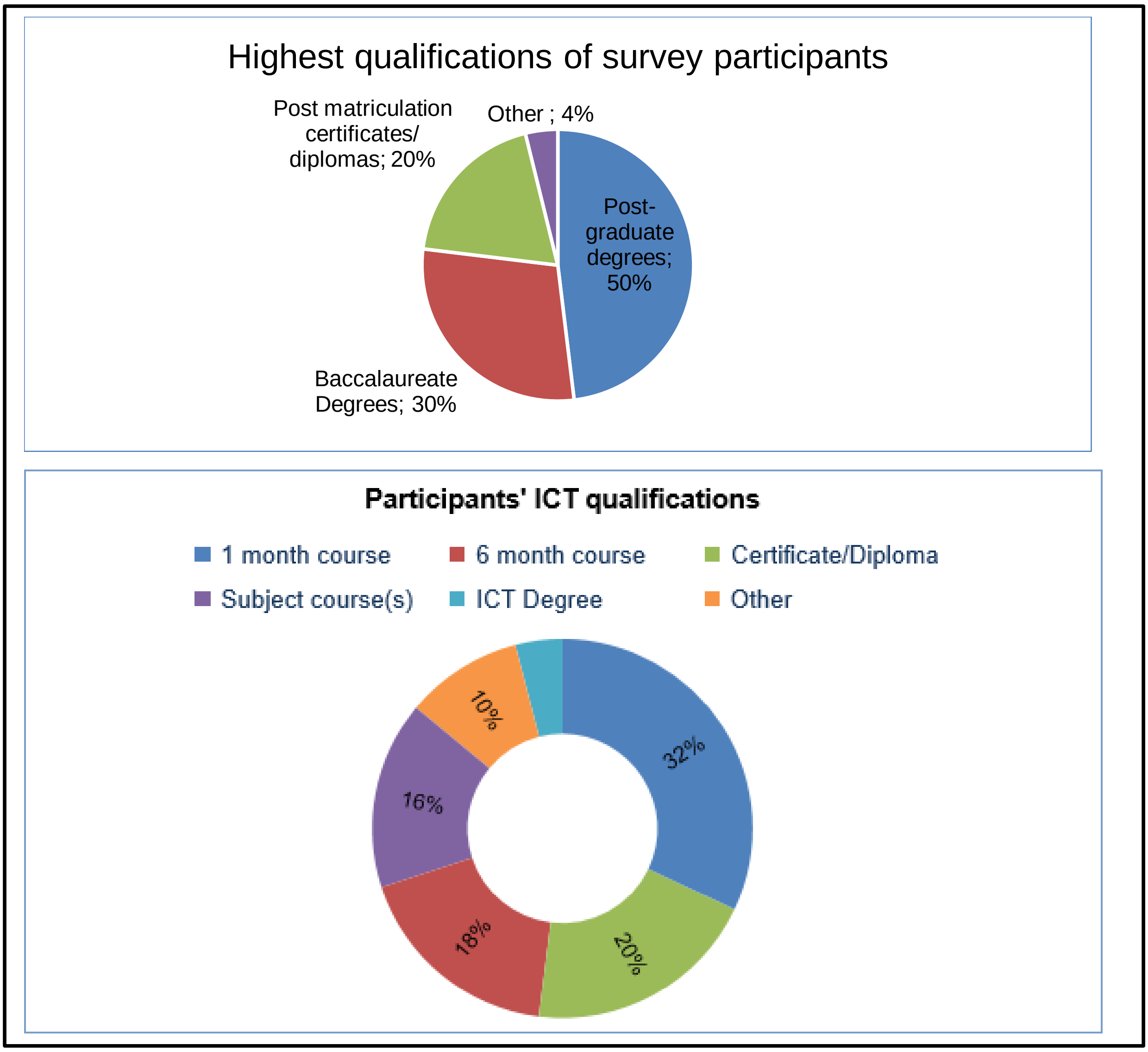


Figure 5-2: Highest qualification and ICT education and training level of survey respondents

From Figure 5.2, it is impressive to learn that most participants (50%) have obtained a post-graduate degree(s), followed by Bachelor's degrees (30%), and the lowest number (20%) is in possession of post-matric certificates or diplomas. Furthermore, regarding ICT qualifications, although only 4% have a full ICT degree, majority of the respondents (32%) have completed some ICT subjects as part of a degree or diploma. The next group (20%) possesses an ICT diploma or certificate and 16% have completed ICT subject(s) within a degree. The rest, 10%, have other unspecified ICT qualifications. It is encouraging to learn that the general trend is to become qualified in ICT. It is expected that ICT qualified educators are more likely to accept and apply SDL approach in the learning environment and utilize ICTs to deliver their respective curricula. The next sub-section gives a portrayal of the respondents' rank and teaching experiences.

5.2.2.3 Rank and teaching experience distribution

Figure 5.3 (below) indicates participants' responses (n=50) to survey question numbers 4 and 7 to respectively indicate their current designation or rank (subject educator, subject head, deputy principal, principal or principal) as well as their experience of teaching in an ICT environment. The statement was to establish what positions they occupied, whether they have experience of teaching in an ICT environment and for how long. On part one of Figure 5.3, the vertical axis indicates rank, and the horizontal axis reflects the number of participants in the particular rank. The second part of Figure 5.3 reflects the experience in years of teaching in an ICT environment.

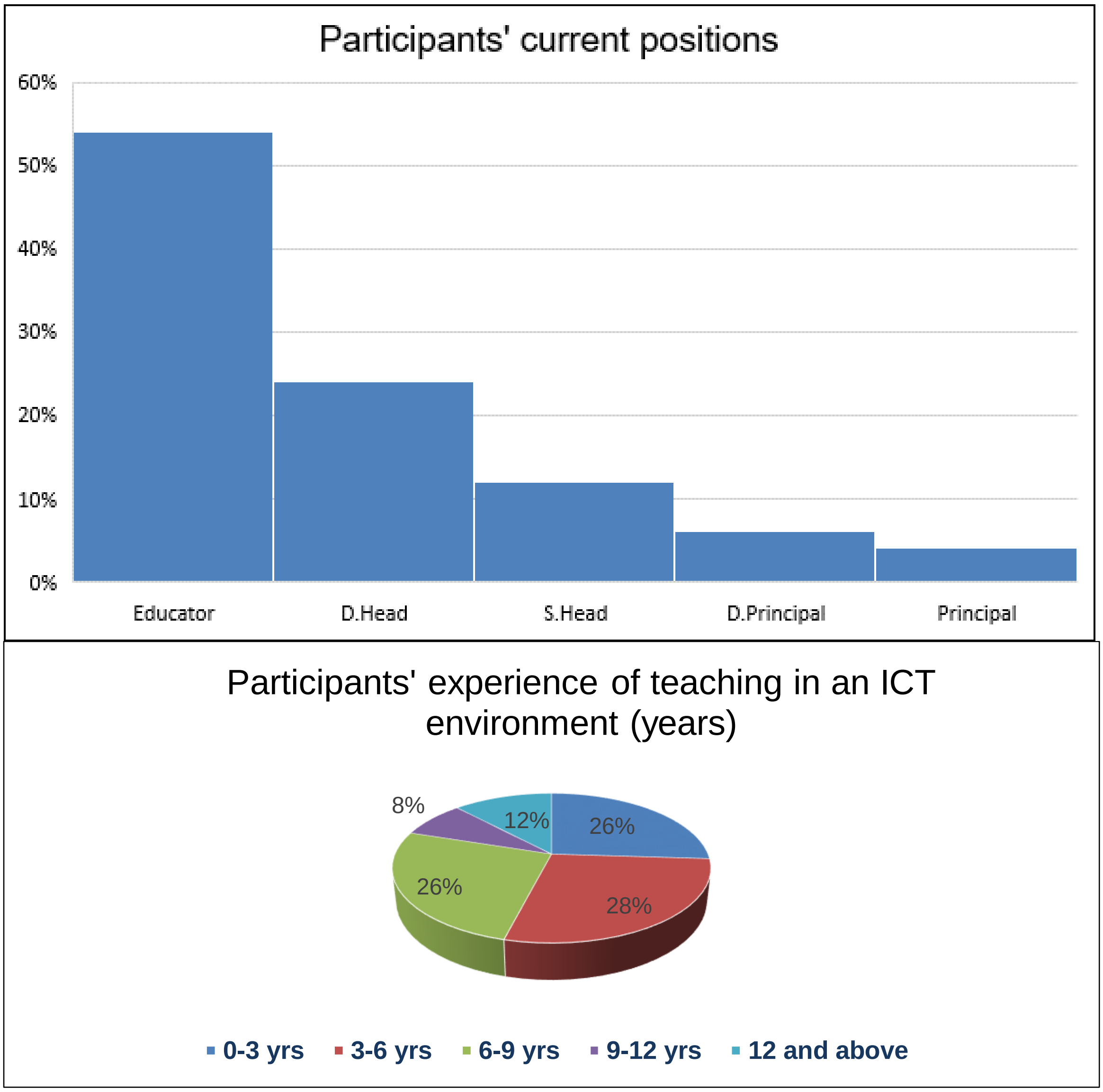


Figure 5-3: Positions held by survey participants and experience of teaching in an ICT environment

As gathered from Figure 5.3 (above), majority of the respondents are educators, 27 (54%) are subject educators, followed by departmental heads (24%), subject heads (12%), deputy principals (6%) and principals (4%). As stated earlier in section 5.2.1, in the analysis of correlations regarding effectiveness of procedures, principals agreed more than educators regarding effectiveness of procedures. The Correlation between variables implies that the more participants have management as their primary function, the more likely will they agree with effectiveness of procedures.

The overall majority of the participants have more than six years teaching experience. As part of a homogeneous purposive sample wherein participants share similar socio-economic characteristics (Serra, Psarra & O'Brien, 2018:13), all the respondents have experience of working in the ICT environment, majority for a period of three to nine years. As a consequence, it is expected that introducing ICT-evaluation as a skill and utilizing an electronic ICT-evaluation instrument will be implemented without resistance to these techno-pedagogues who are already in the ICT environment. Upon finishing discussion of demographic information and its distributions, the next section details what has, in section 5.2.1, been identified as one of the variables of this study, i.e. participation. The section is an exposition of the participant's impression of the extent to which educators are currently involved in ICT-evaluation. It also exposes participant's opinions of the ideal situation regarding involvement of educators in the process of ICT-evaluation.

5.2.3 Educator Participation in ICT Evaluation

Participation fairly answers the two-pronged main research question of this study. It further goes on to specifically answer the fourth research sub-question: 4 *"To what extent do GDE managers involve educators in the process of ICT-evaluation and -selection in the FET-Phase curriculum?"*

The survey questions enquired about the participant's ICT-evaluation awareness, (who informed them, what media are used for communication media), their level of participation, training and development and their opinion on its significance. An analysis of the participants' responses regarding each of the survey questions is made below.

Figure 5.4 (below) indicates participants' responses to survey question number 8: "Below*, please indicate how familiar you are with evaluation of LTSM including ICTs".* The statement was to establish whether the participants gained awareness of ICT evaluation via circulars, by word of mouth from colleagues, from line managers, hearing about that for the first time and/or whether they were told by private companies.

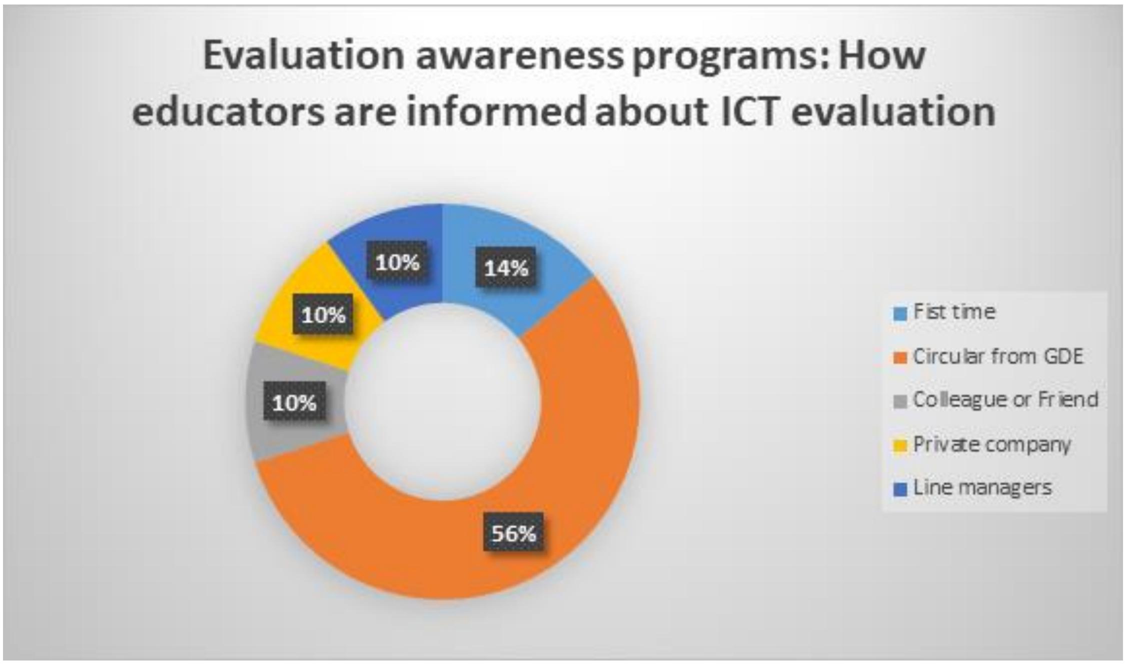


Figure 5-4: Participants' responses regarding dissemination of ICT evaluation information

Per Figure 5.4, majority of the respondents, 86% claim that they know about the ICT-evaluation process. Only 14 % state that it this is their first time to hear about it. However, knowing about and being physically involved in the process are two different aspects. Thus, the study also seeks to find whether the educators are being involved in the ICT-evaluation process. Knowing about the process could make it easier to challenge the educators to start getting more involved or even taking over as leaders of evaluation. When asked how information regarding the process was disseminated to them, they gave various responses. The majority (56%) say they were informed by means of GDE circulars, 10% learnt from colleagues or friends, 10% were told by their line managers and a further 10% learnt via external bodies (private organizations or companies).

Figure 5.5 (below) indicates participants' responses to survey question number 9 to establish whether school management provides them with ICT samples to evaluate. The aim with the statement was to establish whether educators are given any ICT samples in order to partake in ICT evaluation or whether they are marginalized.

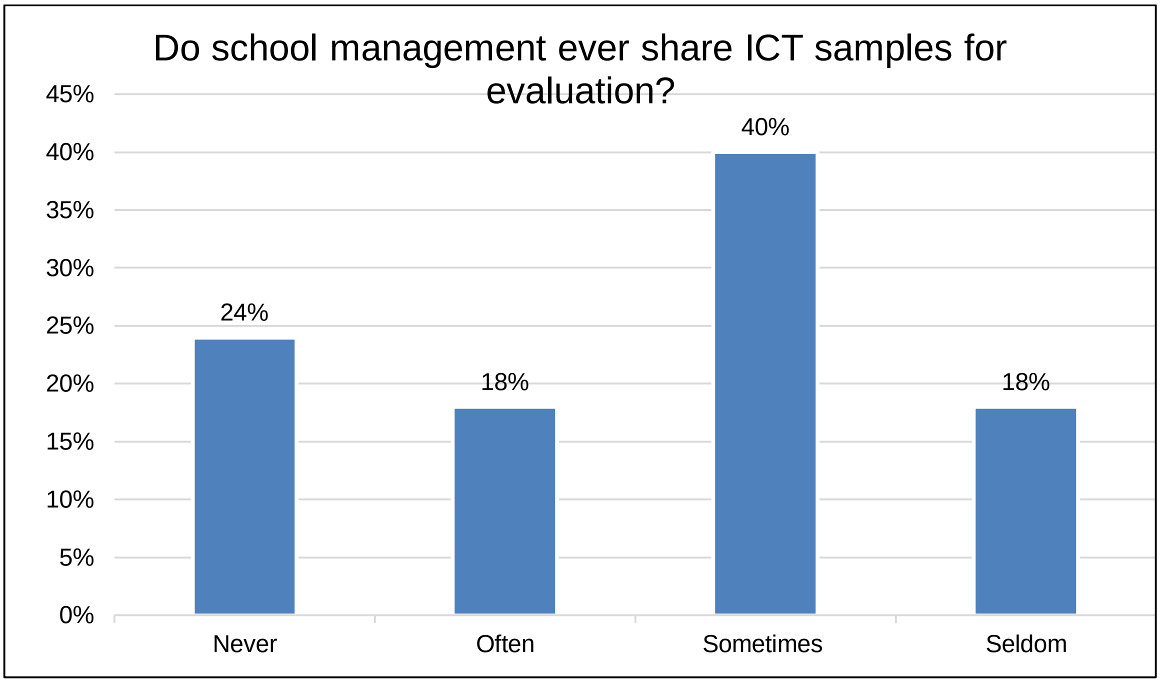


Figure 5-5: Participants' responses on issuing of ICT samples and invitation of educators to partake

Figure 5.5 demonstrates that 46% of the respondents claim to have often participated in ICT-evaluation, 22% sometimes, 18% seldom and 14% never before. When asked how regularly school management gives them samples of ICT to evaluate, there is partial agreement. The general impression is that this activity scarcely happens as 40% think it happens sometimes, smaller portions think it seldom or never happens. However, a small minority (18%) say it often happens. To test managers' activeness in inviting educators to partake in ICT-evaluation, the respondents were asked how often it does happen. The advantage of the educator's involvement is that since they are the ones charged with curriculum delivery, they are likely to positively implement ICT media in their learning environment. If not involved, procured ICTs might remain fallow or marginally utilized which would consequently impact on the delivery of curriculum and SDL objectives to the learners' benefit. There was partial agreement, less than half claimed that it happens often whereas the rest think it seldom, never or sometimes happens.

Figure 5.6 (below) indicates participants' responses to survey question number 9 in which they were asked how often ICT evaluations are done by only a selected few educators. The aim was to establish whether participants thought that GDE managers socially collaborate with educators during LTSM and ICT evaluation.

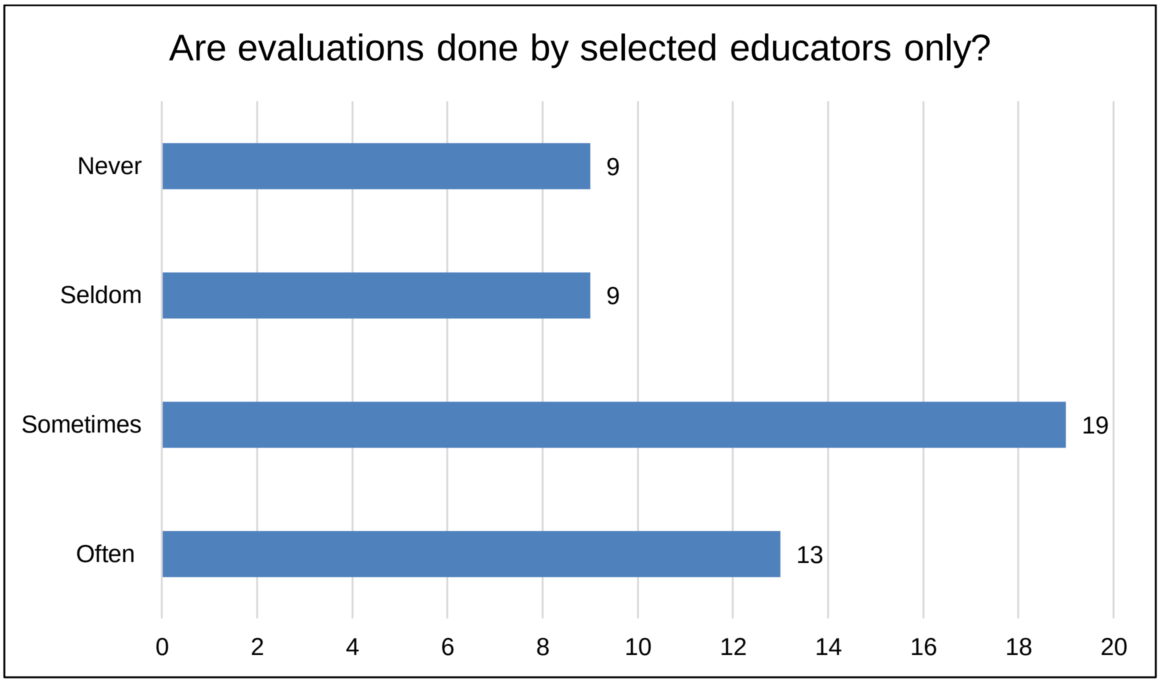
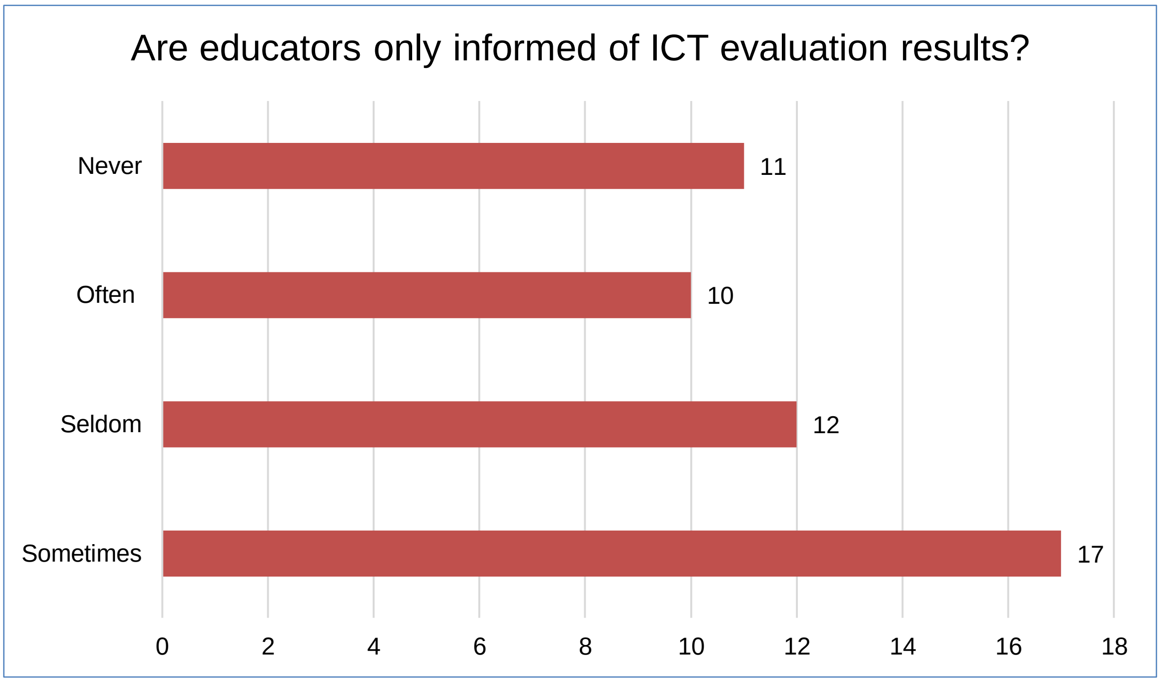


Figure 5-6: Participants' responses on who performs ICT evaluations

Figure 5.6 illustrates that the majority (41 of the 50 respondents) voiced the opinion that ICT-evaluations are performed only by a selected few educators, whereas a sizeable number of educators are excluded from the process. Majority of the respondents think that ICT-evaluations are mostly performed by senior staff members. As stated earlier in Chapter 4, section 4.3.1.6, meaningful evaluations are not possible where there is disregard for social collaboration in task performance (Svilla (2014:36) with the educator – the ideal knowledgeable techno-pedagogue (Sasirekha & Sasthya, 2017:249). Once appropriately managed, this would be a pedagogical partnership, which is crucial in the twenty-first century to yield outcomes that are "both personally meaningful and socially worthwhile" (Garrison, 1997; McCreadie, 2020:155; Toh & Kirschner, 2020:6). Social collaboration in ICT-evaluation would liberate the educator in SDL and even match the interpretivist philosophical conviction that reality is socially constructed (Thanh & Thanh, 2015:25).

Figure 5.7 (below) indicates participants' responses to survey question number 9 in which they were asked how often and whether they thought educators are only informed of evaluation results when all is done. The reason for the question was to establish whether participants thought educators that GDE managers socially collaborate with educators during all steps of LTSM and ICT evaluation or they are only informed about the results.



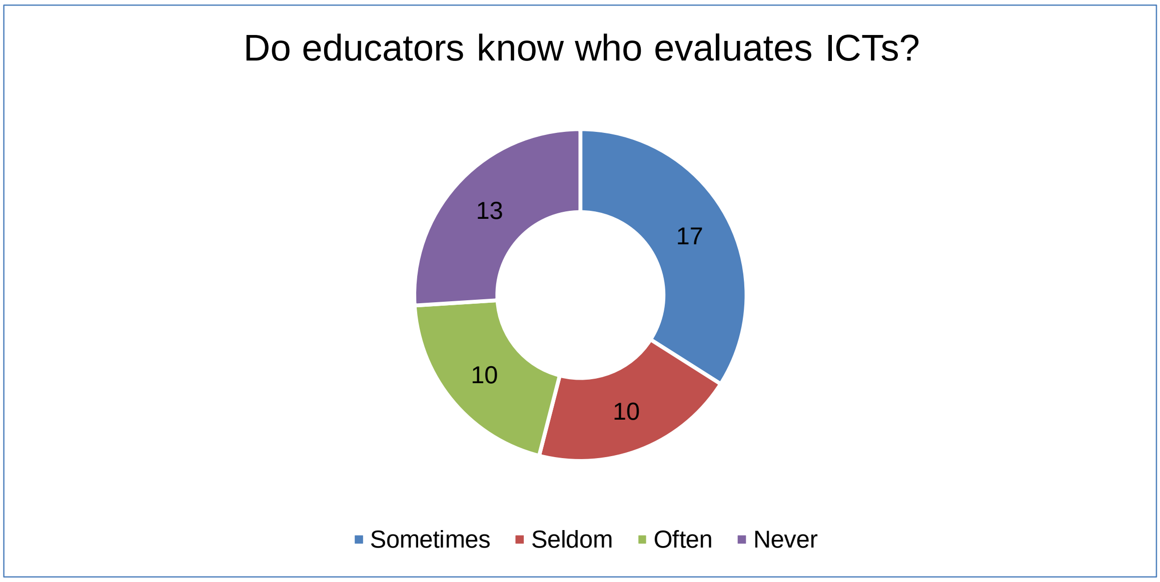


Figure 5-7: Participants' responses regarding dissemination of ICT evaluation results and evaluators of ICTs

Figure 5.7 projects that the majority of educators claim that they are either seldom, sometimes or often not informed about results of the ICT evaluation. It implies that they are never exposed to or provided with catalogues or lists of approved ICTs. Consequently, not providing educators with results and catalogues could cause resistance to optimal utilisation of selected ICTs. Educators might also have no knowledge of which ICTs have been approved and are available within their schooling system. Lack of access could therefore prevail and exacerbate the DD. Majority of the participants stated that they do not know who evaluates ICTs. This is a disturbing finding as marginalizing educators could negatively impact on the willingness to express their creativity and innovativeness which are key for social collaboration towards a common goal (Tan & Liu, 2017:245). Educators need to be made part of ICT-evaluation so as to adopt and implement approved ICTs on catalogues. It is the competence of education managers to direct educators' involvement by means of directives and come up with measures to counter potential lack of intrinsic motivation (Azeez, Fapohunda & Jayeoba 2019:20), increase technology acceptance, technological self-efficacy and attitude toward technology-based SDL (Pan, 2020). After all, educators are expected to deliver their respective curricula using approved curricular and also promote and enhance SDL environments. Educator participation in evaluation would imply emancipation to execute their relevant teaching and learning obligations (Vahedi *et al.*, 2019:4).

Figure 5.8 (below) indicates participants' responses to survey question number 10 in which they were asked to indicate their experience of evaluating LTSM, including ICTs. The reason for the question was to establish whether participants had been involved in LTSM and ICT evaluation.

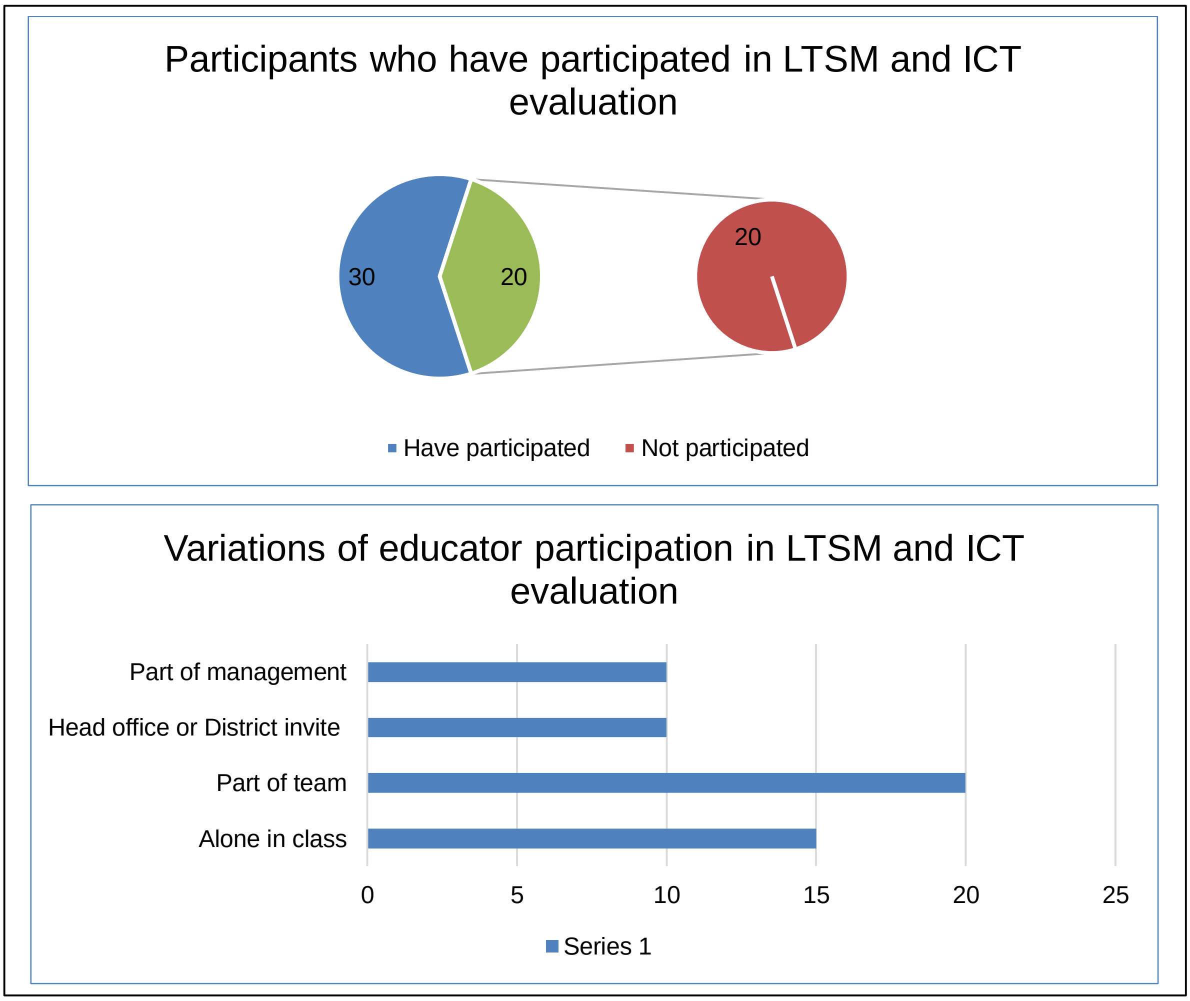


Figure 5-8: Educators' experience of LTSM and ICT evaluation

As gathered from Figure 5.8, 60% of the respondents have in the past participated in ICT and LTSM evaluation. There are however some variations, as some for instance have done it alone in class or as a management duty, whereas others have done it both in class and as part of the district team. The variations are from the 60% of the respondents who claim to have participated in ICT evaluations. Of those, 30% have done it alone in class, 40% as part of an evaluation team, 10% were invited by District or head office to participate and 15% perform it as part of management duty. The GDE might have to view this low participation as an indicator of a need for intervention programs. The need for educators' participation in ICT committees and processes was highlighted in the GDE policies (GMUIP, 2010; PDFDL, 2017).

Figure 5.9 (below) indicates participants' responses to survey question number 11 in which they were asked to indicate their LTSM and ICT evaluation training levels. The aim of the statement was to establish whether participants had been trained to evaluate LTSM and ICTs.

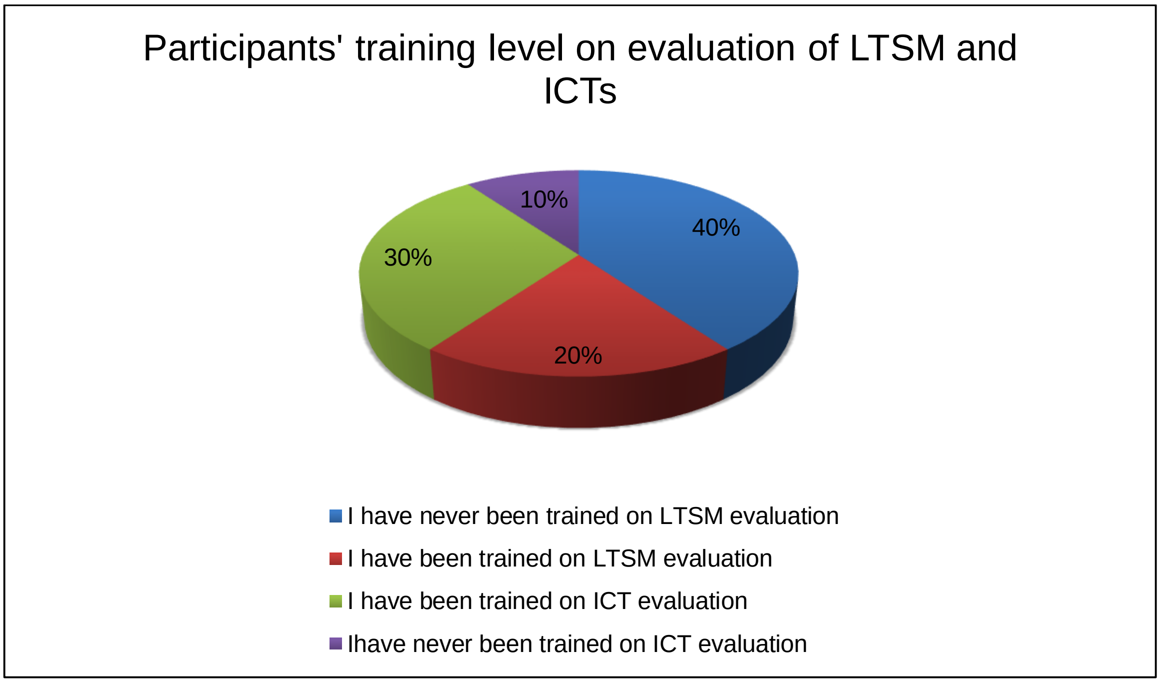


Figure 5-9: Educators' training level on LTSM and ICT evaluation

Figure 5.9 reflects that a majority (40%) have not been trained on LTSM evaluation at all, 18% were trained, yet 30% have been trained on ICT-evaluation which is far less than sufficient. Lastly, 10% of the respondents have never been trained on evaluation of ICTs. If not trained on ICT-evaluation educators might not be able to utilize the instrument to assess the individual learner's level of development or progression and ICT-skills ladder. Successful training requires a certain level of ICT skills, intrinsic motivation and decreased technophobia (Van Deursen & Van Dijk (2010:4). As stated in section 3.2.2.4, Chapter three, due to lack of training and ICT knowledge and skills (Steyaert, as cited by Lavrynenko, *et al*., 2018:5; Van Deursen &

Mossberger, 2018:127), some teachers are not comfortable utilising modern ICTs and, as a consequence, could be marginalised, and that would make the DD effect worse and hinder ICT-utilization in the learning environment (Mubarak & Nycyk, 2017). The consequence could be a negative effect towards curriculum delivery.

Figure 5.10 (below) indicates participants' responses to survey question number 12 in which they were asked to indicate the level at which they thought ICTs were significant. The aim of the statement was to establish whether educators regarded ICT evaluation as a significant aspect of their work.

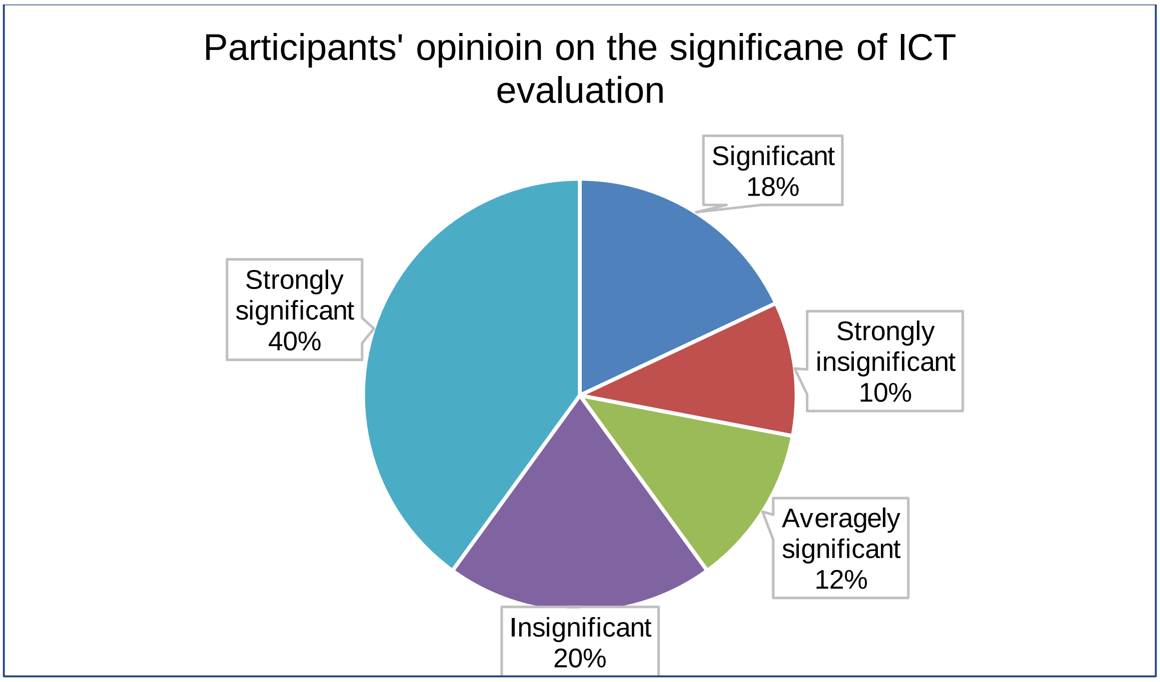


Figure 5-10: Participants' perceptions about the significance of ICT evaluation

As illustrated in Figure 5.10, when asked about the significance of ICT-evaluation, a large majority (40%) believed that it strongly significant, 18% thought it is significant and 12% averagely significant. ICT-evaluation is favoured by most; a whopping 70%. As per the factors tabled earlier in section 5.2.1, the other two variables of this study are *procedure* and *leadership*. Thus, in the next section, participants' responses regarding evaluation procedures and leadership are being analysed.

5.2.4 Evaluation Procedures and Leadership

Procedure is covered in this section. It significantly covers the main research question. In terms of the sub-questions, the first and sixth were more specifically answered: ❶ *"What evaluation procedures or instruments do managers and educators use to support selection of appropriate*

ICTs and what are the main challenges within the process globally and in South Africa?" and ❻ *"How can an* ideal, all-inclusive *ICT-evaluation instrument be integrated and utilized for the enhancement of self-directed learning in the FET-Phase curriculum?"* In order to answer these questions, the survey investigated issues regarding (a) ICT-evaluation criteria dissemination; (b) evaluation period/time in a year; (c) whether a wide spectrum of ICT brands is evaluated; (d) educators' say in ICT-evaluation; (e) formal reporting on evaluation results; and (f) composition and leadership of evaluation teams. The participants' responses are analysed below.

Figure 5.11 (below) indicates participants' responses to survey question number 13 in which they were asked to state their opinions as to whether educators are provided with ICT evaluation criteria and whether they thought evaluations should be done anytime or at a particular time of the year. The aim of the statement was to establish whether educators are given criteria to evaluate ICTs (reflected in the first graph) and whether they deem it to be a process to be done at a particular time in the year (second graph).

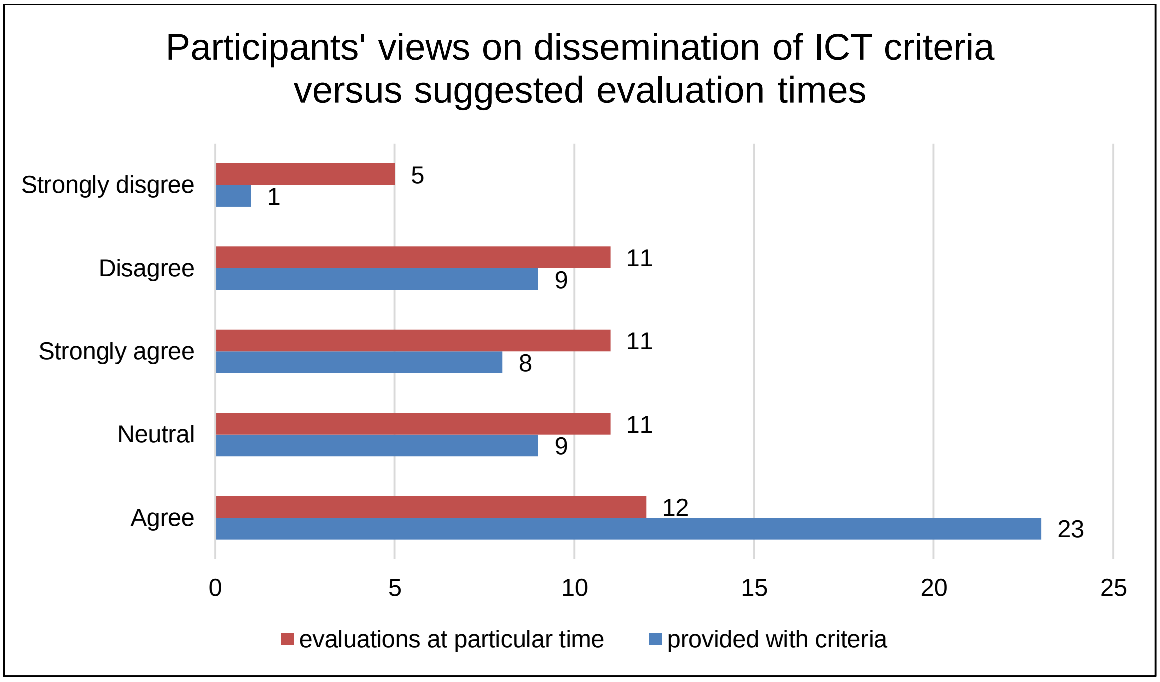


Figure 5-11: Participants' opinions on dissemination of ICT criteria to educators and evaluation period per year

As depicted in Figure 5.11, most respondents think that educators are generally not provided with ICT-evaluation criteria at any given time (whether prior, during or after evaluations). This finding is in line with the identified gap mentioned in Chapter one, section 1.3 that there was no evidence of a set of formal ICT-evaluation criteria stated anywhere in the GDE that the author of this document has accessed. The researcher is of opinion that if educators are provided with evaluation criteria, they would implement their curriculum delivery and SDL objectives with more confidence. Given ICT evaluation criteria, knowing SDL objectives and being included as part of evaluation teams, educators would be more equipped to plan both BL and SDL activities upfront. First, educators would know which ICT media to select, based on criteria and MIs, and thus implement the selected ICTs in line with SDL and activities in the learning environment. This tallies with the earlier assertion that they are generally not made part of evaluation teams. They are probably not sufficiently trained and work-shopped on such matters. Since evaluation criteria are too broad, if they are provided with such, educators would be instrumental in assisting with splitting criteria into MIs.

As formerly explicated in section 3.3.2, Chapter three, based on Evaluation Indicator Model (Rodríguez *et al.*, 2009:2), depending on their nature, developed MIs could be categorised as either input or process indicators and would assist ICT evaluators to implement intervention processes. Most importantly, once they are part of the crafting of the evaluation criteria, educators would liberally support their own learners in selecting ICT resources. The researcher is of opinion that such support is vital because learners still largely depend on educators for ICT resource selection (Khaloufi & Laabidi, 2017:57) to use in SDL and BL environments. In particular, learners need to select ICTs for home-learning in order to cope in compelling conditions e.g. due to the COVID-19 lockdown restrictions. In brief, the aforementioned implies that evaluation criteria would be directed towards specific tasks of execution (Kalanthroff *et al.*, 2017:603). Furthermore, majority of the respondents think that there is a particular time in a year when evaluations are performed.

Figure 5.12 (below) indicates participants' responses to survey question number 13 in which they were asked whether they thought educators were always given a broad spectrum of ICT brands to evaluate for possible selection. The reason for the question was to establish whether the participants thought they are given a fair number of suppliers' ICTs for possible selection.

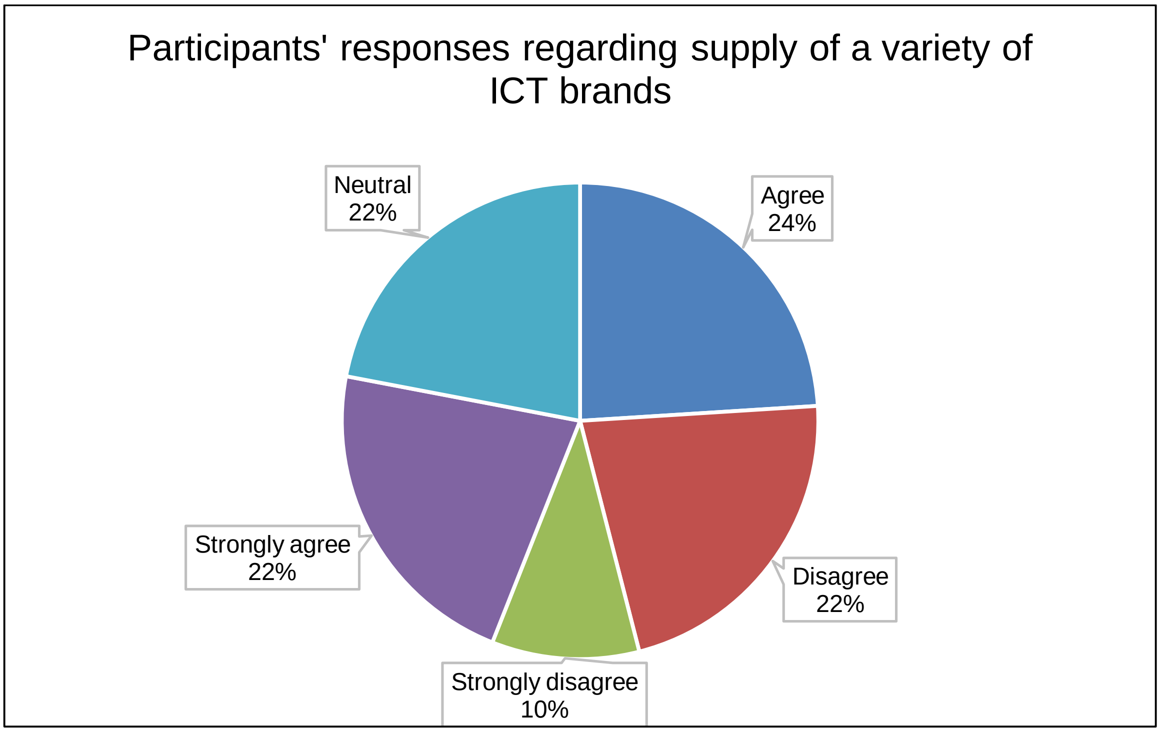


Figure 5-12: Dissemination of a variety of ICT brands for evaluation

From Figure 5.12 it is evident that only 24% of respondents think that a wide spectrum of ICT brands is evaluated within the GDE. Per majority of responses, it seems there is limited dispensing of various ICT brands to educators for them to offer opinion on what ought to be selected for schools. The broader the spectrum, the better the chances of objective evaluations. Objective evaluations using a valid instrument are necessary to ensure that selected ICTs meet the curriculum and pedagogical needs of the learner and educator (Andyani *et al*., 2020:129) which is the ultimate goal of all education departments. Based on the aforementioned, one may conclude that the broader the ICT sample spectrum, the greater the objectivity when selecting ICTs. The researcher is of opinion that objectively selected ICTs will support educators in their endeavour to meet SDL and curriculum goals of, amongst other things, producing the aspired for competitive, skilled and knowledgeable twenty-first century learner (UNESCO, 2015:18).

Figure 5.13 (below) indicates participants' responses to survey question number 13 in which they were asked whether they thought educators had a say in ICT evaluation at school level and whether they are provided with formal reports on ICT evaluation. The aim of the statement was to establish whether the participants thought educators do have a say and are given reports on ICT evaluation results.

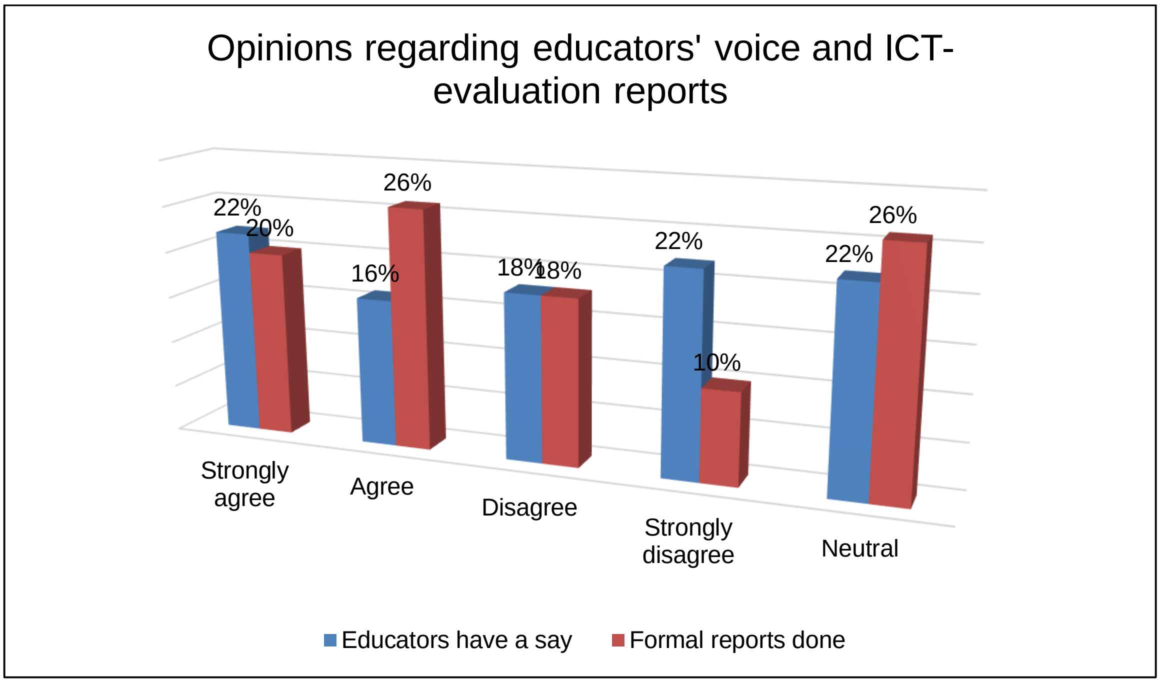


Figure 5-13: Participants' opinions on whether educators have a say on evaluation and existence of formal reporting regarding ICT evaluation

As gathered from Figure 5.13, only 38% of respondents believe that educators at least have a say in the evaluation of ICTs at school level. Less than half agree that formal reports or evaluation results on selected ICTs are rendered and probably shared amongst evaluation team members. Majority feels that periodic evaluation of ICTs be done to avoid keeping outdated ICTs. Furthermore, they believe that educators' involvement is key.

Figure 5.14 (below) indicates participants' responses to survey question number 14 whether they thought educator involvement and leadership in ICT evaluation was important. The aim of the statement was to establish whether the participants thought it was important for educators to lead and form part of ICT evaluation teams.

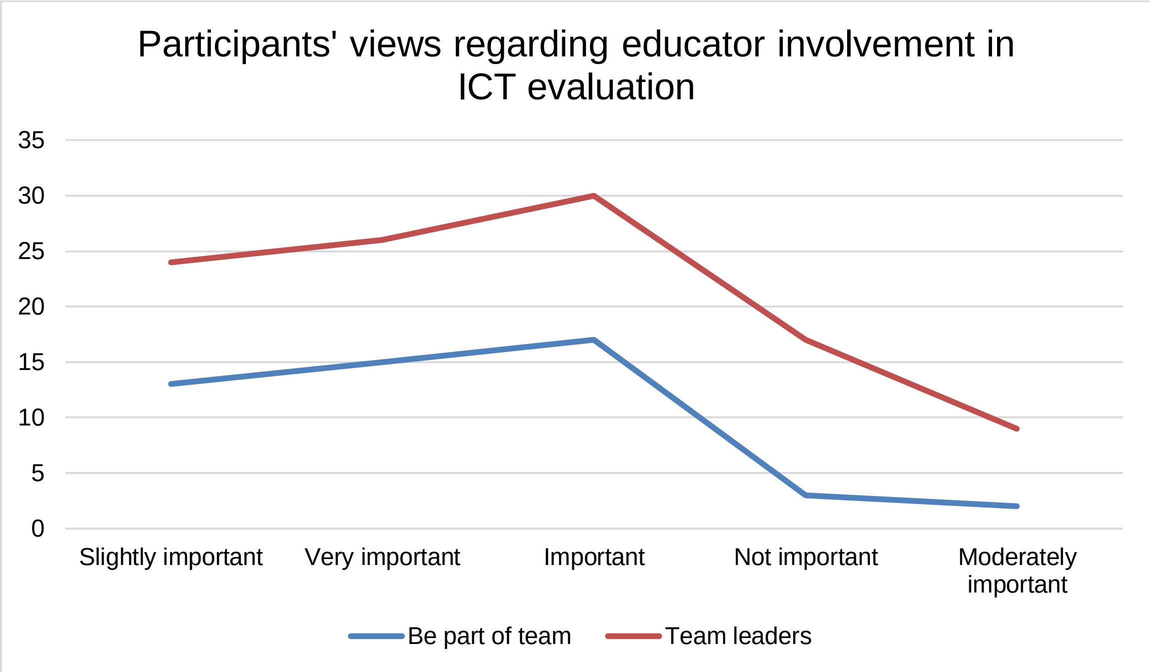


Figure 5-14: Participants' views regarding involvement, participation and leadership in ICT-evaluation

Per Figure 5.14, the majority of respondents perceive involvement and participation of educators in ICT-evaluation to be important. Beyond that, most feel that educators should take leadership and decision-making in the process of ICT-evaluation. It seems that ICT-evaluation is perceived as an activity of value to the respondents. Although aiming to liberate the learner, the educator seeks to be emancipated to not to abdicate his/her pedagogical responsibilities (Lemmetty & Collin, 2016:59) and fully manage ICT-evaluation and -selection to perform such responsibilities. The educator should be emancipated to participate in ICT-evaluation in order to select ICTs that will support the educator curriculum delivery and taking the learner step-by-step towards self-direction (Grow, as cited by Tredoux, 2012:37)

Figure 5.15 (below) indicates participants' responses to survey question number 14 in which they were asked whether they thought educators should be passive or active regarding ICT evaluations. The aim of the statement was to establish whether the participants thought educators should be passive and wait for recommendations by managers or active role players in ICT evaluation.

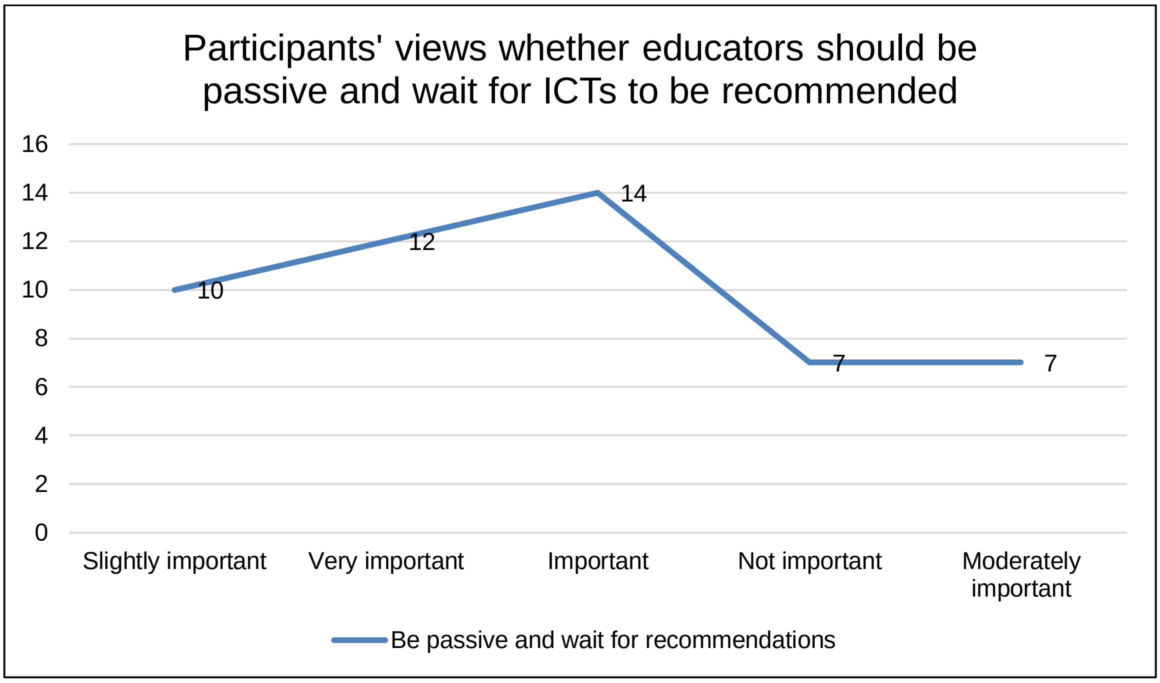


Figure 5-15: Participants' perceptions on the role of educators in recommending ICTs for selection by the GDE

As portrayed in Figure 15.5, the popular idea is for the educators to be part of decision-making regarding ICT-evaluation and -selection instead of being passive and waiting for announcement of recommendations made on their behalf. Based on this finding, educators have made it clear that they do not appreciate mere information sharing – mere exchange of different information types – but would love social collaboration which requires a commitment of time, resources as well as joint high-level decision-making as SDL partners (Wu & Chiu, 2018:6) who are involved in ICT-evaluation. Besides for objectivity, educators would like to evaluate ICT systems using valid instruments to serve as a theoretical basis for future evaluations and research (Akhmetshin, 2020:9). These evaluation results could be used as a basis for future decisions on the calibre of ICTs to consider for utilization in the learning environment-based decisions within the GDE. Such social collaboration would be made possible by emancipation to execute their relevant teaching and learning obligations (Vahedi *et al.*, 2019:4) including directing a learner towards self-directedness. If not self-directed themselves, educators will not be able to practise SDL in their learning environments. An educator needs to serve his role as coach, motivator, facilitator and consultant to lead the learner from being dependent, to interested, involved, and then fully self-directed (Du Toit-Brits, 2015; Tredoux, 2012:37). Robust ICT evaluations will also assist educators in decision-making and in questioning their goals and practices (Mariño & Zaror, 2020) during curriculum and SDL delivery. The next section analyses the responses received when the survey participants were asked about qualities and viability of an evaluation instrument.

5.2.5 Qualities and viability of an ICT-evaluation instrument

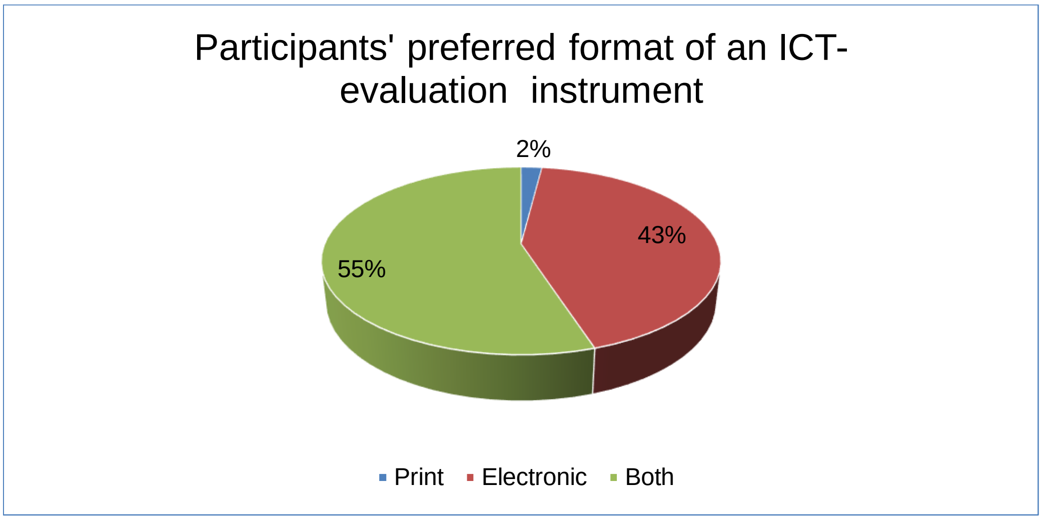
Requesting responses from participants regarding qualities and viability of an ICT-evaluation instrument was an attempt to answer the following research sub-questions:

❷ *What should the ideal evaluation instrument look like according to literature and educators so as to support implementation of ICTs in the FET-Phase learning environments?*

❸ *To what extent do GDE managers and educators perceive an ICT-evaluation instrument as being a viable tool for evaluation in the FET-Phase curriculum?*

❺ *What suggestions made by subject teachers and GDE curriculum specialists can be infused with the ICT-evaluation instrument suitable for self-directed learning environments in the FET-Phase?*

Figure 5.16 (below) indicates participants' responses to survey question numbers 15 and 18 in which respondents were requested to state their preferred format of an ICT-evaluation instrument (whether electronic or print) and to stipulate the necessity for it. The aim of the statement was to establish the type of instrument participants thought was convenient and user friendly and whether it was necessary to have an ICT-evaluation instrument at all.



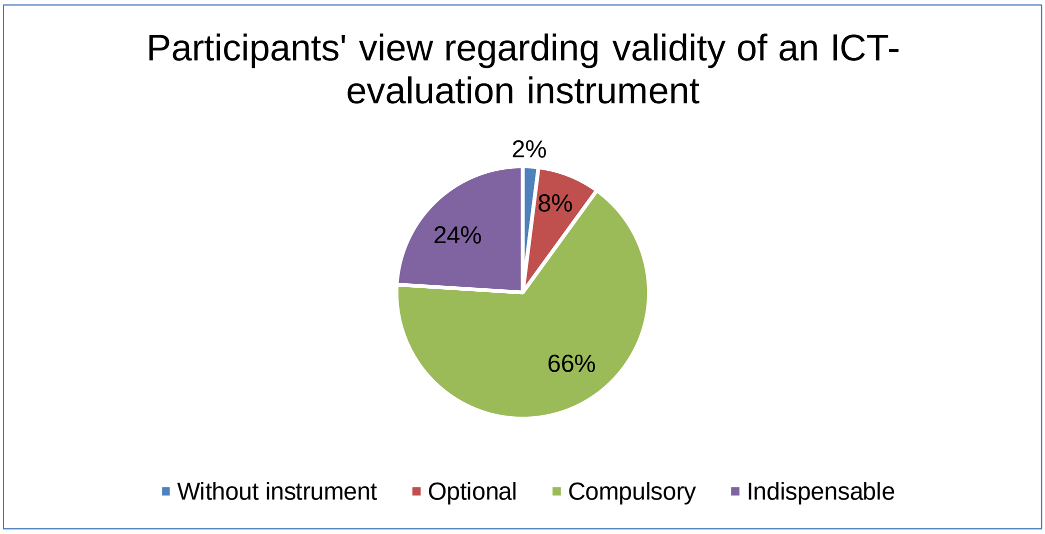


Figure 5-16: Participant responses towards the necessity of an ICT-evaluation instrument

Per Figure 5.16, the majority of the respondents (55%) are in favour of an electronic ICT-evaluation instrument as opposed to print form. In order to accommodate those who might still struggle with ICTs (due to the DD or lack of equipment), some feel that the ICT-evaluation instrument should be both printed and electronic. Majority (52%) feel that for ICTs to be selected there should be attainment of a score of 75-90 percent whereas 22% feel it should be 90-100 percent. For the purpose of regular evaluation of new ICTs, the majority of the respondents feel that ICT-evaluations should never be performed once per year only, but more often. Of those, most still hold the view that it should be performed every quarter or whenever necessary. An overwhelming majority are of the opinion that it is necessary and indispensable to have an evaluation instrument when evaluating ICTs. This finding is congruent with the GDE's aim for objective evaluations using a valid instrument to optimally ensure that selected ICTs meet the curriculum- and pedagogical needs of the learner and educator (SAQMEQII; PDFDL, 2017;

Andyani *et al*., 2020:129). In other words, a valid ICT instrument is of the essence to ensure that ICTs that enter the school system are carefully selected so as to facilitate adequate and appropriate curricular and SDL experiences. This is the ultimate goal of all education departments. The GDE has committed to a stance of competing within the global space via provision of world-class ICTs for its schools (SAQMEQII; PDFDL, 2017). ICT selection needs to be preceded by evaluation to ensure that only ICTs that meet the curriculum and pedagogical demands are selected to support the educator in curriculum delivery. An ICT-evaluation instrument equipped with MIs derived from evaluation criteria originated from various literature as well as evaluation and curriculum models will reduce error in selecting ICTs for the classroom.

Figure 5.17 (below) indicates participants' responses when they were asked on survey question number 19 to state a teaching strategy or strategies they thought was ideal for ICTs to provide for. The aim of the statement was to establish whether participants thought ICTs should provide for face-to-face, SDL, BL or a combination of all or a combination of some.

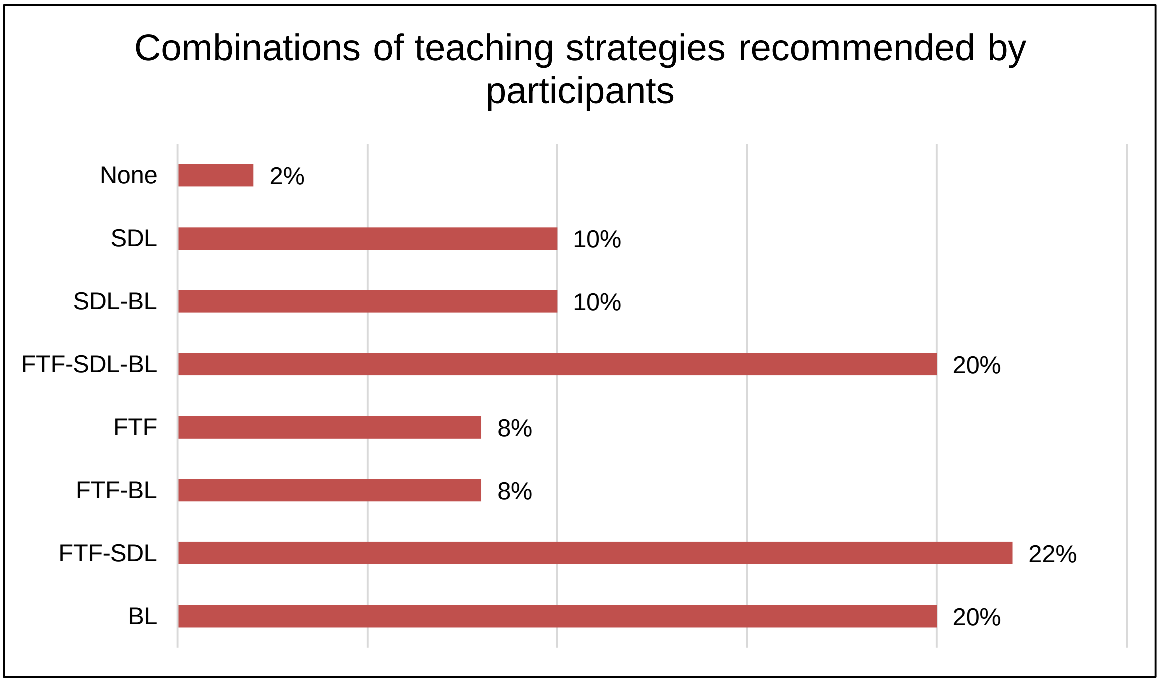


Figure 5-17: Some teaching strategies that an ICT-evaluation instrument should comply with

Per Figure 5.17, the respondents argued that an ICT-evaluation instrument should make it feasible for selection of ICTs that are compatible with some important teaching strategies. The most popular combination of teaching strategies is face-to-face (FTF) coupled with SDL (22%) as well as FTF coupled with SDL and BL (20%). When used alone, the most popular teaching strategy was BL (20%) followed by SDL (10%) and then FTF (8%). In order to cater for educators' various pedagogical needs, an ICT-evaluation instrument should be one that caters for selection of ICTs that allow for a multiplicity of teaching strategies. A multiplicity of teaching strategies liberates the educator to be as innovative as possible when planning activities to deliver the curriculum. To determine the adversity of the DD, respondents were requested to display their assessment of the situation at their schools. A summary of their responses is portrayed in the next section.

5.2.6 The Digital divide

Figure 5.18 (below) indicates participants' responses to survey question number 20 in which they were requested to indicate the adversity of the DD at their institutions. The aim of the statement was to establish whether the participants thought the DD is adverse in the GDE institutions.

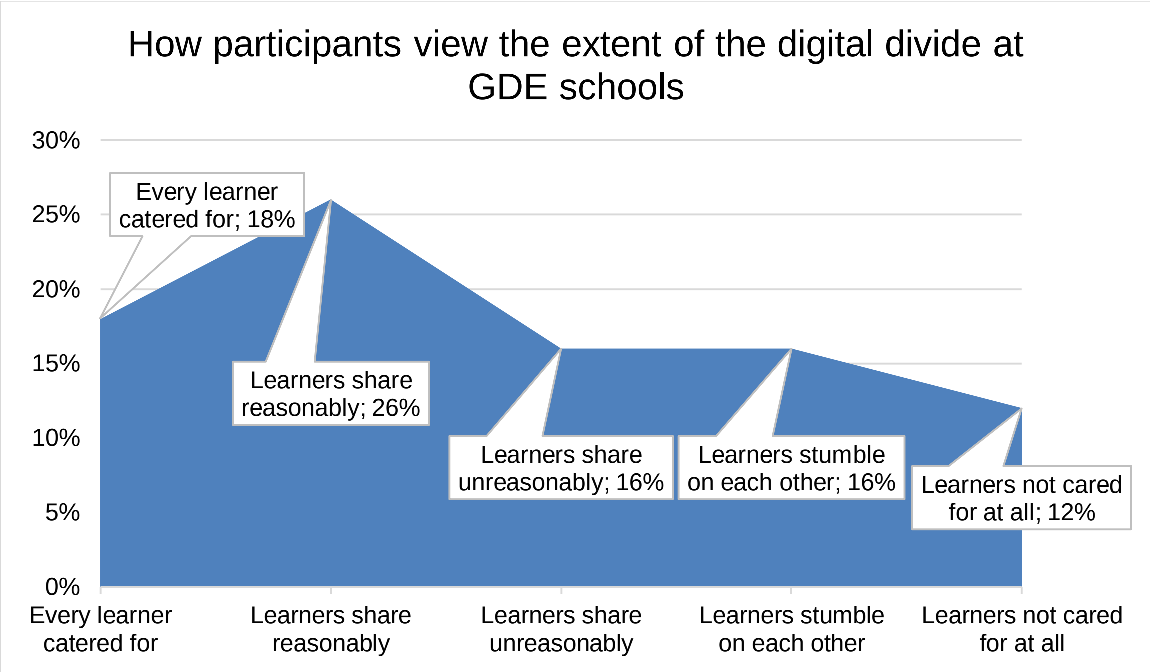


Figure 5-18: Participants' responses to the extent of the digital divide in GDE schools

As depicted in Figure 5.18, almost half of the respondents stated that their schools are negatively affected by the DD in which learners are either not catered for at all with ICTs or unreasonably share ICTs. The ideal per capita LCR ratio would be 1:1. This applies more to individual ICTs such as tablets. As stated earlier, during the COVID-19 regulations it was extremely difficult to do online learning. Besides, the demands of the twenty-first century are for learning to take place anywhere away from the traditional brick-and-mortar classroom. Limited ICTs is an element of the DD. In addition, with limited ICTs some activities even become difficult to execute in case of adverse LCR. It becomes extremely difficult to strike the balance between meeting the twenty-first-century ICT demands and having adverse DD since there shall be minimal ICT usage and accessibility to some, which also could be ascribed to social stratification (Ragnedda, 2017:4). Inequitable supply or availability of ICT infrastructure (Liu, Zhang & Tian, 2019:281), a DD factor, negatively impacts teaching objectives and strategies and could be a challenge for implementing SDL. The educator would find it difficult to be innovative and support the learner face-to-face or remotely even during unforeseen compelling circumstances such as those due to COVID-19 lockdown regulations.

To conclude this section on strand one, the survey questionnaire, the researcher would like to highlight some areas of research. With regard to the group statistics factor analysis, three variables were identified as being participation, procedures and leadership. Overall, there was a computation of 95% confidence interval which implies that responses were not influenced by gender. Correlations, however, indicated that managers might score procedures in a similar pattern. The demographics of the participants were fairly distributed between male and female. Majority of the participants have ICT-related qualifications. The next paragraph explains how managers implement procedures by means of allowing educators' participation in ICT evaluation.

Regarding participation, responses were made in terms of whether: (a) school managers inform educators about the ICT-evaluation process; (b) educators are invited to partake in the ICT-evaluation process; (c) ICT-evaluations are performed by selected educators; (d) ICT evaluators are only performed by senior officials in the GDE; (e) educators are only informed about evaluation results; and (f) educators do know who selects ICT.

Regarding Procedure, responses were made to answer whether: (a) educators are normally provided with criteria for selecting ICT for the schools; (b) in a school year, ICT-evaluation and -selection are performed during a particular period; (c) a variety of ICT brands from different suppliers are provided for possible selection; (d) educators also have a say in the process of ICT-evaluation; (e) formal reporting is done on approved ICT; (f) evaluation results are shared with educators; and (g) whether ICTs already in use are periodically evaluated for "out datedness".

Regarding leadership, participants were asked to state whether they wished to: (a) form part of the evaluation team; (b) take over as leaders of the evaluation team; (c) make final decisions on ICT approval; and (d) to be passive and wait for recommendations from above. Thus far in this section, the author of this document presented some of the survey results. In the next section, the survey results are interpreted in accordance with the research sub-questions. It will also be indicated how the survey interpretation links up with qualitative interpretation as well as with the focus of the study. The interpretation commences with descriptive statistics which will be succeeded by factor analysis.

5.2.7 Descriptive

In this section, with the support of the NWU-Statistical Consultation Services (see Annexure I: NWU-Consultation services letter), the author of this document used descriptive statistics to describe the basic features of data, provide simple summaries of the sample and measures (Trochim, 2020). Descriptive statistical techniques were used to compute means and standard deviations to describe data and assist in answering research questions. Computation was done earlier in section 5.2.1 for each of the three factors, labelled Factor 1 (Participation), Factor 2 (Procedures) and Factor 3 (Leadership).

In the next section, a table is presented containing empirical survey results for each of the three factors. This will be succeeded by a description of the statistical details, firstly being participation, then procedures and lastly leadership.

5.2.7.1 Participation

This sub-section deals with the Participation factor of which the empirical survey results are displayed in Table 5.1 (below).

In Table 5.1 (below), participant responses to the Participation factor are presented on a percentage distribution. Also the mean and standard deviation was computed for each item (9.1 to 9.6 adopted from the survey questionnaire). To minimize error, the mean was utilized to determine the most common views among the respondents from the data set in this factor. The SD was computed to determine how spread out the participants' responses were and how far each observed value is from the mean. To analyse what the majority of participants think about educators' participation in ICT evaluation, the researcher applied these two measures of centrality. The analysis follows below the table.

Table 5-1: Empirical results for Participation

FACTOR 1: PARTICIPATION							
POSSIBLE RESPONSES		FREQUENCY				MEAN ($\bar{X}$)	STANDARD DEVIATION
		OFTEN (1)	SOMETIMES (2)	SELDOM (3)	NEVER (4)		
Item	**Question/ Statement**	**Percentage (%)**					
9.1	Educators are informed of ICT evaluation process	18	40	18	24	2.48	1.05
9.2	Educators are invited to partake in the process	46	22	18	14	2.00	1.11
9.3	ICT evaluations are done by selected educators	26	38	18	18	2.28	1.05
9.4	ICT evaluators are only done by senior officials in the GDE	14	30	34	22	2.64	0.98
9.5	Educators are only informed of evaluation results	20	34	24	22	2.48	1.05
9.6	Educators do not know who selects ICT	20	34	20	26	2.52	1.09

As depicted in Table 5.1 above, questions or statements from the survey questionnaire were decoded into items 9.1 to 9.6. The possible responses to those statements were: 1) Often; 2) Sometimes; 3) Seldom; and 4) Never. Participant responses were then expressed in the form of percentages. A mean and standard deviation value for each item was computed. Three out of four (75%) of the mean values of participation are below 2.5 in the range of sometimes and seldom. The computed average mean is 2.35, which can be a tendency to lean more to the often range. More than 80% of the standard deviation (SD) values in this participation section are over 1.000 with the largest being 1.11. The smallest measured SD is 0.98 for item 9.4. Therefore, none of the items could be considered outliers. Statistically it means that the distribution around the mean is concentrated with a more bell-shaped normal distribution. The next section presents a description of the factor Procedures and its empirical results.

5.2.7.2 Procedures

In Table 5.2 (below), participant responses to the Participation factor are presented on a percentage distribution. Also the mean and standard deviation was computed for each item (9.1 to 9.6 adopted from the survey questionnaire). To minimize error, the mean was utilized to determine the most common views among the respondents from the data set in this factor. The SD was computed to determine how spread out the participants' responses were and how far each observed value is from the mean. To analyse the majority of opinions regarding the manner in which procedures are followed in the GDE when ICT evaluations are done, the researcher applied these two measures of centrality. The analysis follows below the table.

Table 5-2: Empirical results for Procedures

FACTOR 2: PARTICIPATION							
POSSIBLE RESPONSES		FREQUENCY					STANDARD DEVIATION
		STRONGLY AGREE (1)	AGREE (2)	NEUTRAL (3)	DISAGREE (4)	STRONGLY DISAGREE (5)	
Item	Question/ Statement	Percentage (%)					
13.1	Educators are normally provided with criteria to select ICT for the schools	18	22	38	16	6	1.13
13.2	In a school year, ICT evaluation and selection are done in a particular time	16	46	18	18	2	1.03
13.3	A variety of ICT brands from different suppliers are provided for possible selection	22	24	22	22	10	1.31
13.4	Educators also have a say in the process of ICT evaluation	22	16	22	18	22	1.46
13.5	Formal reports on approved f ICT are done	20	26	26	18	10	1.26
13.6	Evaluation results are shared with educators	26	20	24	16	14	1.39
13.7	ICTs already in use are periodically evaluated for out datedness	24	24	16	18	18	1.45

As depicted in Table 5.2 above, questions or statements from the survey questionnaire were decoded into items 13.1 to 13.7. The possible responses to those statements were: 1) Strongly agree, 2) Agree, 3) Neutral, 4) Disagree and 5) Strongly disagree. Participant responses were then expressed in the form of percentages. A mean and standard deviation value for each item was computed. Six out of seven (86%) of the mean values of participation are below 3 in the range of neutral. The computed average mean is 2.74, which can be a tendency to lean more to the agree range. 100% of the standard deviation (SD) values in this procedure section are above 1.000 with the largest being 1.46. The smallest measured SD is 1.03 for item 13.2. Therefore, none of the items could be considered outliers. Statistically it means that the distribution around the mean is concentrated with a more bell-shaped normal distribution. The next section presents a description of the third factor, being Leadership, and its empirical results.

5.2.7.3 Leadership

In Table 5.3 (below), participant responses to the Leadership factor are presented on a percentage distribution. Also the mean and standard deviation was computed for each item (14.1 to 14.4 adopted from the survey questionnaire). To minimize error, the mean was utilized to determine the most common views among the respondents from the data set in this factor. The SD was computed to determine how spread out the participants' responses were and how far each observed value is from the mean. To analyse the majority opinions as to whether educators should be included or even take leadership in ICT evaluation, the researcher applied these two measures of centrality. The analysis follows below the table.

Table 5-3: Empirical results for Leadership

FACTOR 3: LEADERSHIP								
POSSIBLE RESPONSES		FREQUENCY					MEAN ($\bar{X}$)	STANDARD DEVIATION
		NOT IMPORTANT (1)	SLIGHTLY IMPORTANT (2)	MODERATELY IMPORTANT (3)	IMPORTANT (4)	VERY IMPORTANT (5)		
Item	Question/ Statement	Percentage (%)						
14.1	Form part of the evaluation team	6	26	4	36	30	3.56	1.33
14.2	Take over as leaders of the evaluation team	16	22	14	26	22	3.16	1.42
14.3	Make final decisions on ICT approval	14	20	14	28	24	3.28	1.40
14.4	Be passive and wait for recommendations from above	58	18	10	6	8	1.88	1.29

As depicted in Table 5.3 above, questions or statements from the survey questionnaire were decoded into items 14.1 to 14.4. The possible responses to those statements were: 1) Not important; 2) Slightly important; 3) Moderately important; 4) Important; and 5) Very important. Participants' responses were then expressed in the form of percentages. A mean and standard deviation value for each item was computed. Three out of four mean values (75%) of the mean values of participation are above 3 in the range of moderately important. The computed average mean is 2.97, which can be a tendency to lean more to the agree range. 100% of the standard deviation (SD) values in this procedure section are over 1.000 with the largest being 1.42. The smallest measured SD is 1.29 for item 14.4. Therefore, none of the items could be considered outliers. Statistically it means that the distribution around the mean is concentrated with a more bell-shaped normal distribution. This concludes the descriptive statistics sections, whereas the next section deals with exploratory factor analysis.

5.2.8 Exploratory factor analysis

In this section, the author of this document explored and analysed each factor with the aid of tables that contain respective statistical details. Tables 5.4 to 5.6 (below) depict the three factors that were labelled earlier as Participation (Factor 1), Procedures (Factor 2) and Leadership (Factor 3) coupled with their respective screening statistics including factor loadings and communalities. A communality is the proportion of observed variance accounted for by the common factors and it represents the total amount of variance for an item explained by the extracted factors; and extraction communalities are estimates of the variance in each variable accounted for by the components (Wipulanusat, Panuwatwanich & Stewart, 2017). Extracted variables are said to represented very well in case where the communalities in a table are relatively high. If any communalities are exceptionally low, it will mean the inverse and demand for the researcher extract another component. The next section commences with the factor analysis of Participation, which precedes Procedures and lastly Leadership

5.2.8.1 Factor 1: Participation

In this section dealing with Factor 1, Participation, statistical values based on responses from the survey participants are utilised to analyse the extent to which the findings answered research sub-question ❹ *“To what extent do GDE managers involve educators in the process of ICT-evaluation and -selection in the FET-Phase curriculum?”*

To commence analysis, Table 5.4 (below) details the Pattern Matrix for Participation (Factor 1) in which relevant computed statistical measures are given. For the entire participation factor group of statements, statistical measures including the Kaiser-Meyer-Olkin (KMO), Bartlett’s test of sphericity, Mean and SD were computed. In addition, regarding individual items (9.1 to 9.6 extracted from the survey questionnaire), Factor loadings and Communalities were computed. The researcher applied this set of statistical measures in conjunction with one another to analyse the extent and trajectory of the respondents’ views regarding participation of educators in ICT evaluation. Conclusions drawn from analysis of the findings could be considered by GDE policymakers in terms of potential intervention programs to ensure educator participation in ICT evaluation.

Table 5-4: Pattern Matrix for Participation (Factor 1)

FACTOR 1: Participation		
Kaiser-Meyer-Olkin (KMO)	0.707	
Bartlett's test of sphericity	p<0.05	
Factor Mean	2.40	
Factor Standard Deviation	0.69	
Statement	Factor Loadings	Communalities
9.1	0.825	0.375
9.2	0,712	0.205
9.3	0.700	0.681
9.4	0.612	0.490
9.5	0.606	0.507
9.6	0.453	0.367

From Table 5.4 above, in case of participation, factor loading scores for all statements are higher than 0.4, which indicates a correlation between the item and the factor (Samuels, 2017:1). For example, in item 9.1, the factor loading is 0.825, a figure higher than 0.4. Therefore, there is a positive correlation between the item, that educator participation is important in ICT evaluation and the Factor participation. In fact, it is more of a relief since all the Factor 1 items ranging from 9.1 to 9.6 have factor loadings exceeding 0.4. The Kaiser-Meyer-Olkin (KMO) measure is the ratio of correlations and partial correlations with values that range from 0.00 to 1.00 of which values higher than 0.60 (close to 1.0) are appropriate for the data (Watkins, 2018:276; Claassen, 2015:64) or simply that the data is suitable for factor analysis or structure detection. The KMO value for this factor is 0.707, which brings a relief because it implies that the collected data is suitable for analysis. The p-value of Bartlett's test of sphericity was calculated to be lower than 0.05, which depicts a sufficient correlation between statements and suitability to perform exploratory factor analysis. Had the p-value been more than 0.05, it would then have implied that the variables or items are unrelated and therefore unsuitable for structure detection or factor analysis.

Furthermore, from Table 5.4 the mean of Factor 1 is 2.40; therefore, leaning towards the positive side of the scale implying that the respondents are of the view that participation of educators in ICT-evaluation is important. This result is key to the GDE, the pivotal leading agency (Tan et al., 2017:15), whose ICT policies stipulate educators' participation in ICT-evaluation via the school ICT committees (GMUIP, 2010). Regarding sub-question 4, the survey respondents did not differ significantly regarding their responses. The general trend of their responses are that they think that GDE managers to a large extent allow them to participate in ICT-evaluation. They are not only informed about but partake in ICT-evaluation and are informed about the results. However, at school level, evaluations regarding statement 9.3, they largely hold the opinion that evaluations are performed by a select few. If marginalization does exist, educators could then distance themselves from the ICT-evaluation processes and limit their invaluable contributions as knowledgeable pedagogues. They could also be limited in terms of effectively utilizing the selected ICTs in the learning environment to achieve curricular, pedagogical and SDL objectives. The next section describes Factor 2 and its relevant screening statistics.

5.2.8.2 Factor 2: Procedures

In this section dealing with Factor 2, Procedures, statistical values based on responses from the survey participants are utilised to analyse the extent to which the findings answered research sub-question ❶ *"What evaluation procedures or instruments do managers and educators use to support selection of appropriate ICTs and what are the main challenges within the process globally and in South Africa?"*

To commence analysis of the Procedures factor, Table 5.5 (below) details the Pattern Matrix in which relevant computed statistical measures are given. For the entire participation factor group of statements, statistical measures including the Kaiser-Meyer-Olkin (KMO), Bartlett's test of sphericity, Mean and SD were computed. In addition, regarding individual items (13.1 to 13.7 extracted from the survey questionnaire), Factor loadings and Communalities were computed. The researcher applied these statistical measures in conjunction with one another to analyse participant views when asked whether procedures are generally followed in the GDE during ICT evaluation. The procedures listed included provision of criteria, evaluation schedule or time-frame, variety of brands, formal reporting, result dissemination and periodic evaluation of ICTs.

Conclusions drawn from analysis of the findings could be considered by GDE policy-makers in terms of potential intervention programs or system overall to ensure that evaluators do follow procedures when performing ICT evaluation functions.

Table 5-5: Pattern Matrix for Procedures (Factor 2)

FACTOR 2: Procedures		
Kaiser-Meyer-Olkin (KMO)	0.787	
Bartlett's test of sphericity	$p<0.05$	
Factor Mean	2.74	
Factor Standard Deviation	0.99	
Statement	**Factor loadings**	**Communalities**
13.1	0.901	0.394
13.2	0.893	0.183
13.3	0.814	0.611
13.4	0.795	0.632
13.5	0.781	0.812
13.6	0.628	0.797
13.7	0.428	0.633

From Table 5.5 above, in case of procedures, factor loading scores for all statements are also higher than 0.4 and indicate correlation between the item and the factor. For example, in item 13.4, the factor loading is 0.795, a figure higher than 0.4. Therefore, there is a positive correlation between the item, that participants' views are that procedures are largely followed during ICT evaluation and the Factor Procedure. It is more of a relief since all the Factor 2 items ranging from 13.1 to 13.7 have factor loadings exceeding 0.4. Communality values are mostly above 0.6 which reflects a positive correlation among the items or independent variables. The Kaiser-Meyer-Olkin (KMO) measures 0.787. The KMO value is 0.787, which is also encouraging since the implication is that the collected data is suitable for the factor analysis. The p-value of Bartlett's test of sphericity was calculated to be lower than 0.05, which depicts a sufficient correlation between statements and suitability to perform exploratory factor analysis.

As stated above, Factor 2, Procedures, is loaded with statements 13.1 - 13.7 which all have factor loadings exceeding 0.4. From Table 5.5 the mean of Factor 1 is 2.74; therefore, leaning towards the positive side of the scale, implying that the respondents are of the view that procedures are generally followed during ICT-evaluations. This result is key to the GDE because following procedures is likely to yield sound ICT-evaluation and -selection of appropriate ICT media.

Regarding sub-question 1, the survey respondents did not significantly differ in their responses and agreed that procedures are generally followed during ICT-evaluation. Procedures that are being followed include provision of criteria, evaluation schedule or time-frame, variety of brands, formal reporting, result dissemination and periodic evaluation of ICTs. The next section displays an analysis of Factor 3, Leadership.

5.2.8.3 Factor 3: Leadership

In this section Factor 3, leadership's statistical values based on responses from the survey participants, are utilised to analyse the extent to which the findings answered research sub-questions 1 and 4: ❶ *"What evaluation procedures or instruments do managers and educators use to support selection of appropriate ICTs and what are the main challenges within the process globally and in South Africa?"* and ❹ "*To what extent do GDE managers involve educators in the process of ICT-evaluation and -selection in the FET-Phase curriculum*?"

To perform analysis of the Leadership factor, Table 5.6 (below) details the Pattern Matrix in which relevant computed statistical measures are given. For the entire participation factor group of statements, statistical measures including the Kaiser-Meyer-Olkin (KMO), Bartlett's test of sphericity, Mean and SD were computed. In addition, regarding individual items (14.1 to 14.4 extracted from the survey questionnaire), Factor loadings and Communalities were computed. The researcher applied these statistical measures in conjunction with one another to analyse participant views when asked whether educators should be included or even take a lead in ICT evaluation. Conclusions drawn from analysis of the findings could be considered by GDE policy-makers when appointing and training ICT evaluation teams.

Table 5-6: Pattern Matrix Leadership (Factor 3)

FACTOR 3: Leadership		
Kaiser-Meyer-Olkin (KMO)	0.640	
Bartlett's test of sphericity	$p<0.05$	
Factor Mean	2.97	
Factor Standard Deviation	1.02	
Statement	**Factor loadings**	**Communalities**
14.1	0.871	0.709
14.2	0.867	0.751
14.3	0.842	0.758
14.4	0.337	0.114

From Table 5.6 above, in the case of leadership, factor-loading scores for most statements are higher than 0.4 and indicate correlation between the item and the factor. For example, in item 14.3, the factor loading is 0.842, a figure higher than 0.4. Therefore, there is a positive correlation between the items, that educator participation is important in ICT evaluation and the Factor participation. In fact, it is more of a relief since most Factor 3 items ranging from 14.1 to 14.3 have factor loadings exceeding 0.4. Although Item 14.4 factor loading is 0.337, it is still a figure close to 0.4. Communality values are mostly above 0.6 which reflects a positive correlation among the items or independent variables. The Kaiser-Meyer-Olkin (KMO) measures 0.640. The KMO value is 0.640 which is also encouraging since the implication is that the collected data is suitable for the factor analysis. The p-value of Bartlett's test of sphericity was calculated to be lower than 0.05, which depicts a sufficient correlation between statements and suitability to perform exploratory factor analysis.

As stated above, Factor 3, Procedures, is loaded with statements 14.1 to 14.4 of which 75% exceed 0.4. From Table 5.6, the mean of Factor 3 is 2.97; therefore, leaning towards the positive side of the scale, implying that the respondents are of the view that educators should form part of ICT-evaluation teams, take leadership, take final decisions and not be passive but active in all ICT-evaluation processes. The positive consequence could be optimal achievement of teaching-and-learning goals and application of SDL objectives. An emancipated educator is self-directed and should optimally implement SDL in their learning environment to the benefit of the learner and the teaching and learning process.

Regarding sub-question 1, to achieve optimal curricular goals and delivery of SDL objectives, the procedures and processes should largely be inclusive of educators in a socially collaborative fashion. Regarding sub-question 2, the general response is that educators desire to take a lead in ICT-evaluation. If not included the implementation of ICT-based strategies in the classroom could be hampered. The survey respondents did not differ significantly in their responses and agreed that educators should be 'active leaders', thus self-directed leaders and not 'passive followers' during ICT-evaluation (Toh & Kirschner, 2020).

Table 5.7 (below) summarizes the statistical measures of the three factors as described and analysed in the above sections. The table lists and compares KMO, p-value, mean, SD as well as sub-questions that were answered by the factor items based on the survey questions.

Table 5-7: Summary of "screening" statistics for participation, procedures and leadership factors

Items	Factor	Factor name	KMO	p-value	Factor Mean	Factor SD	Average Mean	Sub-question
9.1 - 9.6	1	Participation	0.707	P<0.05	2.40	0.69	2.35	4
13.1 – 13.7	2	Procedures	0.787	P<0.05	2.74	0.69	2.74	1
14.1 – 14.1	3	Leadership	0.640	P<0.05	2.47	1.02	2.97	1 and 4

The next section deals with reliability statistics to measure validity and reliability of the measuring tool – the survey questionnaire.

5.2.9 Reliability Statistics

As stipulated above, in this section, the author of this document deals with content validity and instrument reliability, the two most important and central features in the evaluation of any measurement instrument. Validity concerns what an instrument measures, and how well it does so (Mohajan, 2017:1) or whether it measures what it is intended for. On inverse, reliability concerns consistency and clarity associated with the actual conduct of the research (Rose & Johnson, 2020:4).

Both validity and reliability will be measured below using Cronbach's Alpha Co-efficient values as well as inter-item correlation means. Table 5.8 (below) indicates the association per Cronbach's Alpha's Coefficient size which are later implemented in the next paragraph.

Table 5-8: Cronbach's Alpha's Coefficient Size rule of thumb (Zain et al., 2020:2663).

Alpha coefficient range	Strength of association
<0.6	Poor
0.6 to <0.7	Moderate
0.7 to 0.8	Good
0.8 to 0.9	Very Good
>0.9	Excellent

From Table 5.8 it is evident that when the computed Cronbach's Alpha coefficient value is less than 0.6, it is categorised as poor, between 0.6 and 0.7 as moderate, 0.7 to 0.8 as good, 0.8 to 0.9 as very good and above 0.9 as excellent.

Table 5.9 (below) is used to measure the extent to which the survey questionnaire is good enough and reliable. The first reliability indicator, the Cronbach Alpha, of each factor or construct was computed to determine its variance from the prescribed value of 0.7 which determines the reliability of the survey questionnaire. As a supplement, the second reliability indicator, the mean inter-item correlation, which has to be between 0.3 and 0.6, was also computed per item to determine the reliability of the survey questionnaire and whether it is likely to produce similar results when used several times. These measures also affirm validity and whether the respondents construed the statements clearly.

Table 5-9: Reliability indicators for Participation, Procedures and Leadership

Variable	Cronbach's Alpha	Mean inter-item correlation
Participation	0.730	0.314
Procedures	0.877	0.492
Leadership	0.736	0.402

Table 5.9 confers that the Cronbach's alpha values of all the different constructs are above or close to 0.7 and mean inter-item correlation values between 0.3 and 0.6. According to Table 5.7 translations, the performance is very good, and this indicates that this study's measurement instrument (survey questionnaire) was reliable. The instrument indicates stability, consistency (Mohamad, Sulaiman, Sern & Salleh, 2015:165) and is likely to produce similar results when repeated several times. It also affirms validity and implies that that the design of the measuring instruments and the items that were constructed to measure the variables were well formulated, clearly construed by all the research survey respondents. The next section deals with the survey's T-test, a type of inferential statistics.

5.2.10 *t*-test

As hinted above, a *t*-test is one of many types of inferential statistics used to determine if there is a significant difference between the means of two samples or how different the samples are from each other (Jankowski, Flannelly & Flannelly, 2017:1). It determines whether there is a significant difference in the manner in which sample groups answered questions. In social sciences, p-values are widely used to quantify the statistical significance of observed results or how likely it is that any observed difference between groups is due to chance (Shrestha, 2019).

Table 5.10 (below) depicts the *t*-test results determining whether the Male (n=27) and Female (n=23) survey respondents answered questions differently for each construct. If the effect size is less than 0,5 it implies that there was a small variance in the manner in which the male and female respondents answered the survey questions regarding performance, procedures and leadership. That would imply that gender of the respondent does not matter, nor does it influence the responses made.

Table 5-10: Table T-test results for Participation, Procedures and Leadership factors

Construct	Gender	N	Mean	SD	p-value	Effect sizes
Q9 Participation	Male	27	2,39	0,67	0,90	0.03
	Female	23	2,41	0,73		
Q13 Procedures	Male	27	2,70	1,02	0,77	0.08
	Female	23	2,78	0,96		
Q14 Leadership	Male	27	2,81	1,00	0,22	0.35
	Female	23	3,16	1,02		

From Table 5.10 it is clear that the effect sizes for participation, procedures and leadership are less than small (less than 0,5 small). As stated in section 5.2.1, the small effects size implies that there was a small difference in performance, procedures and leadership between male and female respondents. In other words, there is a small variance in performance between male and female respondents. The responses are given irrespective of the gender of the participants.

5.2.11 Correlations

Table 5-11: Depicts correlation coefficients for Participation, Procedures and Leadership factors

Factor	Correlation coefficient	Q9 Participation	Q13 Procedures	Q14 Leadership	4. What is your current position?
Q9 Participation	Correlation Coefficient	1,000	.289*	0,217	-0,046
	Sig. (2-tailed)		0,042	0,130	0,752
	N	50	50	50	50
Q13 Procedures	Correlation Coefficient	.289*	1,000	0,212	-.369**
	Sig. (2-tailed)	0,042		0,140	0,008
	N	50	50	50	50
Q14 Leadership	Correlation Coefficient	0,217	0,212	1,000	-0,145
	Sig. (2-tailed)	0,130	0,140		0,315
	N	50	50	50	50

Per Table 5.11, the correlation coefficient between Procedures and respondents' current employment position is -0.369 (a strong negative linear relationship). The implication is that school principals agree with effectiveness of procedures more than educators do. This means that educators who occupy leadership positions, as opposed to educators, believe that procedures are followed when evaluations are done. Furthermore, the correlation coefficient between Participation and Procedures is 0.289 (a strong positive linear relationship). The implication is that the more educators participate in ICT-evaluation, the more likely will they agree with effectiveness of procedures. The implication is that social collaboration of educators in ICT-evaluation is meaningful (Svilla, 2014: 36) and could impact on their attitude towards procedures. As was hinted in Chapter three, section 2.4, educators who are included in ICT evaluations are likely to commit more time and resources as they feel that they are part of the high-level decision-making process (Wu & Chiu, 2018:6).

As earlier stated, to complement the survey and address some of the possible gaps, some qualitative methods (individual and Focus-group interviews) were used. Therefore, in the next section is qualitative research analysis staring with the semi-structured individual interviews and later progressing to the Focus-group interview.

5.3 QUALITATIVE ANALYSIS: STRAND TWO AND THREE

As stated above, qualitative strands two and three consist of semi-structured individual and focus-group interviews respectively. Due to the COVID-19 lockdown regulations, researchers were prohibited from physically accessing GDE institutions (see Annexure H: GDE letter: No School Access). As a result, interviews were conducted online via the Zoom-Interviews application. The interviewer was still guided by questions in respective interview schedules. To abide by the research ethical code, informed consent forms were electronically distributed, signed and recollected via the DocuSign application.

The set interview questions endeavoured to answer secondary research questions (2, 4, 5 and 6): ❷ What should the ideal evaluation instrument look like according to literature and educators so as to support implementation of ICTs in the FET-Phase learning environments?; ❹ To what extent do GDE managers involve educators in the process of ICT-evaluation and -selection in the FET-Phase curriculum?; ❺ What suggestions made by subject teachers and GDE curriculum specialists can be infused in an ICT-evaluation instrument to make it suitable for self-directed learning environments in the FET-Phase?; and ❻ How can an ideal, all-inclusive ICT-evaluation instrument be integrated and utilized for the enhancement of self-directed learning in the FET-Phase curriculum?

As seen in the list above, broadly the second research question addresses qualities of an ideal ICT-evaluation instrument required to support utilisation of ICTs in the FET-Phase to enhance SDL. The fourth research question addresses the extent to which FET educators are involved in ICT-evaluation and -selection. The fifth research question takes into cognisance suggestions made by specialists on criteria for development of an ICT-evaluation instrument. The sixth question enquires about integration of the ICT-evaluation instrument to enhance SDL.

In order to gain answers for the above-stated research sub-questions, interview questions were set and placed on an interview schedule. The aim of the interviews was first to establish the respondents' perspectives, experiences, opinions and ideas on qualities of an ideal ICT-evaluation instrument. Thus questions were posed as to whether they thought an instrument is necessary when evaluations are performed and also what they thought were ideal significant qualities of such an instrument. The interviews also aimed to establish respondents' opinions on educators' involvement in ICT-evaluation, what should characterise an instrument as well as how it could be integrated in the curriculum to offer support to educators. Responses were carefully classified, analysed and implemented during the development of a model ICT-evaluation instrument (this step is regarded as qualitative strands 4A-4C). This study suggests that once developed and adopted, an ICT-evaluation instrument should be utilized to evaluate, select and approve ICTs for utilization in the FET learning environments.

The first step towards classification and analysis of data was manual coding. During manual coding the researcher assigned labels to words and phrases that represent important and recurring themes (thematic analysis). These labels or codes were written in the form of words and phrases (Medelyan, 2019). Assigning codes to each response made it easy to classify, interpret and analyse larger segments of text (Belotto, 2018:2634) or data to obtain meaning and influence decision (data-driven decisions).

As suggested by Medelyan (2019), in order to code the interview data, the researcher undertook the following steps (a) chose type of coding, (b) read through the interview recordings, (c) went through data line-by-line to code as much as possible, (c) categorized codes to figure out how they fit into the coding frame, and (d) identified which themes come up most, grouped related themes into families and acted on them. In the context of this study, inductive coding wherein the researcher does not get codes from a code book but starts from scratch and creates codes based on the qualitative data itself (Medelyan, 2019), was chosen. As introduced in Chapter one, section 1.5.1.5 and Chapter four, section 4.4.5, inductive coding was used in conjunction with a method called "structural coding" whereby passages were labelled with terms related to research questions and sub-questions (Belotto, 2018:2624).

To put the aforementioned in practice, the next sections of this work demonstrate coding, analysis and interpretation of individual interview data to determine meaning and perhaps influence data-driven decisions towards GDE managers.

5.3.1 Linear open, Axial and Selected coding of interviews

To protect the participants' identity, cryptograms were used instead of their original names. The interviews were recorded using the Otter application. Thereafter recorded interview data were transcribed verbatim via Otter Application. As illustrated in Figure 5.19 (below), the transcripts were then coded by means of a Linear open, Axial and Selective coding approach (Williams & Moser, 2019:46).

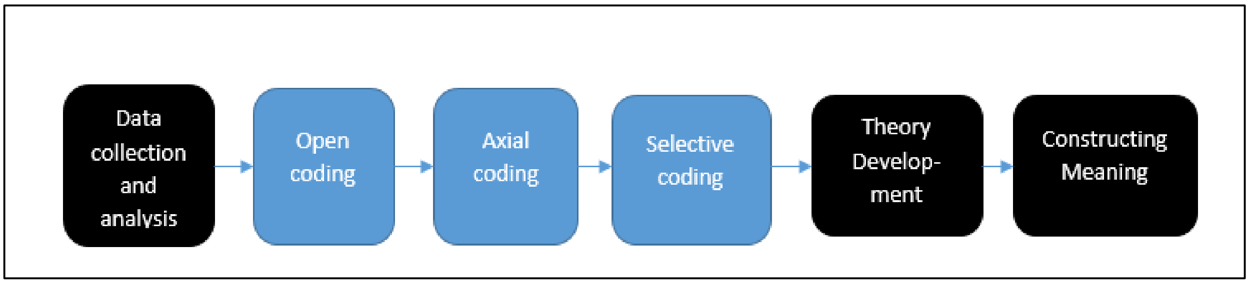


Figure 5-19: Linear Open, Axial and Selected coding (Williams & Moser, 2019: 53)

As per Figure 5.19, upon collecting data, the researcher engaged in open coding during which he identified distinct concepts and themes for categorization, then approached the thematic fragments to coalesce concepts in an organized and systematic manner. During the next level, axial coding, the researcher detected relationships between open codes, for the purpose of developing core codes. Lastly, during selective coding, the researcher integrated categories of organized data from axial coding in cohesive and 'meaning-filled expressions' known as 'families', then developed theory and constructed meaning for application in real-life ICT-evaluation. The Linear, Axial and Selected coding translate to an inductive approach of generating theory from collected data (Williams & Moser, 2019:46). Application of this approach will be illustrated in the next section whereby a few quotations from the semi-structured individual and focus-group interviews scripts were stated, converted into codes, themes and families to address the research questions and aims.

5.3.2 Interview questions

As directed in section 5.3.1 (above), data from the semi-structured individual and focus-group interviews were coded through Linear Open, Axial and Selective coding. The coded data demonstrates how respondents answered each set of interview questions as delineated hereunder.

The first set of questions (listed below) concerned participants' opinions about the necessity of an ICT-evaluation instrument and its ideal qualities: (a) *Do you think when ICTs are chosen for the classroom, there should be some kind of instrument to serve as a guide? (Or should educators do it without an instrument because they are experienced anyway?); (b) In the presence of an instrument to evaluate ICTs for the classroom, give significant qualities you think it should possess (If there is one instrument you know of, tell us about it. (If there is none, tell us about an ideal instrument that educators could use to evaluate ICTs for the classroom).*

The second set consisted of one question regarding educator participation in ICT-evaluation: *What is your opinion regarding the level at which educators are involved in ICT-evaluation processes? (Do you think it is a pure administrative or management function or should it involve subject educators?)*

The third set consisted of one question concerning participants' suggestions to form components of an ICT-evaluation instrument: *Describe characteristics that could be vital for an ideal instrument for ICT-evaluation. (Consider anything that comes to your mind: Its outlook, sections to be covered, type of questions, curriculum relevance, scoring system etc.).*

The fourth set of questions concerned the integration of an ICT-evaluation instrument: (a) *How do you think that an instrument could be harmoniously integrated in curriculum processes implementation? (Consider how it will guide the selection of ICTs that are harmonious with the pedagogical activities as suggested in the CAPS); (b) Suggest ways in which the instrument could be utilized as a means to support the educator in implementing the curriculum. (Consider how it will guide selection of ICTs that boost curriculum implementation or strategies as per the CAPS).*

5.3.3 Results from interviews

As explained in section 5.3.1 above, conversations from transcripts of both the semi-structured individual and focus-group interviews were coded using Linear Open, Axial and Selected coding. In this section, the researcher reflects those interview codes, converts them into themes and families of themes. During that exercise, the researcher also reflects some of the quotes (verbatim) from the interviews. The following headings sub-divide the entire exercise.

5.3.3.1 Determining the necessity of an ICT-evaluation instrument

Prior to engaging in a hefty exercise of developing ICT-evaluation criteria and instrument, the researcher endeavoured to establish whether participants deemed it necessary to have an ICT-evaluation instrument. During the interviews, the participants were asked:

Do you think when ICTs are chosen for the classroom, there should be some sort of an instrument to serve as a guide? (Or should educators do it without an instrument because they are experienced anyway?

In response to the first part of the first question, most respondents believed that an ICT-evaluation instrument is necessary when evaluations are done in the GDE FET-Phase. Besides for objectivity, evaluations in education are important to serve as a theoretical basis for further research (Akhmetshin, 2020:9). In addition to the envisaged future research, an education department has a mandate to constantly 'e-supply' its schools to keep up with the twenty-first century ICT demands (Hadini, *et al*., 2020:2). As a prerequisite to e-procurement, it is logical for an education department to evaluate ICTs using a valid instrument. Objective evaluations using a valid instrument are necessary to ensure that selected ICTs assist the educator to deliver the curriculum and create an SDL environment (Andyani *et al*., 2020: 129).

Further to the above-stated, ICT evaluations via a valid instrument could empower evaluators to test for compliance to pedagogy and cost-effectiveness (Verbelen *et al.,* 2017: 396). Based on their option for evaluations to be done via a valid instrument, one may suggest that participants mostly think that curriculum and pedagogical appropriateness require ICT-evaluations. The aforementioned implies that a valid instrument to select ICTs gives means to utilization of ICT media which are suitable for SDL and curriculum delivery.

To add more, Table 5.12 (below) illustrates themes, codes and some quotations regarding the participants' perceptions of the necessity of an ICT-evaluation instrument. The purpose of this table is to illustrate participants' views; some of which expressed in the quotes (verbatim) were used to construct some codes, which were utilized for developing themes which were conglomerated into families of themes. The themes were therefore used in a deliberation that follows to analyse and portray educators' perceptions and responses when asked whether they thought an ICT-evaluation instrument was necessary. Such an analysis was useful to form part of the formulation of conclusions and recommendations to be presented to the GDE. These recommendations could form a basis for decision-making and policy formulation to decide whether or not an ICT-evaluation is valid and necessary when evaluations are done. If deemed necessary, it could form the basis for the rest of other processes that are discussed in subsequent paragraphs.

Table 5-12: Themes, codes and typical quotes associated with participant's perceptions regarding the necessity of an ICT-evaluation instrument

FAMILY	THEMES	CODES	QUOTES	
			Individual	**Focus-group**
Educators require a dynamic regularly updated ICT-evaluation instrument	Ideal, all-inclusive , dynamic ICT-evaluation instrument is a necessity	New innovations	M1: "We do have an instrument, but it is outdated. We used it long time ago"	NDM: "I also support that an instrument to evaluate must be regularly updated to effectively address its use" LBO: "We must remember that times are changing, and we cannot afford to cling to the past. We need to keep up so that we are not behind the likes of the USA and other countries like Russia"
		all inclusive	OE1: "Yes I must have an instrument to use. It lists the minimum requirements of software and hardware for example smart board, server and teacher laptop for a smart classroom.	TLT: "In fact the ICT-evaluation instrument we are talking about should be central to all processes"
		Indispensable tool	J1: "Yes it is vital to have an instrument".	LLL: "It would be ridiculous to do evaluations when there is no instrument.… then it will mean all of us will land with different results.
ICT-evaluation instrument necessary for learner, educator and district support.	ICT-evaluation instrument inspires educator support to select SDL ICTs	Learner-centred approach	H1: "…it is necessary to enable us to accommodate individual learner levels/ background"	ZNL: I will be happy if ICTs address the needs of the learner effectively….teachers can always find their way…"
		Educator leadership	O1: "We do need to develop an instrument in order to support our schools or ICT educators to work independently when evaluating"	RGI: "Teachers always find themselves in a confusion…. best if we have system that adds to their leadership"
		District facilitation	P1: There has to be a guide to create and maintain uniformity among schools and also guide districts".	NTH: "I think at last we shall have synergy if there is a universal district or even Provincial instrument for all schools" SBS: "I think since we are the ones who teach, district should only act as facilitators and empower

FAMILY	THEMES	CODES	QUOTES	
			Individual	Focus-group
				us to do the rest of the work”
	ICT-evaluation instrument should be diverse	Multi-level ICT-evaluation instrument	E1: “They must use it (an instrument). But remember it cannot be one instrument for all levels. There should be one for different levels (there should be one for District, one for management and one for teachers. When schools have to evaluate ICTs, district, ICT and school management must all be involved.	BTT: “Our instrument should focus on classroom activities and the one for district assist them to oversee….”
		ICT skills audit	R1: “It is important to have an instrument as it will help to evaluate ICT-skills levels of educators. All need an instrument to evaluate ICTs. The procurement unit should consider having an ICT-evaluation instrument before they procure for schools. However, schools should do it themselves.”	NLT: “An instrument is necessary to help us develop more ICT skills”

As derived from Table 5.12, the researcher hereunder discusses each of the themes to expatiate on participants’ views concerning the necessity of an ICT-evaluation instrument. In this first family of themes, participants generally believed that educators require a research-based, dynamic ICT-evaluation instrument. More so, some participants think that having an ICT-evaluation instrument would enable the education department to compete with other regions of the world. That fact was highlighted by participant LBO.

> LBO: “We must remember that times are changing, and we cannot afford to cling to the past. We need to keep up so that we are not behind the likes of the USA and other countries like Russia”

Next is discussion of the first theme.

5.3.3.1.1 All inclusive, dynamic ICT-evaluation instrument is a necessity

As indicated in the above paragraph, interview participants generally agreed that there is a necessity for an instrument when evaluations are performed. However, participants further stressed that it should be a research-based, dynamic ICT-evaluation instrument. *All-inclusivity* and *dynamism* are analysed below:

- **An All-inclusive ICT-evaluation instrument:**

In correlation with the assumption alluded to in section 1.4, Chapter one, participants are of an opinion that schools should be provided with a research-based, empirically validated ICT-evaluation instrument.

> OE1: "Yes I must have an instrument to use. It lists the minimum requirements of software and hardware for example smart board, server and teacher laptop for a smart classroom."
>
> TLT: "In fact the ICT-evaluation instrument we are talking about should be central to all processes"
>
> MPM: "That instrument should include all subjects, learning programs, different learner abilities and…. different school types"

Based on these participant perceptions, an ICT-evaluation instrument should be versatile to accommodate all possible areas and types of media. One should further suggest that an ICT-evaluation should be based mainly on the guidelines that will be recommended to the GDE. Such guidelines will be based on the findings of this research work. An ICT-evaluation instrument is of essence to ensure that a broad spectrum of ICTs (e.g. software, hardware, smart boards, servers and teacher laptops) that enter the school system are carefully selected. What is of essence during selection is for ICTs to cater for effective curriculum delivery and allow the educator to create an SDL environment by means of various learning activities. Specified curriculum and SDL objectives should be achievable by ICTs selected via the ideal, all-inclusive ICT-evaluation instrument. Next is a short discussion on instrument dynamism.

- **A dynamic ICT-evaluation instrument:**

Participants by and large believe that an ICT-evaluation instrument should be dynamic in nature.

> NDM: "I also support that an instrument to evaluate must be regularly updated to effectively address its use"
>
> LBO: "We must remember that times are changing, and we cannot afford to cling to the past. We need to keep up so that we are not behind the likes of the USA and other countries like Russia"

It is encouraging to obtain this participants' opinion because Instrument dynamism is important in this modern digital information age of the twenty-first century in which education departments worldwide aspire to project vigorous, active, dynamic progress. As outlined in Chapter one, section 1.4, dynamism is for education departments to keep up with the fast-growing changes in the ICT-world within the highly digitalised, fast-growing and dynamic ICT-age twenty-first century (Oviawe, 2016:9). Dynamism is synonymous with keeping up with new developments, changes, upgrades and updates in order to increase agility, profitability, competitiveness, value add, inclusivity and innovation (Hanna, 2018:3). Furthermore, dynamism is demanded by the fast-growing, ever-changing ICT or technological innovations (Oviawe, 2016:9). Dynamism is the converse of out-datedness, against which the participants warn. According to participants, an ICT-evaluation instrument should be timeously updated. The implication is that neither an instrument nor ICTs should be outdated.

As earlier implied, an outdated ICT-evaluation instrument might not accurately evaluate ICTs to ensure effective curriculum delivery and enhance SDL. Thus an ICT-evaluation instrument should be dynamic and include a shift from computer-initiated to internet-initiated innovations (Naveed, Watanabe & Neittaanmäki, 2017:6). The former statement tallies with what was stated in section 1.4, Chapter one, that ICTs ought to be dynamic to keep up with new developments, changes, upgrades and updates to increase agility, profitability, competitiveness, value-add, inclusivity and innovation (Hanna, 2018:3). In Figure 5.20 (below), a dichotomy is drawn between a dynamic and non-dynamic ICT evaluation environment. For the purpose of this exercise a dynamic ICT environment is one in which education managers continuously keep up with new innovations as much as possible. A non-dynamic environment is characterised by managers who only implement changes in a responsive manner and do not anticipate and adjust to new innovations.

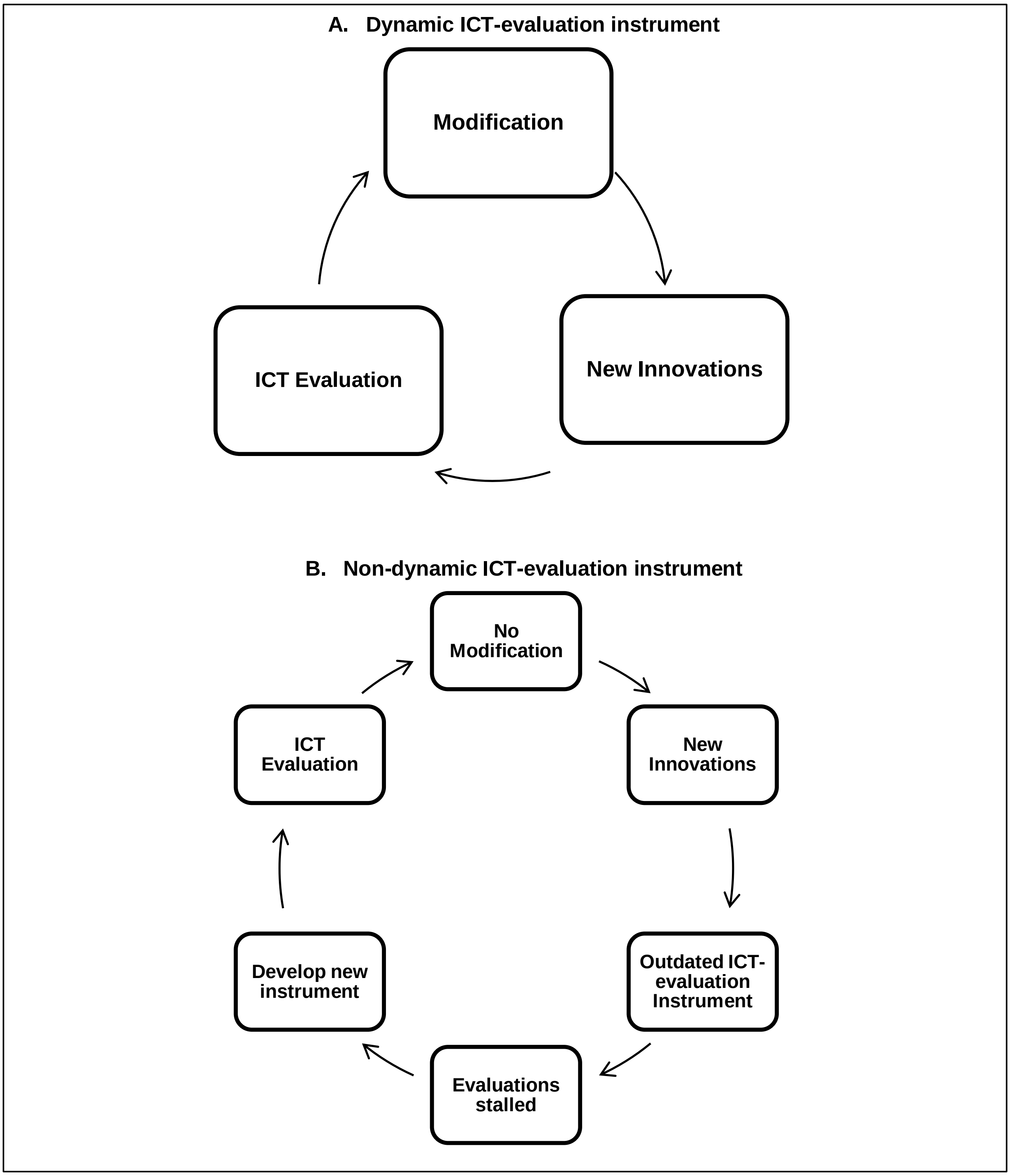


Figure 5-20: The impact of using a dynamism ICT-evaluation instrument

Source: Author's own

From Figure 5.20 it is clear that in the case of a dynamic ICT-evaluation instrument (A), ICT-evaluation is never interrupted and keeps up with innovations. Process managers anticipate innovations and modify the instrument accordingly. In the case of a non-dynamic instrument (B), there is no anticipation of innovations. Consequently, no modifications are made, and the instrument becomes static and outdated; thus stalling evaluation. As a reaction, a new instrument is developed for ICT-evaluation. Situation A is characterised by pro-action and B as reaction.

In the next family of themes, participants generally were of the view that an ICT-evaluation instrument is necessary for learner-, educator- and district-support. Next, the discussion of each theme follows:

5.3.3.1.2 ICT-evaluation instrument supports educator to select self-directed learning Information and Communication Technologies

As indicated in the foregoing paragraph, participants generally agreed that an ICT-evaluation instrument is necessary to support the educator in selecting ICTs.

> LLL: "It would be ridiculous to do evaluations when there is no instrument…. then it will mean all of us will land with different results.

It is intriguing to get this opinion because it might not be difficult for the GDE to influence educators to accept and use an ICT-evaluation instrument should they be tasked with selection or approval of relevant media. As indicated below, mainly learner needs, followed by educator- and district- support to enhance SDL are cited (Learner-centred approach, educator requirements and district requirements).

- **Learner centered approach:**

Participants generally are of an opinion that an instrument should address the needs of the learner.

> ZNL: "I will be happy if ICTs address the needs of the learner effectively…. teachers can always find their way…"

> H1: "…it is necessary to enable us to accommodate individual learner levels/ background"

Furthermore, regarding the learner, participants appeal for ICTs that are compatible with SDL environments and congruent to the twenty-first century attributes demands.

> MAZ: "At this day and age or era within which we are living, I can't imagine ICTs that do not embrace our children's needs"

Therefore, the above-stated opinions are in line with some of the reviewed literature yielding an idea that an ICT-evaluation instrument should support the educators to develop through the SDL steps of self-directedness, such as being a (1) dependent, (2) interested: (3) involved: and (4) self-directed as suggested by Tredoux (2012: 37) and demonstrated earlier in Chapter two, section 2.4.4.1. Also as it was discussed in Section 2.3.2.1 to support the learner's self-directedness, the educator encourages the learner to select their own ICT resources and decide on learning venues (Lai, 2015: 75). The educator supports the learner to meaningfully engage in a variety of learning environments, including online learning (Horn & Stalker, 2017). During that engagement in the SDL learning environment learners select their own resources under educator guidance. Selecting ICT resources is simpler because learners are often intrinsically motivated to own or enjoy such resources or media and be connect to the Internet (Azeez, *et al.*, 2019:20).

ICTs that enhance SDL are key to raise levels of competency, skills, and cognitive knowledge, which directly affect the learner's performance (Abid, *et al.*, 2019:3157). This implies that the educator should also have skills to assess the learners' level of readiness and thereby decide how to navigate between the steps as mentioned earlier when guiding the learner towards SDL. Next is a short discussion on how an instrument is viewed to support the educator taking leadership in the ICT evaluation process.

- **Educator leadership**

Participants believe that an ICT-evaluation instrument should promote an environment in which educators are emancipated to take leadership in the process.

> RGI: "Teachers always find themselves in a confusion…. best if we have system that adds to their leadership"

> O1: "We do need to develop an instrument in order to support our schools or ICT educators to work independently when evaluating"

To support the above-stated participant perceptions, as professed in section Chapter two, section 2.3.2.1, for that educator-emancipating environment to be fully complemented, the educator needs to take leadership and encourage the learner to select their own ICT resources and decide on learning environment (Lai, 2015: 75). This implies that the ICT-evaluation instrument should have MIs that enable the educator to direct the learner to, in any particular moment, decide whether to confine to the traditional "brick and mortar" or engage in a variety of learning environments, including online learning (Horn & Stalker, 2017). The educator's willingness to work independently further implies that an educator needs strong SDL attributes. This statement is supported by Du Toit-Brits (2018a). Such attributes include taking ownership; self-determination; intrinsic and extrinsic motivation; coaching, motivating, facilitation, and consultancy (Grow as cited by Tredoux, 2012:37); integration of resources (Becker & Palenberg, 2018; Khaloufi & Laabidi, 2017:57); advising learners on learning strategies; creating a class structure; taking leadership roles; guidance and support (Du Toit-Brits, 2018a); incorporate in-class and home-based learning activities; providing students with conceptual information, providing students with methodological information (Brockett & Hiemstra, 2018:75); assigning technology-enhanced homework; encouraging learners to use technological resources on their own (Lai, 2015). Once these attributes are possessed the educator is dedicated to curriculum delivery. Intrinsic motivation increases educator's willingness to utilize ICTs and consequently be impactful to facilitate the learner's self-directedness (Louws *et al.*, 2017:174). An intrinsically motivated educator assumes various roles to enable the learner to travel through all stages of self-directedness. In the optimum partnership between the educator and learner, the educator plays the role of coach, motivator, facilitator and consultant (Du Toit-Brits, 2018a; Tredoux, 2012). The ultimate goal is to have an instrument that enables the educator to support the learner to select ICTs that set a 21st century ICT-based SDL environment. Next is a short discussion of how the instrument is deemed necessary to support district officials to in their facilitation of ICT evaluation.

- **District facilitation**

Although participants stated their wish for educators to take lead in ICT evaluation, some have argued for participation and leadership of districts as facilitators in ICT-evaluation.

> NTH: "I think at last we shall have synergy if there is a universal district or even Provincial instrument for all schools"
>
> P1: "There has to be a guide to create and maintain uniformity among schools and also guide districts".
>
> SBS: "I think since we are the ones who teach, district should only act as facilitators and empower us to do the rest of the work"

Based on these opinions, it is clear that some participants have argued for an all-encompassing instrument, yet others proposed that there should be specialized instruments for different levels such as provincial, districts and school. The involvement of districts, among other stakeholders, appeals to the provisions of the social collaboration model specified in section 3.4.1, Chapter three. These provisions match the interpretivist philosophical conviction that reality is socially constructed (Thanh and Thanh (2015:25). This is a practical application of social collaboration in task performance as advocated by Svilla (2014:36). However, during social collaboration, stakeholders should not lose focus but continuously prioritise learners needs. Thus, a learner-centred ICT-evaluation instrument that enables the educator and district to collaboratively select ICTs that enhance SDL to meet the learner's needs is necessary. Why is this necessary?

As earlier alluded in section 1.4, Chapter one, districts are challenged to facilitate, among stakeholders, the COI, comprehension and application of the Social-presence, Cognitive-presence and Teaching-presence. These presences are vital for a lively, harmonious, synchronous cooperation among all stakeholders for objective development of an ICT-evaluation instrument (Swan, Garrison and Richardson, 2014). As implied by Pollard *et al.* (2014:1), each of these presences has its elements or dimensions which qualify interrelationships among role-players in various learning processes, contextually ICT evaluation. An ICT-evaluation instrument should therefore infuse these presences in its MIs. These MIs are to make sure that all role-players participate and there is minimal error in Evaluation. The next theme to be discussed is based on perceptions that an ICT-evaluation instrument should be diverse in character.

5.3.3.1.3 ICT-evaluation instrument should be diverse

Participants generally feel that an ICT-evaluation instrument should be diverse, multi-level and cater for ICT skills audit. Each of these perceptions is discussed below in short.

- **Multi-level ICT-evaluation instrument**

Although all participants agree that an instrument is necessary, some further argue for it to be multi-level.

> E1: "They must use it (an instrument). But remember it cannot be one instrument for all levels. There should be one for different levels (there should be one for District, one for management and one for teachers. When schools have to evaluate ICTs, district ICT and school management must all be involved".

For effectiveness of ICT-evaluation and inclusion of all stakeholders, the author of this document also supports the educator's opinion for a multi-level ICT-evaluation instrument that caters for all levels, including school and district. This notion is in line with the idea of stakeholder's shared meaning and joint action to establish what works optimally in practice as suggested by Juuti et al. (2016:38). Some participants believe that there should be a different instrument for districts and another one for schools. It, however, becomes an education department's competence to decide whether to have an ideal, all-inclusive multi-level or separate ICT-evaluation instrument for each level. A multi-level ICT-evaluation instrument would assist all role players to play their part in ICT evaluation when approached by manufactures or suppliers. Based on the participants' views, in order to have sound ICT evaluation which will result in selection of curriculum-sound and SDL-suitable ICTs, this study proposes an ideal, all-inclusive ICT-evaluation instrument suitable for use at any level.

- **ICT skills audit**

Some participants believe that an ICT-evaluation instrument should have MIs that assist managers and educators to audit their own and the learners' skill levels. It is therefore the researcher's opinion that skills audits are important which is congruent with the views of Lombard (2018) that ICT skills are likely to motivate educators to partake in pedagogic proceedings (Van Dijk, 2017:7). ICT measurement and evaluation is viewed as part of pedagogic proceedings. Furthermore, the researcher's opinion is that besides for evaluation purposes, acquisition of ICT skills is an important competence for a twenty first century educator who is faced with a wide spectrum of ICTs for curriculum delivery. This statement could also be supported by an earlier notion (Chapter two, section 2.4.4) that through ICT-access, -skills and -knowledge, the twenty-first century educator is responsible for expanding the learners' intellectual readiness, supporting learners towards self-initiated goal-setting, catering for individual learners' level of development and implementing SDL-compatible assessment strategies (Beach, 2017:60; Nasri, 2017:3). It is therefore exciting to notice the synergy between the aforementioned participants' beliefs, the researchers' opinion and reviewed literature regarding ICT skills audit.

The researcher is also elated by the participant's beliefs that the learner's ICT skills should be audited. This belief is in line with some the notion based on literature reviews (Chapter two, section 2.4.3 that a twenty first century learner requires ICT skills to ensure convergence of educational practices (Graham, 2019:146) and socially collaborate with other learners and educators (Zhu, Bonk & Doo, 2020:15). (Sang, et al., 2018:307), Wu & Chiu, 2018:6. Focus on this aspect could promote the goal of producing self-directed, competitive, independent, socially collaborative world-class citizen (Tan et al., 2017:1; UNESCO, 2015:18 stipulated in section 2.4.3.3. The aforementioned facts based on triangulation of interviews, literature and the researcher's opinion are summed up well with what participant NLT stated below:

> NLT: "An instrument is necessary to help us develop more ICT skills"

Furthermore, it is the researcher's opinion that instrument-based audits would be useful since lack of ICT-skills could lead to the digital divide, which was dealt with in section 3.2, Chapter three. Having MIs that audit ICT skills may be viewed as an integral element towards countering the tribulations of the DD. The DD was earlier portrayed as infamous for nullifying pursuance of ICT-evaluation, selection and utilization aspirations. It is the researchers' further opinion that if not opposed effectively, the DD could hinder the education department's agenda of producing world-class, competitive citizens and accountable members of their workforces who can compete in the ICT-dominated world as aspired for by most countries evidenced in the UNESCO (2015:18) documents and supported by Tan et al. (2017:1).

Given the above, typical ICT-evaluation instrument MIs could include auditing a gap between people who do and do not have ICT skills (Van Dijk, 2017:1); minimal ICT usage and access due to social stratification (Ragnedda, 2017:4); level of the surge in ICT skills and users (Chetty, Aneja, Mishra, Gcora and Josie, 2017:15; and how the DD causes aggradation of day-to-day pedagogical proceedings (Van Dijk, 2017:7). The above facts conclude discussions centred on determining the necessity of an ICT-evaluation instrument. The next sub-topic deals with participants' perceptions of the qualities of an ICT-evaluation instrument.

5.3.3.2 Determining qualities of an ideal ICT-evaluation instrument

Once the necessity of an ICT-evaluation instrument had been determined per the first part of the first question, determining participant's perceptions regarding its qualities followed as the next priority. As commanded by the second part of the first question, the researcher sought to determine ideal qualities and establish whether any instruments existed in the GDE. The thrust was that an instrument has to adhere to specific set standards, which are primarily determined by its ideal qualities. In the context of this study, the qualities and characteristics of the instrument vary. To draw that dichotomy, in this section, the author of this document focuses only on qualities; then characteristics shall be dealt with later, in section 5.3.3.4. As implied in Chapter one, a determinant for the instrument qualities is to ensure that ICTs considered for procurement do appropriately meet pedagogical needs of the end-users, namely learners and educators (Andyani *et al.*, 2020:129). During the interviews, to determine the suggested qualities and existence of an ICT-evaluation instrument, the participants were asked:

> *In the presence of an instrument to evaluate ICTs for the classroom, give significant qualities that you think it should possess (If there is one instrument you know of, tell us about it. (If there is none, tell us about an ideal instrument that educators could use to evaluate ICTs for the classroom).*

In response to the second part of the first question regarding qualities of an ICT-evaluation instrument, it was derived that participants by and large believe that an ICT-evaluation instrument should be synchronous, policy-based and user-friendly.

Part of policy requires ICTs to be curriculum-compliant and pedagogically sound; therefore, the relevant instrument needs to test for such compliance. Respondents believed that that designers of an ICT-evaluation instrument have to decide whether they intend to evaluate only the device, content or both. In the case of content evaluation, for curriculum compliance, it is the researcher’s opinion that ICTs have to be relevant to Computer Assisted Technologies and the CAPS. This statement is in support to what Hazar (2019: 955) assets that using ICTs in curriculum teaching can be viewed positively in the outcome of education. Some ICT developers only supply new devices that have never been used or are content-free, and the GDE has to upload contents like electronic worksheets. As implied by participant MHL below, some manufacturers supply devices with content already uploaded.

> MHL: “It depends whether you are evaluating devices or content. Content has to be relevant to CAT (Computer Applications Technology) and what will be taught at school (CAPS)”.

As stated in the above response, in the case of ICTs without content, only the software and hardware or technical aspects should be evaluated to test for capacity to load curriculum content. However, it is encouraging to learn that educators affirm that both content, hardware and software need to be equally evaluated to ascertain that ICTs that enter the school system are educationally sound (Popovic *et al*., 2017:11). This is in line with the guidelines for ICT evaluation stated earlier on in Chapter three, section 3.3. It is therefore, the researcher’s opinion that since ultimately content will be loaded to those devices, it should then be evaluated.

Based on the above-stated educators’ perceptions, literature and guidelines, it is the researcher’s further opinion that since pedagogical and technological factors influence competence in digital learning, it is significant to consider the capability of the devices to load content prior to procurement of such ICTs. This opinion is in line with the statement of the draft PDFDL (2017:9) that capacity of the devise is important. Based on the participants’ views above and literature reviews, the researcher further suggests that a rule to be set in the policy should state that a device should not be selected for its own sake or personal preferences as was suggested by Lamb & Kling (2003:212; Rossi, 2016) in Chapter five, section 5.3.3.4 dealing with suggested characteristics of an ICT-evaluation instrument. In totality, an ICT device should meet specific minimum pedagogical (e.g. CAPS, SDL activities and objectives) and technological requirements such as speed, storage capacity, compatibility with infrastructure and available software applications.

Contrary to the above, in the case of ICTs already loaded with content, curriculum aspects of the ICT-evaluation should be evaluated. Respondents, therefore, suggested the inclusion of pedagogical MIs on the ideal ICT-evaluation instrument. Since individualized teaching can give better results than teaching with groups (Hazar, 2019: 955), the ideal instrument should address the individual learner’s level of development or progression, the ICT-skills ladder of the end-users (both learners and educators) and exposure to ICT utilization and training levels.

Based on the interviews, there is a conviction that for pedagogical soundness, an ICT-evaluation instrument should test for learner-centeredness as stated below:

> L1: “In the COVID-19 new normal life, it should seek for learner centred ICTs to cover environments like home-schooling. They should cater for online-learning. The learners should be able to study on their own in a self-paced manner. There should be versatility.”

The above conviction is further supported by literature stating that learner-centeredness should empower learners to take responsibility for their own learning (Oyelana, Martin, Scanlan, & Temple, 2018:118). It is therefore the researcher’s opinion that when learner-centeredness is promoted, SDL enhancement is as practical as possible. It is encouraging to learn that participants are concerned about the difficulty the GDE encountered during the COVID-19 lockdown period which prevailed when the GDE was unprepared to to support the learner off-site or in remote learning environments (Becker & Palenberg, 2018) away from the brick-and-mortar classroom (Khaloufi & Laabidi, 2017:57) as proposed in section Chapter three, section 3.2.2. The pparticipants’ views imply that they claim that the difficulty was caused by lack of ICT and SDL readiness, resulting in learners not effectively learning in environments away from the traditional ‘brick-and-mortar’ as proposed by Horn & Staker (2017) in Chapter two, section 2.3.3.1. dealing with supporting the learner’s self-directedness in an SDL environment. The participants’ belief that the GDE should be prepared for remote learning is in line with the proposal by Ping & Libing (2016:12) that it is a measure to bridge the digital divide. It is further encouraging to learn that educators are in favour of SDL learning environments.

As a guide towards the technical aspect, respondents suggested that ICT-evaluation MIs should mainly be quantitative or close-ended for user friendliness and ease of use. Only a minority should be open-ended. Open-ended questions will probably elicit more details (Lyon & Henderson, 20121:2), potentially not sufficiently accounted for when closed questions were answered. The majority of participants believed that an ICT-evaluation instrument should be designed in an electronic format for user-friendliness. Among participants, an electronic ICT-evaluation instrument is primarily associated with minimal administrative workload.

Still, on the technical aspect, participants generally think that an ICT-evaluation instrument should test for quality, usability and durability of the ICT media components (e.g. key pads). Other technical evaluation aspects could be verification of generation, capacity, speed, RAM (for quick access to information) and software.

Furthermore, there is a suggestion for an ICT-evaluation instrument to have MIs that evaluate affordability. For instance, it is suggested that Internet Service Providers (ISP) should be challenged to play a role to assist learners to access portals free of charge and learner devices should be priced reasonably.

> MHL: "I have learnt during COVID that all that probability is zero rated because learners may have smartphones without data bundles. We can enhance our portals to be zero-rated among all the ISPs (Internet Service Providers). I am speaking of portals like SIYAVULA.COM and the GDE content website – they should be zero-rated"

From these beliefs one could deduce that there should be a balanced value for the invested fiscals. As supported by Verbelen *et al.*, (2017: 396), such a balance would imply that evaluations are organised to test for a combination of compliance measures, including pedagogy and cost-effectiveness. Participants believe that an ICT-evaluation instrument should not be too limited but have capacity to evaluate a wide spectrum of ICTs (e.g. e-books and multimedia). Based on participants' views, to be used for longer periods effectively, an ideal ICT-evaluation instrument should test for cost-effectiveness and the life span of media.

> PKS "It should evaluate a variety of ICTs including devices, e-books, multimedia even ISPs".

Table 5.13 (below) tabulates themes, codes and quotes to confirm participant's perceptions of qualities of an ICT-evaluation instrument. The purpose of this table is to illustrate participants' views, some of which are expressed in the quotes (verbatim) and used to construct some codes. Those codes were utilized for development of themes which were conglomerated into families of themes. The themes were therefore used in a deliberation that follows to analyse and portray educators' perceptions and responses. Participants were questioned about the qualities that they thought an ICT-evaluation instrument should possess in order to efficiently support the educator in selecting ICTs that effectively support curriculum and SDL. Such an analysis was useful to form part of the formulation of conclusions and recommendations to be presented to the GDE. These recommendations could assist ICT managers and evaluators to consider when developing ICT-evaluation instruments in the future. Some of these qualities could also be considered when developing FET subject-specific ICT-evaluation instruments or even instruments for other phases.

Table 5-13: Themes, codes and quotes to confirm participant's perceptions on qualities of an ICT-evaluation instrument

FAMILY	THEMES	CODES	QUOTES	
			Individual interviews	Focus-group interviews
Ideal ICT-evaluation instrument is synchronous, policy-based and user-friendly	ICT-evaluation instrument should promote synchronisation	Synchronization	PKS: "There has to be a guide to create and maintain uniformity among schools"	DLS: "We need to know what other schools are doing as well, yeah"
	ICT-evaluation should be inclined to policy	Policy alignment	PKS: "Schools have ICT policies that guide them …instrument should follow that"	CND: "On that, we rely on the guidance from districts"
	ICT-evaluation instrument should be concise and user-friendly	Concise and user-friendly instrument	MHL: "Not too much administrative work" RBT: "It minimizes administrative workload like capturing after evaluation".	GRP: "it should not be difficult to use…"
		Quantitative and qualitative electronic instrument	EMM: "Majority of the questions of the ICT-evaluation instrument should be closed questions and it should provide for narrative descriptions as well. MHL: "Electronic instrument will be better because evaluators can analyse results online. It minimizes administrative workload like capturing after evaluation".	DSY: "At this day in age….it is obvious…. we need everything to be digitalized".
Ideal ICT-evaluation instrument should meet the requirements of CAPS and pedagogy	Instrument should test for Curriculum and pedagogical soundness	Test for CAPS compliance	**MHL:** "It depends whether you are evaluating devices or content. Content has to be relevant to CAT (Computer Applications Technology) and what will be taught at school (CAPS)".	LOU: "Our bible these days is CAPS….so it should work hand-in-hand with it**"**
		Consider learner's level of development	**B1:** "It should take into cognisance the different learners' level of development, achievement and ICT-skills (skills ladder),	"Our learners come first, so we need to consider them first"

FAMILY	THEMES	CODES	QUOTES	
			Individual interviews	Focus-group interviews
			background…...and progression”	
		Decentralised Self-paced learning	L1: “In the COVID-19 new normal life, it should seek for learner centred ICTs to cover environments like home-schooling. They should cater for online learning. The learners should be able to study on their own in a self-paced manner. There should be versatility.” RBT: “Previous ICT-evaluation instrument was more for classroom ICTs and not for learning away from traditional schools…. learning must happen anytime anywhere.” JOE: “We also have a small challenge regarding our portals which enhance the learners to access content online”	“Learners should be in control of where they should be at what time with their work”
	ICT evaluation should evaluate technical capacity of ICT media	Evaluate specific ICT components	PKS: It needs to have basic questions like ICT-exposure, components, icons, keys.” JOE “Generation, capacity and speed of the gadget”. “If they are selling the content, curriculum specialists should assist the schools. However, if the schools have specialists they should do it themselves.” “RAM is part of that – for how quick information is processed by the ICTs, also Navigation (or how easy it is to access the content). Also software”	BDT: “It is not wise to have good content saved in a device that is value-less…so ICT experts should assist to check if devices have the capability….”
Ideal ICT-evaluation instrument should measure for cost-effectiveness, affordability of ICTs		Test for Cost effectiveness	MHL “I have learnt during COVID that all that probability is zero rated because learners may have smartphones without data bundles. We can enhance our portals to be zero-rated among all the	

FAMILY	THEMES	CODES	QUOTES	
			Individual interviews	**Focus-group interviews**
			ISPs (Internet Service Providers). I am speaking of portals like SIYAVULA.COM and the GDE content website – they should be zero-rated. The ISPs are making money. Information is there on the portals, but learners have no data.”	
			MHL “We need to have a paradigm shift because these devices are quite expensive. The small businesses that sell these devices must have a way of reducing their prices…. you can still reduce data cost but if the smartphones are still extensive it’s still a problem. Because a learner must have a device and data bundles. Affordability should be one of the criteria.	EMM: “We should rip the benefits for the money we spend…. these things are expensive. So, we need to save money where we can”
Ideal ICT-evaluation instrument should measure diverse media		Multimedia ICT evaluation	PKS “It should evaluate a variety of ICTs including devices, e-books, multimedia even ISPs”. “It should test for the lifespan of the device (3 years for tablets but may vary with other ICTs”	JRM: “The instrument should be versatile……it should screen an unlimited number of technologies….”

As derived from Table 5.13, the researcher hereunder discusses each of the themes to determine participants’ perceptions of ideal qualities of an ICT-evaluation instrument. In the first family of themes, participants generally view an Ideal ICT-evaluation instrument as synchronous, policy-based and user-friendly. Most interesting is that some participants think that an ICT-evaluation instrument should support educators to select SDL suitable ICTs as stated by participant L1 below:

> L1: “In the COVID-19 new normal life, it should seek for learner centred ICTs to cover environments like home-schooling. They should cater for online-learning. The learners should be able to study on their own in a self-paced manner. There should be versatility.”

The next theme is discussed hereunder.

5.3.3.2.1 ICT-evaluation instrument should promote synchronization

Based on some of the participants' responses, they believed that an ideal ICT-evaluation instrument should promote synchronization between and among schools. That belief is apparent in the following statements made by participant PKS and DLS:

> PKS: "There has to be a guide to create and maintain uniformity among schools"
>
> DLS: "We need to know what other schools are doing as well…yeah"

It is the researcher's perception that synchronization appeals to the focus of this study which propagates an ICT-evaluation instrument and processes that select ICTs that are suitable for SDL and support the educator in curriculum delivery. As discussed in Chapter three, section 3.4.2.2., synchronization is one of the tenets of Valiathan's Skill-driven Model. To achieve the aspired goal of synchronization, it is the researcher's view that all schools should have similar ICT evaluation criteria and MIs based on an overarching policy. To further promote synchronization, the researcher suggests that managers and educators should adhere to policy when evaluating ICTs. Furthermore, as suggested by participants PKS and DLS, the MIs within the ICT-evaluation instrument should spell synchronization. in order to assist educators to adhere to their pace setters when pursuing curricular objectives.

Based on the aforementioned findings, the researcher's opinion is that synchronization of ICT evaluation is the competence of education planners and managers so that resources are evenly distributed. In order to set an environment for synchronization, an instrument should be reliable, valid and dependable since it has to bear as objective results as possible. There should be minimal error when evaluating ICTs, the instrument should be credible and, as suggested by Nowell *et al.*, 2020:4, to a great extent, measure what it is meant for. In line with the participants' belief towards synchronization, the researcher is of the opinion that a credible instrument is dependable and consistent enough to yield similar results. This assertion is supported by the contribution of Korstjens and Moser (2018:122) regarding instrument consistency. The next section describes an ICT-evaluation instrument inclination towards educational policy.

5.3.3.2.2 ICT evaluation should be inclined to policy

Since education departmental policies guide schools, participants believe that an ICT-evaluation instrument should be policy-based or inclined.

> PKS: "Schools have ICT policies that guide them …instrument should follow that"
>
> XHS: "At workshops, some of the policies are discussed…. such could be utilized to decide on the path we should follow when doing evaluations"

The inclination of ICT evaluation towards the policy is a mandate that is implicit in various national and provincial policy documents, including the Guidelines on the Management and usage of ICTs in public schools in Gauteng (2010) and Professional Development Framework for Digital Learning (2017). As implied in chapter one, the measure inference from such policy documents is that ICT evaluation should adopt a user-centred approach due to a dedication to 'considering human as a future user of the product to improve the quality of design' (Merlo *et al.*, 2019: 197). Policy inclination tallies with this one of this study's sub-objectives to investigate whether GDE managers implement policy-based processes and procedures during ICT evaluation and selection in the FET-Phase. Without consistent policy-based MIs, education managers, evaluators and policymakers are disempowered (Chetty *et al.* 2017:3) and will not be able to select ICTs that are congruent to the objective of curriculum delivery, creating an SDL environment and implementing their respective policies. For this reason, this study seeks to develop criteria upon which ideal ICT-evaluation instrument MIs will be based. Next is a short discussion of participants' beliefs that an ICT-evaluation instrument should be concise and user-friendly.

5.3.3.2.3 ICT-evaluation instrument should be concise and user-friendly

Most participants expressed their belief that an ICT-evaluation instrument should be concise and user-friendly. By and large, participants express their frustration over a lot of administrative work and too lengthy documents and instruments.

> MHL: "Not too much administrative work"
>
> RBT: "It minimizes administrative workload like capturing after evaluation".
>
> GRP: "It must be easy to use…."

Hence the ICT-Evaluation instrument is anticipated to be brief, with instructions and MIs that are easily comprehensible. An ICT-evaluation instrument should assist educators to evaluate with minimal administrative burden. It should be concise and help educators to perform evaluations efficiently and with ease. Section 2.3.1, in chapter two of the literature review, alluded that adherence to SDL principles suggested by Knowles (1975:18) could yield a user-friendly ICT-evaluation instrument. A user-friendly instrument assists the evaluator, educator, and ICT-manager select ICTs that set a learning environment in which the learner is emancipated. Emancipation gives the learner some confidence to engage in SDL activities and build their competence (Biemiller & Meichenbaum, 2017:89) to be innovative.

> JOJ: "If easy to use, then we will be able to select computers wisely and liberate our learners to express their talent, skills and ….eh eh…. initiatives"

The next family of themes is based on participants' conviction that an ideal ICT-evaluation instrument should meet the requirements of CAPS and pedagogy. The themes are discussed hereunder:

5.3.3.2.4 ICT-evaluation instrument should test for pedagogical and curriculum soundness

As earlier alluded to, participants believe that an ICT-evaluation instrument should have MIs that deal specifically with the device or content. Participants further expressed that ICT content has to be relevant to CAPS and compatible with planned learning activities. In line with CAPS, participants believe that ICTs should consider various learners' development levels, academic achievement, ICT-skills and background.

> MHL: "It depends whether you are evaluating devices or content. Content has to be relevant to CAT (Computer Applications Technology) and what will be taught at school (CAPS)".
>
> LOU: "Our bible these days is CAPS….so it should work hand-in-hand with it"

It is interesting to learn that educators are of an opinion that an ICT-evaluation instrument should support them in selecting ICTs that are CAPS compliant, encompass pedagogies and determine teacher and learner experiences. This belief is in line with the contribution made by Adegbenro & Gumbo (2015:34) (in Chapter three, section 3.2.1.3.) that ICTs are integrated tools that should be suitable for and support the educator in a technology-enhanced or SDL environment to deliver curriculum.

An SDL environment should also encompass individual learners' level or individualized learning plans (Robinson, 2018:3). Individualization implies that a learner cannot be held back in case of content in which he/she is competent. In brief, participants believe in the decentralized, self-paced, autonomous learning mission of SDL whereby learners can learn anywhere from the traditional classroom and direct their own learning. As it was deliberated on in section 2.2.1, Chapter 2, self-paced learning is often made possible by innovativeness. Innovative learners are proactive and apply SDL in their own life-long experiences (Knowles cited by Du Toit-Brits, 2018: 376). In brief, innovativeness coupled with creativity and novelty by both the learner and educator (Kalyani & Rajasekaran, 2018:3) implies that these partners, by means of using sound ICTs that were selected via a valid, objective ICT-evaluation instrument, are liberated to create and share a well-coordinated SDL environment.

Furthermore, ICTs should be used in conjunction with other teaching aids to enhance SDL and create opportunities for learners to liberally complete their own assignments (Tondeur *et al.*, 2015:9).

> MSN: "Even though we have ICTs, it is key to be able to integrate that with other teacher support materials."

Next, is a look at the participants' perceptions regarding the capacity of ICT media.

5.3.3.2.5 ICT-evaluation instrument should test for technical capacity of ICT media

Participants have expressed a conviction that an ideal ICT-evaluation instrument should also have MIs that focus on the technical aspect.

> PKS: "It needs to have basic questions like ICT-exposure, components, icons, keys."

> JOE "Generation, capacity and speed of the gadget". "If they are selling the content, curriculum specialists should assist the schools. However, if the schools have specialists they should do it themselves." "RAM is part of that – for how quick information is processed by the ICTs, also Navigation (or how easy it is to access the content). Also software"

> BDT: "It is not wise to have good content saved in a device that is value-less…so ICT experts should assist to check if devices have the capability…."

According to participant responses above, the ICT-evaluation instrument should be used to evaluate for technical aspects such as ICT-exposure, components, icons, generation, capacity, speed, RAM, navigation, and software. It is also intriguing to learn that respondents are also concerned about the technical qualities of the gadgets upon which curriculum content will be embedded. The aforementioned participants' opinions also correlate with what was cited in section 3.2.1.1, Chapter three, that education departments need to design policies to enhance technical ICT competency, which could lower access costs and consequently stimulate user demand (Hanafizadeha *et al.*, 2019:325). As stipulated in Chapter three, section 3.2.2.5, the demand for technical competency among ICT evaluators is also key in the assessment of ICT policies in developing countries (Kumar & Best, 2007; Trkman & Turk, 2009 cited in Hanafizadeh *et al.*, 2019). The next family of themes states that an ideal ICT-evaluation instrument should measure for cost-effectiveness or affordability of ICTs. The theme in that family is discussed hereunder.

5.3.3.2.6 ICT-evaluation instrument should measure cost-effectiveness

Participants have expressed concern regarding the cost of ICTs or access to information via ICTs. At times learners do not afford ICTs or internet connectivity which poses a DD.

> MHL: "I have learnt during COVID that all that probability is zero rated because learners may have smartphones without data bundles. We can enhance our portals to be zero-rated among all the ISPs (Internet Service Providers). I am speaking of portals like SIYAVULA.COM and the GDE

> content website – they should be zero-rated. The ISPs are making money. Information is there on the portals, but learners have no data."

> MHL "We need to have a paradigm shift because these devices are quite expensive. The small businesses that sell these devices must have a way of reducing their prices…. you can still reduce data cost but if the smartphones are still expensive it's still a problem. Because a learner must have a device and data bundles. Affordability should be one of the criteria".

> EMM: "We should rip the benefits for the money we spend…. these things are expensive. So, we need to save money where we can"

From the above participant responses, it is encouraging to learn how educators regarded COVID-19 circumstances as a "learning curve" to deal with curriculum delivery. As earlier stated, most participants stated that the DD challenge was more evident during the advent of COVID-19 lockdown regulations during which learners stayed at home either without gadgets or connectivity to partake in online learning. Participants further believe that internet access should be zero-rated or as cost-effective as possible. As well Internet Service providers are challenged to be as reasonable as possible. This belief tallies with advice stated in Chapter three, section 3.2.1.1, that in order to counter situations like the DD, education departments should consider re-designing its ICT policies.

The afore-stated participant opinions are in line with the notion that ICT policies should aim at (a) enhancing ICT technical competency; (b) lowering access costs; and (c) stimulating ICT demand and interest among learners and educators, as suggested by Hanafizadeha *et al.*, 2019:325). Based on the aforementioned participant opinions and the contribution made by Hanafizadeha *et al.*, 2019:325, the researcher suggests affordability as one of the criteria used in an ICT-evaluation instrument. An ICT-evaluation instrument should have MIs that cover a broad spectrum of ICTs including ISPs and the gadget's lifespan. In the next section, participants believe that an ICT-evaluation instrument should determine the level at which educators participate in ICT evaluation

5.3.3.3 Determining the level of educator's participation in ICT evaluation

Through the second question of the interview, the researcher aimed to determine educators' perception of the level at which they participate in ICT-evaluation. The participants were asked to share their knowledge and experience regarding the current involvement of educators in the process of ICT-evaluation. Over and above the level of educators' participation, the probing question aimed to establish whether educators thought it was their responsibility or others' like managers and/or administrators. They were probed whether they thought it is the function of officials or educators and how they thought its allocation affects teaching and learning.

During the interviews, to determine the educators' perception of their level of involvement in ICT evaluation and whether it is an administrative or management function, participants were asked:

> What is your opinion regarding the level at which educators are involved in ICT evaluation processes? (Do you think it is a pure administrative or management function or should involve subject educators?).

Based on the second question of the interviews, most of the respondents thought that educators are currently not involved in ICT-evaluation. Educators' non-involvement is mainly ascribed to lack of or inadequate dissemination of ICT evaluation processes and procedures. Some thought information is only broadcast among certain officials, including District ICT evaluators, whereas it is not disseminated to educators. Others thought that only ICT members or members of School Management Teams were privileged to access ICT-evaluation information at the school level. The consequence could be evaluations done with limited objectivity and educators having a negative attitude towards ICTs selected on their behalf. Carrying negative attitudes could hamper curriculum delivery and also disempower educators to use their innovativeness and preparedness to facilitate an SDL environment. Consequently, curriculum and SDL might not be optimally achieved. However, some respondents thought that their district was gradually phasing-in involvement of educators to evaluate ICTs. Non-involvement of educators could be due to a lack of directive or intrinsic motivation (Azeez *et al.*, 2019:20) and could also hamper curriculum delivery and disempower educators to use their innovativeness and preparedness to facilitate an SDL environment.

As implied above, the possible consequence of educators' non-involvement in ICT could be detrimental. Participants think that educators, the knowledgeable techno-pedagogues (Sasirekha & Sasthya, 2017: 249), are better positioned to be part of evaluation teams. This notion is that because educators are stationed at schools and are therefore directly involved in the learning environment and have a detailed understanding of the needs of their social collaborative partners, the learners. Once appropriately managed, this pedagogical partnership, which is particularly crucial in the twenty-first century (McCreadie, 2020:155; Toh & Kirschner, 2020:6) yields outcomes that are "both personally meaningful and socially worthwhile" (Garrison, 1997).

Participants are of the view that educators should participate in ICT evaluation. That view is supported because, as pointed out in Chapter two, section 2.2.2., the educator is the one who utilizes ICTs to create and maintain a balanced learning environment to support the learner to become more self-directed (Beckers *et al.*, 2018). Some participants think that even though the participation of educators in evaluation is key, district and school management should take the lead in the process. However, the researcher's opinion is that in order to involve the educators, such leadership in ICT evaluation should be done in a socially collaborative manner. As explained in section 2.4.3.2, Chapter two, social collaboration is not a mere information sharing but complex process that requires commitment of time, resources and a joint high-level decision making for the partners (Wu & Chiu, 2018:6). Overall, educator participation in evaluation would imply emancipation to execute their relevant teaching and learning obligations (Vahedi *et al.*, 2019:4).

To further argue for educator involvement, participants generally feel that ICT-evaluation without educators would result in selection of ICTs that do not address the needs of the end-users. The primary need for the end-user is associated with curriculum delivery goal achievement which should include self-direction of the learning environment. If the user needs are not addressed, the consequence would be futile expenditure. Participants also think that educators should be trained to be competent in ICT evaluation. To be trained successfully, educators are required to, as the starting point or keystone, be intrinsically motivated, be self-directed and have minimal technophobia (Van Deursen & Van Dijk, 2010:4).

Table 5.14 (below) depicts themes, codes and quotes that are associated with participants' perceptions of the involvement of educators in ICT-evaluation. The purpose of this table is to illustrate participants' views, some of which were expressed in the quotes (verbatim) and used to construct some codes. The codes were utilized for development of themes which were conglomerated into families of themes. The themes were therefore used in a deliberation that follows to analyse and portray educators' perceptions and responses when asked whether they thought educator involvement in ICT evaluation was important. Such an analysis was useful to form part of the formulation of conclusions and recommendations to be presented to the GDE. These recommendations could assist ICT managers and evaluators to consider when developing ICT evaluation policies and processes in the future. If educators were marginalised be it partially or in full, the GDE could consider involving them in order to add value to the process of ICT evaluation.

Table 5-14: Themes, codes and quotes associated with participant's perceptions of involvement of educators in ICT-evaluation

FAMILY	THEMES	CODES	QUOTES	
			Individual interviews	**FOCUS-GROUP INTERVIEW**
Social collaboration among all role players for authentic ICT-evaluation	ICT-evaluation requires social collaboration	ICT evaluations at all levels	EMM: "When schools have to evaluate ICTs, district, ICT and school management must all be involved."	**TBE**: "I don't know about other schools but at our school, only ICT members are notified about these things. I think they take it as their own function."
		SMT and School ICT committees are key	MHL: "When schools have to evaluate ICTs, district, ICT committee and school management must all be involved" "The school ICT committee needs to play a part of curriculum evaluation part".	
		Evaluation is an e-Learning and Curriculum specialist competence	RBT: "…. must be CAPS aligned…. that only applies to ICTs loaded with content" MHL: "…As e-learning facilitators we are not subject-specific. Curriculum specialists will cater for curriculum content quality. We deal with the gadget so will stay on the GENERIC instrument".	JZZ: "We need to have a matrix team to evaluate ICTs"
	Curriculum expertise is key in ICT evaluation	Consultation with subject advisors	TSM: "There needs to be some form of consultation with Subject advisors because we, as e-learning facilitators are not curriculum specialists".	SBT: 'Who can we be without subject advisors, …I mean they should take a lead."
ICT evaluation procedures should include and emancipate educators and avoid imposition	Inclusive, liberal ICT evaluation procedures	Educators should not be marginalized	EMM: "The educators are not involved. I don't want to talk politics. Some things are just being more political. Sometimes uses a lot of money in terms of budget to buy ICTs for schools without the educators' input to say what kind of gadgets they need."	**GRL: "**To be honest, ehhhhh, it has been years since we were officially notified. I would say no it is not well broadcast".
		ICTs should not be imposed	RBT: "…So, in other words actually, those ICTs are being imposed on them	**RLT:** "Not very good broadcasted. We sometimes but not

FAMILY	THEMES	CODES	QUOTES	
			Individual interviews	**FOCUS-GROUP INTERVIEW**
			without considering whether they have training or not. Training comes after……”	always get officially notified about ICT evaluation processes through e-mails. MML: “Of course, it is well-broadcast. Yes, we get notified about ICT evaluation processes very often via e-mails.”
Knowledge and experience of subject educators and advisors is key	Educator’s ICT evaluation experiences and knowledge are key for ICT evaluation	Utilize educator’s skills	RBT: “I think educators should be involved in order to decide on what to purchase based on their skills audit instead of being given ICTs that they cannot use or content that is not relevant”.	TRN: “Training should come high in the hierarchy…”

As derived from Table 5.14, the researcher hereunder discusses each of the themes to determine participants’ perceptions of the involvement of educators in ICT-evaluation. In the first family of themes, participants generally argue for the vitality of social collaboration among all role players for authentic ICT-evaluation. Some educators think that they are being purposely marginalised from taking part in ICT-evaluation. As stipulated in Chapter one, section 1.3, for meaningful evaluations, educators, the knowledgeable techno-pedagogues (Sasirekha & Sasthya, 2017:249) should be involved in a socially collaborative manner to partake in ICT evaluation. The rationale for their involvement was that they are in contact with the learner, the primary client of the GDE whose learning needs are priority. Besides, educators are also end-users and need to be included in the joint high-level decision-making (Wu & Chiu, 2018:6) regarding ICT evaluation and selection.

Such suspicions are clearly divulged by EMM below:

> EMM: “The educators are not involved. I don’t want to talk politics. Some things are just being more political. Sometimes uses a lot of money in terms of budget to buy ICTs for schools without the educators’ input to say what kind of gadgets they need.”

Each theme is discussed hereunder.

5.3.3.3.1 ICT evaluation requires social collaboration

The popular idea among participants is that evaluation should be done by all stakeholders, including district officials, school ICT committees and school management.

> EMM: "When schools have to evaluate ICTs, district, ICT and school management must all be involved."

> MHL: "When schools have to evaluate ICTs, district, ICT committee and school management must all be involved" "The school ICT committee needs to play a part of curriculum evaluation part".

However, the concern is regarding inequitable or inadequate dissemination of information which might vary from school to school. Overall and irrespective of its severity, inadequate dissemination of information would negatively impact educators' attitudes towards selected ICTs. Consequently, that could slacken their utilization of ICTs and even discharge their innovativeness to facilitate an SDL environment. As a consequence, achievement of curriculum, pedagogical and SDL objectives could be hampered. Inequitable and inadequate dissemination of information could also marginalize the most revered knowledgeable techno-pedagogue from making contributions towards ICT evaluation.

> TBE: "I don't know about other schools but at our school, only ICT members are notified about these things. I think they take it as their own function."

Based on the above-stated opinions, ICT evaluation is both an e-Learning and Curriculum specialist competence. This argument is in line with the assertion that for a sound ICT evaluation and selection to adequately reach curriculum and SDL goals, there should be social collaboration (intrapersonal, interpersonal and interconnections) (Du Toit-Brits, 2015:54), in every task performance (Svilla, 2014:36). As advocated in section 3.4.1, Chapter three, whilst performing their tasks, stakeholders need to maintain their focus and consider the learner's needs, the GDE's most valued client. Achievement of the learner's needs is made possible if curriculum is adequately delivered and the educator has set an SDL environment.

Furthermore, as implied in section 3.5.1.1., Chapter three, based on GCM (Du Toit-Brits, 2015; Garrison 1997), task performance requires task control related to self-management (Zhu et al., 2020:4). In the context of this study, ICT evaluation activities, for instance, utilizing an objective instrument, are regarded as task performance. The conscious decision to select those activities for the execution of specific tasks is regarded as task control (Kalanthroff *et al*., 2017:603). Also, in this context, self-management focuses on the social aspects of ICT evaluation. To further apply GCM in context, the social aspects of ICT evaluation involve social and behavioural implementation of intentions, enactment of goals, management of resources, and support to given to evaluators. The implication of social collaboration during ICT evaluation implies that stakeholders engage in a transactional (collaborative) control of external tasks and activities (Du Toit-Brits, 2015:54; Garrison, 1997) in which they work as a matrix team and support one another in the process. As a consequence, social collaboration could cause a balanced synchronization of activities relating to ICT evaluation in which all the stakeholders play a role and take ownership of the process. The keystone is for educators, the knowledgeable techno-pedagogues, to be involved in ICT evaluation or even take leadership since they are the ones who should utilise selected ICTs to deliver the curriculum and SDL goals.

JZZ: “We need to have a matrix team to evaluate ICTs”

The identified ICT stakeholders include office-based and school-based managers, planners, curriculum facilitators/ educators as well as ICT or e-learning facilitators.

The perception mentioned above of the significance of educator participation in ICT evaluation is congruent to this study’s philosophy paradigm, a combined Functional Pragmatism and Interpretivism. To illustrate the congruence, the core conviction of the interpretivist paradigm is that reality is socially constructed, valuing participants’ views, shared meaning and joint action to establish what works optimally in practice (Juuti et al., 2016:38). Thus, derived from the aforementioned convictions, one could stress that ICT policies, processes and procedures are only optimally valid and useful when socially constructed with stakeholders. However, social collaboration alone could be in vain if the participants’ views are disregarded. Hence the author of this document’s view is that educators should not only be socially collaborative to add numbers but their views are of utmost significance to ICT evaluation policy formulation. A shared, common meaning of what ICT evaluation entails and how it should be implemented is significant to increase synchronization. Synchronous action is key because, as stated in functional pragmatism, the life-world of human beings is influenced by action, a constant becoming, change and understanding of democracy (Dewey, 1998:3; Frega, 2019:3; Goldkuhl, 2012:7) – action in order to change the plain of ICT evaluation and selection.

Based on the participants’ opinions and rooted in this study’s philosophical convictions, meaningful ICT evaluation is more practical provided education managers socially collaborate with educators who are tasked with curriculum delivery. Once more, as outlined in section 1.3, Chapter one, it is being reiterated that an educator is the ideal knowledgeable techno-pedagogue (Sasirekha & Sasthya, 2017: 249) who frequently socially interacts with the learner. If ICT-evaluations are done in a socially collaborative partnership towards a common goal (Tan & Liu, 2017:245), intended outcomes are potentially achieved. The main intended outcome in the ICT evaluation is to select and approve ICT media that optimally meet the needs of the educator. The educator needs are primarily to be offered support in order to effectively deliver curriculum and facilitate SDL activities to the benefit of the learner. The learner needs to be liberated in order to (a) display innovativeness and (b) decide on own needs, objectives and learning outcomes in a learning environment. As it was earlier declared that an educator, whether office or school-based, is the knowledgeable techno-pedagogues (Sasirekha & Sathya, 2017:266), the next section deals with the significance of curriculum expertise when ICT evaluations are done.

5.3.3.3.2 Curriculum expertise is key to ICT evaluation

According to the participant's perspective, curriculum specialists are associated with and should bring their CAPS or curriculum-related expertise to assist in ICT evaluation. Participants are of the view that curriculum specialists' role is more prominent in the case of ICTs that are loaded with content.

> "There needs to be some form of consultation with Subject advisors because we, as e-learning facilitators are not curriculum specialists".
>
> SBT: "Who can we be without subject advisors, …I mean they should take a lead."

This view correlates with this study's envisaged deliverable cited in Chapter one, section 1.2, to produce a pedagogical instrument to evaluate and select ICTs that, among other things, satisfy the CAPS and pedagogies.

> YEB: "Yes, I also think that we should re-emphasize the importance of sticking with our CAPS, …so our district curriculum subject experts must not be marginalised".
>
> RBT: "…. must be CAPS aligned…. that only applies to ICTs loaded with content"

Based on literature, such satisfaction is reached when pedagogies optimally determine educator needs (Deshmukh *et al*., 2019:1649) and student experiences in the technology-enhanced learning environments (Adegbenro & Gumbo, 2015:34). The statement mentioned above is in unanimity with an ideal put forward in section 1.4, Chapter one, that evaluations are done to determine whether selected ICTs are suitable, meet user needs (Jones *et al*., 2018:231) and compare with other products in the global market and economies (Lee, 2019:9). The outmost user needs are met when the stage is set for the learner to set his or her own learning goals and engage in a transactional social collaboration with the educator to negotiate task identification and execution (Zhu *et al*., 2020:28).

On the inverse, participants associate e-Learning facilitators with an evaluation of ICT content that is not subject-specific, the technical aspect. Participants thus suggest that e-Learning facilitators should engage in a transactional social collaboration with subject advisors or curriculum specialists in order to negotiate task identification and execution.

> MHL: "…As e-learning facilitators we are not subject-specific. Curriculum specialists will cater for curriculum content quality. We deal with the gadget so will stay on the generic instrument".

In relation to this study, both the e-learning and subject advisors are key in order not to compromise curriculum or content relevance and technical nature of ICT media. This transactional social collaboration is recommended as a mechanism to alleviate so-called 'grey areas' in ICT evaluation. During the transaction, the deal is for curriculum specialists to focus on content and leave the technical aspect to e-learning specialists. However, educators could master both when offered relevant training and skills. It is key for educators to be able to evaluate ICTs for curriculum soundness and also comprehend the capacity and compatibility of ICT media. ICT media should be compatible with existing infrastructure and available software applications (e.g. they should have skills to download applications). Thus, an ICT-evaluation instrument should carry both curriculum and technical MIs.

The next family of themes is that ICT evaluation procedures should include and emancipate educators and avoid imposition. The themes are discussed hereunder:

5.3.3.3.3 Inclusive, liberal ICT evaluation procedures

As it was elucidated in Chapter one, section 1.3, the based on reviewed literature the thrust is generally that since educators have knowledge and experience of working directly with learners, they should not be marginalised in the process of ICT-evaluation, selection and approval (Chetty, Qigui, Gcora, Josie, Wenwei & Fang, 2017:9; Sasirekha & Sasthya, 2017:249). From interview responses, it is therefore worrying to discover that some participants believe that educators are either not involved or purposively marginalised when evaluations are done. Marginalization of educators could harm the evaluation process and even risk acceptance of ICTs that do not fit the suitable pedagogical approaches such as SDL and curriculum delivery in the learning environment. Instead participants believe that educators should be liberated to participate fully in ICT evaluation. Following are some of the participant responses:

> EMM: "The educators are not involved. I don't want to talk politics. Some things are just being more political. Sometimes uses a lot of money in terms of budget to buy ICTs for schools without the educators' input to say what kind of gadgets they need."

> GRL: "To be honest ehhhhh, it has been years since we were officially notified. I would say no it is not well broadcast".

As stated in Chapter three, section 3.2.2.4, due to lack of training and ICT knowledge, some educators may not be comfortable utilising modern ICTs. The researcher believes that lack of ICT skills could serve as a reason for marginalization. Furthermore, as implied by Mubarack and Nycyk (2017), marginalization could worsen the effect of the DD. The researcher's opinion is that since it has been ascribed to hindrance of educational progress (Ragnedda, 2017:4), (Chapter three, section 3.2.2.2.1), worsened DD could also potentially hinder ICT evaluation. If not comfortable using ICTs, educators might resist participating in evaluations to offer their revered inputs. Based on the participants' responses, there is a general thought that marginalization of educators is not acceptable. This thought is supported since marginalization of educators could have a negative impact on ICT evaluations, lead to wasteful expenditure and impair intended outcomes of e-supplying ICTs to schools. E-supply is intended to balance supply and demand in the ever-changing, dynamic twenty-first-century information-age milieu (Hadini, Trifess & Rifai, 2020:2). Consequently, delivery of curriculum and support to educators to create an SDL environment could also be hampered.

Furthermore, participants believe that an SDL-driven educator should be liberated to actively use his innovativeness when guiding learners towards self-directedness. Based on literature, the participants' views are in line with the views of Kalyani and Rajasekaran (2018:24) that a twenty-first century educator needs to be emancipated to optimally execute relevant teaching and learning obligations. The researcher suggests that once emancipated, the SDL-driven educator can take ownership of his/her curriculum implementation as well as other pedagogical tasks such as ICT evaluation. The next family of themes are that the knowledge and experience of subject educators and advisors is key. The themes are discussed hereunder:

- **Educator's ICT evaluation experiences and knowledge are key for ICT evaluation**

The general thinking among participants is that educators' evaluation experience and knowledge are key in evaluation. The general feeling is that since they will be expected to utilize the ICTs as end-users, educators need to contribute their skills, knowledge and evaluation experience and be part of the decision-making when evaluations are done.

> RBT: "I think educators should be involved in order to decide on what to purchase based on their skills audit instead of being given ICTs that they cannot use or content that is not relevant".

Participants are also of an opinion that educators need to be trained on ICT -evaluation, -selection, -approval and -utilization.

> TRN: "Training should come high in the hierarchy…"

Thus this study's adoption of the interpretivist philosophical conviction that truth and knowledge are prejudiced and culturally and historically positioned, based on people's experiences and their comprehension of them (Ryan, 2018:8; Thanh & Thanh, 2015:24) as expressed in section 4.3.1.2, Chapter four. The participants described above' beliefs reinforce these convictions as they uphold the educator's knowledge, background and experiences in what may be termed symbolic interactionism (Cowling, 2016:53).

5.3.3.4 Determining characteristics or components of an ICT-evaluation instrument

By posing the third interview question, the researcher endeavoured to obtain participants' suggestions regarding characteristics of an ideal ICT-evaluation instrument. Participants were probed to consider anything that comes to their minds pertaining to the outlook, sections to be covered, types of questions or MIs, curriculum relevance, scoring system etc. During the interviews, to obtain suggestions regarding characteristics of an ideal ICT-evaluation instrument, participants were asked:

> Describe characteristics that could be vital for an ideal instrument for ICT evaluation. (Consider anything that comes to your mind: Its outlook, sections to be covered, type of questions, curriculum relevance, scoring system etc.).

Based on the third question of the interviews, most of the participants thought that an ideal instrument should have MIs that (i) are based on policy, ii) test compliance with specific technical specifications, iii) are quantitative but allow evaluators to give comments and are iv) are congruent with ICT-skills development programmes.

The following discussions addressed the above-stated suggestions by participants. First, a foundation for policy-baseness of ICT-evaluation was laid in chapter one of this work which refers to some policy documents, including the GMUIP (2010) and PDFDL (2017). These policy documents stress a user-centred ICT approach (Merlo *et al.*, 2019:197) and influence by institutional and moral norms rather than personal preferences (Lamb & Kling, 2003:212; Rossi, 2016). It should, at this point, be reiterated that although ICT-evaluation was mentioned in policy documents, there was no evidence of explicit criteria and instrument. The author of this document's opinion is that absence of ICT evaluation criteria and instrument could negatively affect the rationale for selecting ICTs for schools. Besides, if evaluators are guided by an ICT-evaluation instrument they are likely to select ICTs with confidence and synchronously with their peers within the GDE. Having MIs covering technical competency is meaningful since education departments' ICT policies mostly aim to enhance it (Hanafizadeha *et al.*, 2019:325). Participants mainly stressed for a concise, user-friendly ICT-evaluation instrument with mainly quantitative MIs. Participants also stressed ICT-evaluation MIs that are congruent with ICT-skills development programmes. This would be a way to curb the DD which could deter ICT-related progress (Zilka, 2020:234) and consequently hinder or impair curriculum and SDL objectives delivery. As formerly cited in Chapter three, section 3.2, society continuously responds with a surge in ICT skills and users to counter the DD (Chetty, Aneja, Mishra, Gcora & Josie, 2017:15).

Table 5.15 (below) depicts themes, codes and quotes associated with participant's perceptions of ideal characteristics of an ICT-evaluation instrument. The purpose of this table is to illustrate participants' views, some of which are expressed in the quotes (verbatim) and used to construct some codes. Codes were utilized for development of themes which were conglomerated into families of themes. The themes were therefore used in a deliberation that follows to analyse and portray educators' perceptions and responses when asked about characteristics they thought should be possessed by an ICT-evaluation instrument. An ICT-evaluation instrument is meant to support the evaluator to select ICTs that are sound for inclusion in the education system. Such an analysis was useful to form part of the formulation of conclusions and recommendations to be presented to the GDE. These recommendations could assist ICT managers and evaluators to consider when developing criteria and MIs for an ICT-evaluation instrument.

Table 5-15: Themes, codes and quotes associated with participants' perceptions on ideal characteristics of an ICT-evaluation instrument

FAMILY	THEMES	CODES	QUOTES	
			individual interviews	Focus-group INTERVIEWS
Policy-based criteria and specific Measurement Indicators	An ICT-evaluation instrument should test for capacity of ICT Media	Gadget functional technical potentials	MHL: "….test for generation, capacity and speed of the gadget….". MHL: "It should test for the lifespan of the device (3 years for tablets) but may vary with other ICTs" RBT: "It needs to have basic questions like ICT-exposure, components, icons, keys."	JLB: "These days ICTs should have a certain speed…. not speed only but it should fit in with developments and have resistance…eh I mean in terms of new developments…"

FAMILY	THEMES	CODES	QUOTES	
			individual interviews	**Focus-group INTERVIEWS**
ICT-evaluation instrument should test for and comply with technical specifications	MIs should integrate both soft and hardware	Soft and hardware MIs	MHL: “It lists the minimum requirements of software and hardware (e.g. smart board, server and teacher laptop for a smart classroom).”	HNY: “I think both software and hardware work hand-in-hand, so they should be evaluated before we accept the media” JDS: “Software is important to help us teach new innovations…. hardware is secondary bit also important”.
			EMM: “…. should evaluate hardware e.g. icons, buttons and software”	
	Selected infrastructure should be compatible	Compatibility and usability	PKS: “evaluate if ICTs compatible to infrastructure at the school”	ZWL: “Some of these ICTs are dumped at schools which are not ready because they do not have laboratories” LKH: “What worries us is that some of these laboratories were set up and never used and by the time we know how to use them, new ICTs will be in place and may not work hand-in-hand with the laboratories, then money will have been wasted”
	Instruments audits training levels of users	ICT training levels	“The instrument should test the teachers’ level of technological skills”	JDY: “The instrument has to have the capability to check if the teacher himself can use new technologies” “….how best the instrument should support educators if they lack skills in ICT.”

FAMILY	THEMES	CODES	QUOTES	
			individual interviews	Focus-group INTERVIEWS
ICT instrument should contain quantitative Measurement Indicators and provide for narrative descriptions.	An ICT-evaluation instrument should have quantitative Measurement indicators	Mostly quantitative MIs	EMM: "Majority of the questions of the ICT-evaluation instrument should be closed questions and it should provide for narrative descriptions as well)". "…but Should have commentary section"	HNG: " I prefer to work with short questions and give short answers….to spare my time".
ICT-evaluation should be congruent with ICT skills development programmes	ICT-evaluation instrument should cater for ICT skill audit and development	Learner-centred MIs	RBT: "It should take into cognisance the different learners' level of development, achievement and ICT-skills (skills ladder), background…...and progression"	LSY: "Learners are primary in what we do in class, …so the ICTs should not leave them behind"
		MIs measure ICT-Skills	RBT: "The government should have considered the ICT-skills level of educators"	JLB: "I think all educators in the GDE must have a certain training in ICTs"
	ICT-evaluation instrument should be electronic	User-friendliness	EMM: "Better an electronic version because it is easy to analyse results online"	ANG: "At this age, we don't want to be chopping trees much. We need to be electronic"
	There should be a section on resource management by users	Resource management	PKS: "…should also provide for management of resources.."	EDG: "…it is still the educator's responsibility to either provide for resources or encourage them (learners) to look for such" HNS" "These days, new resources are obtainable on the internet. Our learners should be guided on how to do that"

As derived from Table 5.15, the researcher hereunder discusses each of the themes to determine participants' perceptions regarding the ideal characteristics of an ICT-evaluation instrument. In the first family of themes, participants generally argue that an ideal ICT-evaluation instrument should possess policy-based criteria and MIs. Participants also stress dynamism of an ICT-evaluation instruments as stipulated by participant JLB below:

> JLB" "These days ICTs should have a certain speed…. not speed only but it should fit in with developments and have resistance…eh I mean in terms of new developments…"

Each theme within that family is discussed hereunder.

5.3.3.4.1 An ICT-evaluation instrument should test for capacity of media

Generally, participants propose that an ICT-evaluation instrument should test for the technical capacity of ICTs. Technical ICT potential includes generation, capacity, speed as well as the lifespan of an ICT medium. The suggested average life span of ICT gadgets such as tablets, laptops and desktops is three years.

> MHL: "….test for generation, capacity and speed of the gadget….".
>
> MHL: "It should test for the lifespan of the device (3 years for tablets) but may vary with other ICTs"
>
> RBT: "It needs to have basic questions like ICT-exposure, components, icons, keys."
>
> JOJ: ""These days ICTs should have a certain speed…. not speed only but it should fit in with developments and have resistance…eh I mean in terms of new developments…"

As highlighted earlier in Chapter one, section 1.3, the proposal of hardware evaluation is in line with the guidelines for selecting hardware included in "Guidelines for Schools: ICT Hardware Specifications" issued by the National Department of Education, and available on the Thutong website (GMUIP, 2010:24). Appeal for hardware to be evaluated tallies with the first and second steps of ICT-implementation plan proposed by Cabonara (2005:14) that were discussed in section 1.4.2, Chapter one. In the first step, accessibility is to ascertain hardware availability and the second step, connectivity, inquiries whether schools with hardware have internet connectivity. Hardware availability implies sufficient ICTs for educators and learners to optimally undertake their curriculum and SDL activities. However, logically, without accessibility and connectivity, evaluation would not be practically feasible. Having those ICTs could be near futile since in the twenty-first century most educational materials are available online. Thus, having either hardware availability or connectivity without the other would be inadequate. In the next family of themes, participants generally argue that an ideal ICT-evaluation instrument should test for and comply with technical specifications. Each theme within that family is discussed hereunder.

5.3.3.4.2 Measurement indicators should integrate both software and hardware

Furthermore, still regarding the technical aspect, participants believe that MIs on the ICT-evaluation instrument should integrate both software (e.g. applications) and hardware such as smartboards, servers, laptops, tablets as well as desktops. Integration of software and hardware is also implied by accessibility and connectivity steps (Carbonara, 2005).

> MHL: "It lists the minimum requirements of software and hardware (e.g. smart board, server and teacher laptop for a smart classroom)."
>
> HNY: "I think both software and hardware work hand-in-hand, so they should be evaluated before we accept the media"
>
> JDS: "Software is important to help us teach new innovations…. hardware is secondary bit also important".

Based on these opinions, one may state that there is congruency with what the researcher proposed in section 1.4 for in an evaluation instrument that will also assist evaluators in optimally selecting ICTs that are compatible with the demands of the digital age by being durable and compatible with software updates. One of the popular demands to alleviate the intensity of the dreadful digital divide which could impair teaching and learning strategies, is gender-neutral educational software that also appeals to girls as much as it is currently the case with boys (Cunningham *et al.*, 2016:4).

5.3.3.4.3 Selected ICTs and infrastructure should be compatible

Participants further suggest that the ICT-evaluation instrument should measure whether there is compatibility and usability between or among ICTs and the school's infrastructure.

> ZWL: "Some of these ICTs are dumped at schools which are not ready because they do not have laboratories"
>
> LKH: "What worries us is that some of these laboratories were set up and never used and by the time we know how to use them, new ICTs will be in place and may not work hand-in-hand with the laboratories, then money will have been wasted"

These views challenge education managers, planners and policy makers to evaluate compatibility and follow up on the end-users' optimal utilization of ICTs and relevant infrastructure. The implication is that an ICT-evaluation instrument should be armed with a section dealing with compatibility of ICTs. That section should have MIs derived from relevant criteria that specifically address compatibility. It also means that prior to selecting new ICTs, existing ICTs and their capacities should be evaluated in preparation for utilization in conjunction with new ICTs.

5.3.3.4.4 Evaluation instrument should audit training level of users

In this regard, participants generally feel that an ICT-evaluation instrument should have MIs that allow an audit of the ICT training level or skills in order to offer support to the educators as orchestrators of the evaluation process. This implies that educators value skill development to equip them with means to manipulate and utilize ICTs to select other media as well as to deliver curriculum in the learning environment. The basic MIs should include, amongst other things, ICT-exposure of the end-users, both educators and learners.

> AUB: “The instrument should test the teachers’ level of technological skills”
>
> JDY: “The instrument has to have the capability to check if the teacher himself can use new technologies”
>
> AUB: “…. how best the instrument should support educators if they lack skills in ICT?”

The above perceptions are in line with what was stipulated in section 3.2.2.2, Chapter one, that ICT skills including software installation, web design software, creating a database using MS Access and electronic resources for teaching and necessary skills e-mail and Internet (Adegbenro, *et al.*, 2017:79), should be developed among evaluators in various education departments. A further ICT skills list includes instrumental skills, structural skills, strategic skills, operational internet skills, traditional internet skills, information internet skills and strategic internet (Steyaert (as cited by Lavrynenko, *et al.*, 2018:5); Van Deursen & Mossberger, 2018:127). To meet those suggested qualities of an ideal ICT-evaluation instrument, some MIs of the ICT-evaluation instrument should test for ICT skills mentioned above. In the next family of themes, participants generally argue that an ideal ICT-evaluation instrument should contain quantitative MIs but also provide for narrative descriptions. Each theme within that family is discussed below.

5.3.3.4.5 An ICT-evaluation instrument should contain quantitative measurement indicators

Participants believe that an ideal ICT-evaluation instrument should mostly contain more quantitative MIs than qualitative ones. In line with this belief, participants further suggest that the majority of the MIs in the ICT-evaluation instrument should be in the form of closed questions. To add detail, some participants proposed that a brief narrative section be provided on the instrument for comments or remarks by evaluators. In addition, some of the participants expressed their thought that the MIs of the ICT-evaluation instrument should be quantified through a weighting system.

> EMM: "Majority of the questions of the ICT-evaluation instrument should be closed questions and it should provide for narrative descriptions as well".

> CHS: "…but Should have commentary section"

> HNG: "I prefer to work with short questions and give short answers….to spare my time".

As proposed in Chapter one, section 1.8.2, an ICT-evaluation instrument serves as a concise tool that bears qualitative and quantitative features to assist evaluators, managers, educators and other stakeholders to decode which ICTs to procure for the classroom. As alluded to in section 3.4.2, MIs may be expressed in a quantitative form (Popovic *et al.*, 2017:11). In the next family of themes, participants generally argue that an ideal ICT-evaluation should be congruent with ICT skills development programmes. Each theme within that family is discussed hereunder.

5.3.3.4.6 ICT-evaluation instrument should be in an electronic form

Participants were asked to declare their preference of either an electronic or printed or paper-based ICT-evaluation instrument. Most argued for a user-friendly, electronic ICT-evaluation instrument.

> EMM: "Better an electronic version because it is easy to analyse results online"

> ANG: "At this age, we don't want to be chopping trees much. We need to be electronic"

When asked to justify their preference for the electronic version, most participants stated their belief that it would be easier and faster and would simplify an analysis of results.

> EZR: "As some colleagues have expressed it, we do not have time. We cannot afford too much administrative burden…so I prefer a system that is short and to the point. The lesser the administrative burden, the more we will have that enthusiasm to work with the instrument"

In the next family of themes, participants generally argue that an ideal ICT-evaluation instrument should extensively cover the CAPS curriculum and SDL strategies. Each theme within that family is discussed hereunder.

5.3.3.5 Determining means to integrate ICT-evaluation instrument into curriculum

By means of the first part of the fourth question of the interview, the researcher aimed to determine the educators' perceptions of how an instrument could be harmoniously integrated in curriculum processes implementation. The participants were asked to share their knowledge and experience regarding the best means by which an ICT-evaluation instrument could be integrated with curriculum implementation.

Over and above this, participants were probed to consider how integration would guide educators to perform a selection of ICTs in harmony with pedagogical activities as suggested in the CAPS. During the interviews, to determine the educators' perceptions of how they think an instrument could be harmoniously integrated with curriculum processes implementation, participants were asked:

> How do you think an instrument could be harmoniously integrated in curriculum processes implementation? (Consider how it will guide selection of ICTs that are harmonious with the pedagogical activities as suggested in the CAPS).

Based on the first part of the fourth question, the general trend among the participants' responses was advising to include subject advisors as curriculum specialists. However, participants were asked to share their knowledge and experience regarding factors to be considered to ensure that an ICT-evaluation instrument supports evaluators in their duties to select ICTs that are pedagogically sound.

Participants largely specified that an ICT-evaluation instrument should contain indicators that cater for learners' different abilities as established in CAPS. Similar to what was pointed out in Chapter two, section 2.4.4, participants expressed that ICTs selected via the instrument should emancipate end-users, particularly the learner, to perform different learning tasks with limited interference (Lai, 2015). Whereas ICTs are key, learners' performance emancipation to perform learning tasks does not mean that the educator should abdicate pedagogical responsibilities (Lemmetty & Collin, 2016:59). The participant's views regarding the emancipation of end-users could be supported with the self-management dimension of 'enactment of learning' in the model of Garrison's three dimensions of SDL, the GCM.

Also, participants are for the idea that selected ICTs should accommodate diverse developmental levels. The general thought is that MIs should clearly define that ICTs should promote SDL and allow learners to work in various learning environments (Horn & Stalker, 2017) whereas they plan their objectives and intended outcomes. In those various learning environments, the second dimension of the model by Darkish (2008:18) applies where ICT-rich pedagogies and learning environments are suggested for implementing both traditional and new pedagogies in ICT-integration. The intention is that the educator should lead the learner to be more self-directed to meaningfully select or integrate ICT resources (Beckers *et al.*, 2018). In SDL, the educator is expected to integrate classroom ICTs to support the learner outside the traditional classroom (Khaloufi & Laabidi, 2017:57).

Participants also confer that selected ICTs should promote progression and integration between grades within the phase. Participant B1 makes the following assertion regarding progression and integration:

> **B1:** "It should take into cognisance the different learners' level of development, achievement and ICT-skills (skills ladder), background…...and progression".

> **ANG:** "…. especially this integration could save…. we will only buy media once after years…each child using what they were allocated in the previous grade".

Integration within a phase is argued to be useful and cost-effective since ICTs will be useful for the entire suggested three-year lifespan. As alluded to earlier in Chapter one, section 1.4, continuity and progression were stated as subject-specific areas of an ideal ICT-evaluation instrument. Lastly, participants proposed that to promote integration and multinationalism, selected ICTs should be suitable for learning different subjects and not limited to one subject only.

In addition to the above, participants proposed that the ICT-evaluation instrument should test for relevance of diagrams and illustrations and how these correspond with learners' cognition.

> CLD: "It would be monotomous to have text only. It should be supported with diagrams".

> SKN: "Yes. White space is developmental ….so diagrams break that monotomy".

This is in par with what was thrashed out in section 2.4.2, Chapter two, that once evaluated and approved, ICTs should enable learners to self-initiate learning activities that support their cognitive development (Toh & Kirschner, 2020:9). SDL approach is, amongst other things, characterised by metacognition, a shift from the teacher-oriented approach to a twenty-first-century learner-centred approach (Mok & Mo, 2018; Tan *et al*., 2017). Metacognition refers to involvement of the learner in ICT resource selection. In that process, the learner is supported by the educator in social collaboration with others, including peers. This presents the educator with an opportunity to assume various roles and support the learner towards self-directedness.

Participants further stressed that ICTs should also cater for different assessment types such as continuous and summative assessment. Assessment should be an interactive process with feedback to the learner. Self-assessment is meant for the learner to decide on own learning outcomes (Siminica & Dumitru, 2013:121), and assessing individual competency-needs (Sumuer, 2018:30) is implied. In addition to the above-stated, some participants believed that illustrations and diagrams used should also be sensitive to local context group dynamics, including culture, religion or tradition.

As was alluded to earlier in Chapter one, section 1.3, in order to successfully integrate ICTs selected upon evaluation using a valid instrument, for curriculum implementation, the teacher should be equipped with Technological Knowledge, Pedagogical Knowledge, and Content Knowledge (TPACK) (Zhang, *et al*., 2019:4). To successfully integrate ICTs, the teacher should strike a balance between pedagogical repertoire (a stock of pedagogical skills) and ICT selection skills (based on the crafted ICT-evaluation criteria and MIs) (Huizinga, *et al*., 2014:38). Such a balance would imply that the educator is adequately equipped and skilled as an evaluator and a self-directed curriculum delivery agent.

Table 5.16 (below) depicts themes, codes, and quotes associated with participants' perceptions of how an ICT-evaluation instrument should be integrated with curriculum implementation. The purpose of this table is to illustrate participants' views, some of which are expressed in the quotes (verbatim) and used to construct some codes, which were utilized for the development of themes which were conglomerated into families of themes. The themes were therefore used in a deliberation that follows to analyse and portray educators' perceptions and responses when asked how an ICT-evaluation instrument should be integrated with the curriculum. Such an analysis was useful to form part of the formulation of conclusions and recommendations to be presented to the GDE. These recommendations could assist ICT managers and evaluators to consider when training evaluators and educators so that they could optimally integrate the ICT-evaluation instrument when implementing the CAPS curriculum.

Table 5-16: Themes, codes and quotes associated with participant's perceptions on how an ICT-evaluation instrument should be integrated in curriculum implementation

FAMILY	THEMES	CODES	QUOTES	
			Individual interviews	**Focus-group**
An ICT-evaluation instrument should integrate curriculum and e-Learning objectives	ICT-evaluation instrument should cater for curriculum and e-learning objectives	Align Curriculum and e-learning objectives	TKS: "I think it's all about getting to the 'nitty gritties' of curriculum objectives and also e-Learning objectives and then aligning them together to make sure that at the very same time that we are checking ICT we are also making sure that	FTH: "As e-Learning facilitators, we expect an instrument that will cater for our objectives whilst not undermining curriculum"

FAMILY	THEMES	CODES	QUOTES	
			Individual interviews	**Focus-group**
			curriculum-wise everything is in order.”	
		Use ICTs for curriculum purposes	TKS: “…. because we might focus only on ICTs resources being there and resources being used but not ensuring they are being used for curriculum purposes…”	NIS: “Since our main guide is the CAPS, ICTs that are procured should address the curriculum to a large extent”
An ICT-evaluation instrument should integrate learner and educator management features	The ICT-evaluation instrument should be compatible with learner and educator management control systems	Manage learner content access	MHL: “….be able to see when learners access content…”	KHN: “The ICTs must take stock of ICT usage by learners”
		Manage learner progress	TKS: “…you also need to know how many of them are making progress…so the EMM: “instrument must assist us to make sure that we align our processes…”	SHS: “There should be graphs if possible, to show how our learners are faring as a result of ICT use”
		Manage educator content access	RBZ: “I am not a Mathematics specialist but should access all the contents I need through technology…”	BNZ: “Like the library of the past, we should be able to see how much ICTs are being used by educators”

As derived from Table 5.16, the researcher hereunder discusses each of the themes to determine participants’ perceptions of how an ICT-evaluation instrument should be integrated with curriculum implementation. In the first family of themes, participants generally argue that, to support the educator in curriculum implementation, an instrument should contain MIs that ascertain whether ICTs cater to both curriculum and e-learning objectives as stated by TKS below:

> TKS: “I think it’s all about getting to the ‘nitty gritties’ of curriculum objectives and also e-Learning objectives and then aligning them together to make sure that at the very same time that we are checking ICT we are also making sure that curriculum-wise everything is in order.”

Furthermore, participants desire that an instrument be compatible with learner and educator management control systems. Each theme within that family of themes is discussed below.

5.3.3.5.1 ICT evaluation should cater for e-learning objectives

Participants generally believe that an ICT-evaluation instrument should contain MIs that search presence of both curriculum and e-learning objectives during ICT-evaluation. This belief is congruent to an earlier statement in section 1.4, Chapter one. An ICT-evaluation instrument is designed to test whether recommended ICTs positively promote, complement and support curriculum implementation and objectives, development of SDL skills, and learning relationships (Chugh, Ledger & Shields, 2017:8).

> TKS: "I think it's all about getting to the 'nitty gritties' of curriculum objectives and also e-Learning objectives and then aligning them together to make sure that at the very same time that we are checking ICT we are also making sure that curriculum-wise everything is in order."

> FTH: "As e-Learning facilitators, we expect an instrument that will cater for our objectives whilst not undermining curriculum"

Participants' view of meeting the curriculum and e-learning objectives would imply value add to the curriculum-implementation process (Chan *et al.*, 2017:18). These participants' beliefs are encouraging since they are further congruent to the rationale for choosing DBR, which is compatible with and suited for research projects that engineer instructional materials, technology-enhanced learning environments, curriculum projects, a study of educational phenomena that emerge from curriculum issues, multiple iterations, evaluation cycles, and improving interventions (Lewis, 2020; Ivens & Oberle, 2020:10). It is prudent to, at this stage, reiterate that one of the major objectives is to unshackle the learner and migrate from the traditional curriculum teacher-centred approach (Kidane *et al.*, 2020:9) to absolute self-dependency and self-directedness. Thus, the demand that some MIs of the ICT-evaluation instrument should test whether ICTs are compatible with SDL practices.

5.3.3.5.2 ICT evaluation should be compatible with learner and educator management control systems

Participants are generally of the view that an ICT-evaluation instrument should contain MIs that enable educators and school managers to manage and control learner and educator activities to achieve curriculum and pedagogical goals.

> MHL: "….be able to see when learners access content…"

> KHN: "The ICTs must take stock of ICT usage by learners"

TKS: "…you also need to know how many of them are making progress…so the EMM: "instrument must assist us to make sure that we align our processes…"

SHS: "There should be graphs if possible to show how our learners are faring as a result of ICT use"

This view is in line with what was stipulated earlier in Chapter one: that before e-procurement, an education department's main concern should be whether ICTs considered for procurement will appropriately meet the pedagogical needs of learners and educators (Andyani, *et. al.*, 2020:129). An ICT-evaluation instrument should therefore, according to the aforesaid participants' beliefs, provide a control system via its MIs to enable evaluators to detect whether the said pedagogical goals are met.

Based on the aforementioned, one could reiterate that the department of education should have an evaluation instrument that will assist in testing and evaluating whether ICTs optimally meet the needs of the end-user to be competitive in the world economies (Lee, 2019:9). User-needs could be pedagogic, scientific, technological, curriculum and management in nature (Deshmukh *et al.*, 2019:1649; Jones *et al.*, 2018:231). To satisfy those needs, a certain amount of end-user emancipation should exist. However, emancipation comes with responsibility and still requires the learner and educator to work collaboratively while the educator monitors the learner's activities without abdication (Lemmetty & Collin, 2016:59). According to the participants' notion, some of the MIs should cater for the aforementioned end-user responsibilities.

5.3.3.6 Determining ways in which an instrument could be used to support an educator in implementing curriculum

By means of the second part of the fourth question of the interview, the researcher aimed to determine the educators' perceptions of how an instrument could be utilized to support the educator in implementing curriculum.

Participants hold the opinion that an instrument could be harmoniously integrated in curriculum processes. The participants were requested to impart their knowledge and experience regarding the best means in which an ICT-evaluation instrument could be integrated with curriculum implementation. The general response is that an ICT-evaluation instrument should be aligned with the CAPS curriculum. Participants emphasized issues of quality, relevance to the generic curriculum principles, narrowing down to specific subjects, resource management, and integration.

During the interviews, to determine ways in which an instrument could be utilized as a means to support the educator in implementing curriculum, participants were asked:

> Suggest ways in which the instrument could be utilized as a means to support the educator in implementing curriculum. (Consider how it will guide selection of ICTs that boost curriculum implementation or strategies as per the CAPS).

Based on the second part of the fourth question, the general feeling was that an ICT-evaluation instrument should support the educator in ensuring that chosen ICTs are of good quality, contain content relevant to the curriculum, aim to achieve educational objectives and can be integrated with other resources.

As stated above, participants expressed the belief that ICT content should be of good quality. This belief is in line with what was deduced from GDE documents such as GMUIP (2010) and PDFDL (2017) that ICT-evaluation and -selection should consider improving the quality of design or content (Merlo *et al.*, 2019:197). Quality content in ICTs is enhanced by curriculum reform in which China was among front runners (Sang *et al.*, 2018:307). On the inverse, SDL enhances curriculum reform, which provides for life-long learning opportunities (Lim & Wang, 2016:12; Sang, *et al.*, 2018:307).

Participants mainly argued for the relevance of content to curriculum and aiming for educational objectives. To support this notion, one should reiterate what Huizinga *et al.* (2014:38) state regarding balance among knowledge and skills to select and apply and include relevant pedagogical strategies (e.g. SDL).

Table 5.17 (below) depicts themes, codes and quotes associated with participants' perceptions of ways in which an ICT-evaluation instrument could be utilized as a means to support the educator in implementing curriculum. The purpose of this table is to illustrate participants' views, some of which are expressed in the quotes (verbatim) and used to construct some codes, which were utilized for the development of themes which were conglomerated into families of themes. The themes were therefore used in a deliberation that follows to analyse and portray educators' perceptions and responses when to suggest ways in which an ICT-evaluation instrument could be used as a means to support the educator in implementing curriculum. Such an analysis was useful to form part of the formulation of conclusions and recommendations to be presented to the GDE. These recommendations could assist ICT managers and evaluators to consider when training educators on how to use an ICT-evaluation instrument as a support towards curriculum implementation.

Table 5-17: Themes, codes and quotes associated with participant's perceptions on ways in which an ICT-evaluation instrument could be utilized to support the educator in implementing curriculum

FAMILY	THEMES	CODES	QUOTES	
			Individual interviews	Focus-group interviews
ICT-evaluation instrument aids educator in curriculum content selection and relevance	ICT-instrument is helpful for choice of quality, relevant and specific curriculum content	Good quality curriculum Relevant to caps Subject-specific	RBT: "the content should be of a good quality … "they (curriculum staff) come in on the side of the quality of the content…". EMM: "whether the content is relevant to caps content should be subject-specific"	JNE: "The bottom line is that ICTs should address more than ninety percent of the caps curriculum".
	ICT-evaluation instrument helps educator towards e-learning and curriculum objectives	Integration with e-learning	KLY: "we are subject-specific. We work closely with curriculum people." KLY: "curriculum people take care of the curriculum part …. We assist it with the technological part…."	LPP: "there should be a matrix model in which e-learning and curriculum work together and align their activities and outcomes via ICTs "
ICT-evaluation instrument aids educator to stay within curriculum objectives		Meet curriculum objectives Meet e-learning objectives	PKS: "curriculum objectives: i think it all depends on the curriculum 'nitty grities' of the curriculum objectives" PKS: "…. And also e-learning objectives…... And then aligning them together to make sure that they are aligned together…."	FLD: "as pedagogues we are concerned that curriculum objectives and directives are followed"
ICT-evaluation instrument aids educator towards meaningful resource and progress management	ICT-evaluation instrument should help educator integrate resources, audit learner progress and align processes.	Use resources Progress audit	PKS: "we need to make sure that resources are being used for curriculum purposes…" RBT: "we also need to check how many of the (learners) are making progress…." "instrument must assist us to make sure that we align these processes……. "	NDW: "without ICTs we are nowhere but also without other resources we are nowhere"

As derived from Table 5.17, the researcher hereunder discusses each of the themes in order to determine participants' perceptions regarding ways in which an instrument could be utilized as a means to support the educator when implementing curriculum. In the first family of themes, participants generally argue that an ideal ICT-evaluation instrument aids the educator in curriculum content selection and relevance as voiced out by PKS below:

> PKS: "we need to make sure that resources are being used for curriculum purposes…"

Participants believe that content should be of good quality, relevant and subject-specific. Each theme within that family of themes is discussed hereunder.

5.3.3.6.1 ICT-evaluation instrument is helpful for choice of quality, relevant and specific curriculum content

Participants generally believe that to support the educator in implementing curriculum, an ideal ICT-evaluation instrument should contain MIs that enable evaluators to select ICTs of good quality, which is relevant and specific curriculum content.

> RBT: "the content should be of a good quality … "they (curriculum staff) come in on the side of the quality of the content…".
>
> EMM: "whether the content is relevant to caps…. content should be subject-specific"
>
> JNE: "The bottom line is that ICTs should address more than ninety percent of the caps curriculum".

Amongst other things, as stipulated in Chapter one, section 1.2, good quality content caters for various learner-needs and accommodates individualization or individualized learning plans (Robinson, 2018:3) which takes cognisance of the learner's unique level of development. To choose good quality content, an ICT evaluator is challenged to possess content Knowledge (Zhang *et al.*, 2019:4) based on the TPACK model by Koehler and Mishra (2009). Over and above content knowledge, as one of the twenty-first-century demands, educators as knowledgeable techno-pedagogues (Sasirekha & Sathya, 2017:266) are expected to play a key role in evaluation. It is anticipated that the more educators take part in ICT-evaluation, the more they could benefit by gaining knowledge and skills to evaluate ICT content. It is also expected that the more educators are involved in ICT-evaluations and gain experience and knowledge of such content, the more they will gain an awareness of what composes apposite usage of such content in what constitutes issues of copyright and intellectual property protections (Chetty *et al.*, 2017:9).

In addition to content quality, as discussed in the previous paragraph, participants believe that to support the educator in curriculum implementation, content has to be, as much as possible, relevant to CAPS and the learning environment. In section 3.2.2.5, Chapter three, local content development and contextualization of content (PDFDL, 2019; BDE, 2017) were emphasized to support the issue of relevance. As stipulated in Chapter two, section 2.4.1, if well cast, an ICT-evaluation instrument will assist the evaluator and the educator to select and approve ICTs with content that is dynamic and relevant to the educational demands of the twenty-first century. Furthermore, it was suggested that ICT content also be relevant to the learner's stage of development or level of self-directedness. To scan for appropriate content, the evaluator needs to possess what was referred to in 3.2.2.3, Chapter three, as strategic skills in the work of Steyaert (as cited by Lavrynenko *et al.*, 2018:5).

Participants also believe that to support the educator in the curriculum implementation, content should be subject-specific. Thus, an instrument used should contain MIs seeking ICTs that have content specific to CAPS subjects. This belief crowns the aspiration of this study announced in section 1.8.4, Chapter one, viz. to respond to the identified gap by providing research-based learning and solutions (Prahmana, 2017:353) and advise education departments to consider crafting subject-specific ICT-evaluation instruments.

5.3.3.6.2 ICT-evaluation instrument helps educator towards achieving curriculum and e-learning objectives

By and large, participants believe that an ICT-evaluation instrument should contain MIs that discharge and identify curriculum objectives within ICT contents to offer support to the educator. Participants thus believe that it is key for curriculum experts such as subject advisors to partake in identifying curriculum objectives.

> KLY: "we are subject-specific. We work closely with curriculum people."
>
> KLY: "curriculum people take care of the curriculum part …. We assist it with the technological part…."
>
> LPP: "there should be a matrix model in which e-learning and curriculum work together and align their activities and outcomes via ICTs"

Based on the above perceptions, one will recall that in Chapter three achievement of curriculum objectives was identified earlier on in section 3.2.2.3 as a key requirement. In that section, a call was made for the education department to counter the effect of the digital divide as it might be a deterrent or hamper progress (Vartanova & Gladkova, 2019:208) towards the achievement of curriculum objectives.

In lieu of the above-mentioned, in section 3.2.2.3, the researcher suggested that to counter the DD and enhance ICT-based SDL and curriculum delivery and optimally achieve curriculum and SDL objectives, the department of education should supply ICTs and internet connectivity to schools and also train the end-users (educators and learners) on how to use ICTs (ICT skills acquisition). It is the opinion of the researcher that possession of ICT skills could equip educators with confidence and knowledge to partake in ICT-evaluation and -utilisation, unleash various pedagogical strategies and enhance SDL in the learning environment. Some of the SDL objectives that an ICT-evaluation instrument should possess to support the educator were enumerated in section 2.4.4.2, Chapter two, as: (a) expanding the learners' intellectual readiness; (b) supporting learners towards self-initiated goal-setting; (c) catering for individual learners' level of development; and (d) implementing SDL-compatible assessment strategies.

In terms of the first SDL objectives stated above, it was argued that SDL comprises opening up the learner's lifeworld towards intellectual readiness, the purpose of education, alternative forms of education, future outcomes of education, anticipating emerging trends, developing new competencies as well as multiple ways of thinking to solve problems (Tan *et al.*, 2017:85). In terms of the second objective, the self-directed learner takes control of the learning process by setting values, setting goals and further engaging in self-planning and self-monitored learning strategies (Du Toit-Brits, 2017). Concerning the third objective, the adaptation of SDL activities to suit the learner's unique situation, including the level of development, interests and motivation, was emphasized (Toh & Kischner, 2020:10). Lastly, the fourth SDL objective was mentioned as implementing SDL-compliant assessment strategies as a pedagogical vehicle for both learner and educator in an SDL environment (Lombard, 2018:28). The participants of this study imply that an ICT-evaluation instrument should assist the evaluator in searching for these SDL and curriculum objectives among ICTs.

As suggested by the participants, to offer the required support to the educator, an ideal ICT-evaluation instrument should cater to e-learning objectives and align such with curriculum objectives. The major e-learning objective was identified as competence in digital learning. As was mentioned in Chapter one, section 1.4, in order to express the drive towards digital competence, Bladergroen *et al.* (2014:3) conducted the MELISSA project. MELISSA proposes focusing on internal human processes such as affective and cognitive attitudes towards ICT. However, Garrison's model (1997) sets the action of e-learning objectives and task motivation to maintain effort towards learning and realizing set cognitive goals. Hence one may in summary state that e-learning objectives address the learner’s needs holistically (affective, cognitive and physical).

5.3.3.6.3 ICT-evaluation instrument should support educator to integrate resources and review learner progress

Participants believe that other resources should be integrated with ICTs to achieve objectives for curriculum, SDL, and e-learning; some of which were discussed in the last sub-section. Participants also believe that since assessment is the ultimate core objective of the CAPS, an ICT-evaluation instrument should contain MIs that establish whether ICTs display features that enable the educator to assess the learners’ progress.

> PKS: “we need to make sure that resources are being used for curriculum purposes…”
>
> RBT: “we also need to check how many of them (learners) are making progress….”
>
> RBT: “instrument must assist us to make sure that we align these processes…….

In addition to the above views one may add that identifying resources is key and evident in the famous Knowles (1975:18) SDL definition: “a process in which individuals take the initiative with or without the help of others in diagnosing their learning needs, formulating goals, identifying human and material resources, and evaluating learning outcomes". It is the educator’s prerogative to select supportive digital resources or ICTs (Claro *et al.*, 2018:171) conducive to SDL.

However, as stated in section 2.2, Chapter two, the aforementioned educator’s prerogative should not undermine the SDL learner’s emancipation and selection of own resources (Lai, 2015:75). Learners, under educator guidance, choose own resources to achieve own goals (Vahedi *et al.*, 2019:4; Tredoux, 2012) and demonstrate the ability to direct their own learning in a process known as inquiry-based learning. Inquiry-based learning is very crucial to the twenty-first-century learner-centred approach (Toh & Kirschner, 2020:6) to keep up with new innovations. However, it should be reiterated that although emancipated, the learner, on his/her path to self-directedness, still relies on the educator’s leadership in selection or integration of resources. In SDL, the educator integrates classroom ICTs to support the learner off-site or in remote learning environments (Becker & Palenberg, 2018), the brick-and-mortar classroom (Khaloufi & Laabidi, 2017:57). However, integration of resources entails selection of resources, knowing how to use resources in a learning environment, providing learners with conceptual information, providing learners with methodological information on resources (Brockett & Hiemstra, 2018:75-76). Resource selection works in conjunction with and paves the way for assessment, of which the MIs are explicated in the subsequent paragraph.

Although it was argued that, as an active partner, an SD learner assesses his/her progress in the process of self-assessment, participants believe that the educator does not abdicate but also monitors the learner's progress. This notion is congruent to the ideas of Lemmetty & Collin (2016:59) that an educator should not, under any situation, abdicate his/her pedagogical responsibilities (Lemmetty & Collin, 2016:59). The educator and learner engage in formal assessment, a systematic way of assessing how well learners progress in a grade and a particular subject (Lombard, 2018:28). An ICT-evaluation instrument should have MIs that verify if ICTs do make provision for such to achieve assessment goals. Ultimately, when progress is achieved, and goals are met, the twenty-first-century learner and educator will have a sense of psychological satisfaction (Tan, *et al.*, 2017:291).

5.3.4 Conclusion to qualitative research strands

In conclusion, participants' responses, beliefs and opinions on the semi-structured individual and focus-group interviews are summarised in this section by means of each theme as follows:

5.3.4.1 An ICT-evaluation instrument is necessary

First, as described in section 5.3.3.1, participants were asked: "Do you think when ICTs are chosen for the classroom, there should be some kind of an instrument to serve as a guide?" In response to that question, most participants expressed their belief that an ICT-evaluation instrument was indeed necessary when evaluations are done in the FET-Phase. Although most of them cited objectivity, the author of this document is of the view that, in addition, objective evaluations via a valid ICT-evaluation instrument are important to serve as a theoretical basis for further research (Akhmetshin, 2020:9).

Participants further suggested that an ICT-evaluation instrument should be:

- **all-inclusive:** versatile to accommodate all possible curriculum areas and types of ICT media.

  KLY: "curriculum people take care of the curriculum part …. We assist it with the technological part…."

  E1: "When schools have to evaluate ICTs, district, ICT and school management must all be involved"

  R1: "…. All need an instrument to evaluate ICTs…."

  OE1: "Yes I must have an instrument to use. It lists the minimum requirements of software and hardware for example smart board, server and teacher laptop for a smart classroom; be:

- **dynamic:** cater for new innovations in the ever-changing twenty-first-century ICT education milieu).

  NDM: "I also support that an instrument to evaluate must be regularly updated to effectively address its use".
  LBO: "We must remember that times are changing, and we cannot afford to cling to the past. We need to keep up so that we are not behind the likes of the USA and other countries like Russia".
  M1: "We do have an instrument, but it is outdated. We used it long time ago".

- **SDL-compliant:** enable evaluators to select ICTs that are suitable for SDL. The selected ICTs should cater for learner centeredness, support educator leadership and district ICT facilitation.

  B1: "It should take into cognisance the different learners' level of development, achievement and ICT-skills (skills ladder), background…...and progression".
  L1: "In the COVID-19 new normal life, it should seek for learner centred ICTs to cover environments like home-schooling. They should cater for online learning. The learners should be able to study on their own in a self-paced manner. There should be versatility."
  RBT: "Previous ICT-evaluation instrument was more for classroom ICTs and not for learning away from traditional schools…. learning must happen anytime anywhere."
  JOE: "We also have a small challenge regarding our portals which enhance the learners to access content online".

- **diverse:** applicable at different levels (multi-level) and have a capacity to audit learner and educator ICT skills.

  PKS: "It should evaluate a variety of ICTs including devices, e-books, multimedia even ISPs" ….
  "It should test for the lifespan of the device (3 years for tablets but may vary with other ICTs"
  JRM: "The instrument should be versatile……it should screen an unlimited number of technologies….".

5.3.4.2 Qualities of an ICT-evaluation instrument

Second, as explicated in section 5.3.3.2, participants were asked: "In the presence of an instrument to evaluate ICTs for the classroom, give significant qualities that you think it should possess". In response to that question, participants largely expressed their views that an ideal ICT-evaluation instrument should be (or possess these qualities):

- **synchronous:** promote synchronization of ICT evaluation activities among schools and role players. The MIs within the ICT-evaluation instrument should spell synchronization in order to assist educators to adhere to their pace setters when pursuing curricular objectives.

PKS: “There has to be a guide to create and maintain uniformity among schools”.
DLS: “We need to know what other schools are doing as well, yeah”.

- **policy-based:** inclined towards existing GDE and national DoE ICT policies. MIs should be policy-inclined.

PKS: “Schools have ICT policies that guide them …instrument should follow that”.
CND: “On that, we rely on the guidance from districts”.

- **user-friendly:** contain MIs that are easy, concise, comprehensible, be user-friendly and assist to search for user-friendly ICT media.

MHL: “Not too much administrative work”.
RBT: “It minimizes administrative workload like capturing after evaluation”.
EMM: “Majority of the questions of the ICT-evaluation instrument should be closed questions and it should provide for narrative descriptions as well.
GRP:” it should not be difficult to use…”

- **test for curriculum and pedagogical soundness:** contain MIs that test whether ICT content is relevant to CAPS and compatible with planned learning activities.

MHL: “It depends whether you are evaluating devices or content. Content has to be relevant to CAT (Computer Applications Technology) and what will be taught at school (CAPS)”.
LOU: “Our bible these days is CAPS….so it should work hand-in-hand with it”.

- **test for technical capacity of ICT media:** used to measure technical aspects such as ICT-exposure, components, icons, generation, capacity, speed, RAM, navigation, and software.

BDT: “It is not wise to have good content saved in a device that is value-less…so ICT experts should assist to check if devices have the capability….”
PKS: It needs to have basic questions like ICT-exposure, components, icons, keys.”
JOE “Generation, capacity and speed of the gadget”. “If they are selling the content, curriculum specialists should assist the schools. However, if the schools have specialists they should do it themselves.” “RAM is part of that – for how quick information is processed by the ICTs, also Navigation (or how easy it is to access the content). Also software”

- **measure ICT cost-effectiveness:** to address the concern regarding cost of ICTs. High ICT costs could limit access to ICTs and consequently exacerbate the DD**;** a huge hindrance to learning.

  MHL "I have learnt during COVID that all that probability is zero rated because learners may have smartphones without data bundles. We can enhance our portals to be zero-rated among all the ISPs (Internet Service Providers) ..."
  MHL "…The small businesses that sell these devices must have a way of reducing their prices…. you can still reduce data cost but if the smartphones are still extensive it's still a problem".

5.3.4.3 Educators should be optimally involved in ICT evaluation

Thirdly, as alluded to in section 5.3.3.3., participants were asked: "What is your opinion regarding the level at which educators are involved in ICT evaluation processes?". In response to that question, most participants expressed the view that educators who are regarded as knowledgeable techno-pedagogues (Sasirekha & Sasthya, 2017:249), should be optimally involved in ICT evaluation, which requires:

- **social collaboration with other stakeholders:** educators should form part of matrix teams or ICT evaluation committees.

  JZZ: "We need to have a matrix team to evaluate ICTs".
  MHL: "When schools have to evaluate ICTs, district, ICT committee and school management must all be involved".

- **involvement of curriculum experts:** there should be curriculum experts to share their curriculum and ICT evaluation knowledge and skills.

  TSM: "There needs to be some form of consultation with Subject advisors because we, as e-learning facilitators are not curriculum specialists".

- **inclusive, liberal ICT evaluation procedures:** these should never purposively marginalize educators.

  EMM: "The educators are not involved. I don't want to talk politics. Some things are just being more political. Sometimes uses a lot of money in terms of budget to buy ICTs for schools without the educators' input to say what kind of gadgets they need."

  GRL: "To be honest, ehhhhh, it has been years since we were officially notified. I would say no it is not well broadcast".

- **educator ICT evaluation experience:** since they will be expected to utilize selected ICTs, educators need to contribute their skills, attributes, knowledge and experience and be part of the decision-making when evaluations are done.

  RBT: "I think educators should be involved in order to decide on what to purchase based on their skills audit instead of being given ICTs that they cannot use or content that is not relevant".

  TRN: "Training should come high in the hierarchy…"

5.3.4.4 Characteristics and components of an ICT evaluation

Fourth, as explicated in section 5.3.3.4, participants were asked: "Describe characteristics that could be vital for an ideal instrument for ICT evaluation." In response to that question, most participants' views were that an ICT-evaluation instrument should:

- **test for capacity of media:** MIs that test for the technical capacity of ICTs (e.g. generation, speed and storage space).

  BDT: "It is not wise to have good content saved in a device that is value-less…so ICT experts should assist to check if devices have the capability…."

  PKS: It needs to have basic questions like ICT-exposure, components, icons, keys."

  JOE "Generation, capacity and speed of the gadget". "If they are selling the content, curriculum specialists should assist the schools. However, if the schools have specialists they should do it themselves." "RAM is part of that – for how quick information is processed by the ICTs, also Navigation (or how easy it is to access the content). Also software"

- **integrate soft- and hardware:** MIs on the ICT-evaluation instrument should integrate software applications as well as hardware such as smartboards, servers, laptops, tablets as well as desktops.

  JRM: "The instrument should be versatile……it should screen an unlimited number of technologies…."

- **test for ICT and infrastructure compatibility:** MIs that determine whether there is compatibility and usability between or among ICTs and the school's infrastructure.

  ZWL: "Some of these ICTs are dumped at schools which are not ready because they do not have laboratories"

  LKH: "What worries us is that some of these laboratories were set up and never used and by the time we know how to use them, new ICTs will be in place and may not work hand-in-hand with the laboratories, then money will have been wasted"

- **audit training levels:** MIs should include ICT-exposure of the end-users; educators and learners alike.

  BNZ: "Like the library of the past, we should be able to see how much ICTs are being

- **contain quantitative measurement indicators:** features to assist evaluators, managers, educators and other stakeholders to decode which ICTs to procure for the classroom.

- **be electronic:** to easily answer statements and summarize evaluation results. Participants also believe that an ICT-evaluation instrument should cater for e-learning objectives.

- **have learner and educator management control systems:** enable educator to manage own and learners' progress.

  MHL: "….be able to see when learners access content…"
  KHN: "The ICTs must take stock of ICT usage by learners"
  RBZ: "I am not a Mathematics specialist but should access all the contents I need through technology…"

- **support educator in curriculum implementation:** curriculum content; curriculum and e-learning objectives; integrate curriculum; and review learner progress.

  FTH: "As e-Learning facilitators, we expect an instrument that will cater for our objectives whilst not undermining curriculum"

5.3.4.5 Means to integrate ICT-evaluation instrument with curriculum

Fifth, as described in section 5.3.3.5, participants were asked the question: "How do you think an instrument could be harmoniously integrated in curriculum processes implementation?". In response to that question, most participants thought that for optimal integration into curriculum, an instrument should test the level at which ICTs:

- **cater for e-learning and curriculum objectives:** MIs that search presence of both curriculum and e-learning objectives;

  LPP: "there should be a matrix model in which e-learning and curriculum work together and align their activities and outcomes via ICTs"
  KLY: "we are subject-specific. We work closely with curriculum people."
  KLY: "curriculum people take care of the curriculum part …. We assist it with the technological part…."

- **are compatible with learner and educator management control systems:** MIs that enable educators and school managers to manage and control learner and educator activities to achieve curriculum and pedagogical goals.

  RBT: “we also need to check how many of the (learners) are making progress….”

5.3.4.6 Instrument could support educator in implementing curriculum

Sixth, as explicated in section 5.3.3.7, participants were asked to: *“*Suggest ways in which the instrument could be utilized as a means to support the educator in implementing curriculum.”

In response to the question, participants mostly expressed their views that an ICT-evaluation instrument should support the educator to select ICTs that:

- **have quality, relevant and specific self-directed curriculum content:** have MIs that enable evaluators to select ICTs of good quality, which is relevant and specific curriculum content;

  RBT: “the content should be of a good quality … “they (curriculum staff) come in on the side of the quality of the content…”.
  EMM: “whether the content is relevant to caps content should be subject-specific”

- **help educator to achieve curriculum and e-learning objectives:** MIs that discharge and identify curriculum and e-learning objectives within ICT contents to offer support to the educator.

  PKS: “…. And also e-learning objectives…... And then aligning them together to make sure that they are aligned together….”

- **integrate resources:** MIs that test whether ICTs are integrated with other resources.

  RBT: “we also need to check how many of the (learners) are making progress….”
  “instrument must assist us to make sure that we align these processes…….

  and

  review learner progress: MIs that establish whether ICTs display features that enable the educator to assess learners’ progress.

  RBT: “we also need to check how many of the (learners) are making progress….”

This point concludes analyses and triangulation of qualitative strands based on participant views, literature reviews and the researcher’s opinions. However, as it was declared in Chapters one and four, this DBR would be incomplete without analyses of the development of an ICT-evaluation instrument (Strands 4A-4C). Logically, as declared in Chapter one, section 1.4.1.1., research findings obtained from the study's survey (Strand 1), focus-group interviews (Strand 2) and semi-structured interviews (Strand 3) were used as an input towards strand ICT-evaluation instrument development (4A to C). This relationship between the strands was also portrayed in figures 5.21 and 5.22. The next section exposes and analyses how Strands 4A to 4C were implemented.

5.4 DEVELOPMENT OF AN ICT-EVALUATION INSTRUMENT (STRAND 4A-4C)

Strands 4A to 4C of the mixed-research, multi-strand design comprised designing a draft ICT-evaluation instrument, testing the draft evaluation instrument, and finalising the final ICT-evaluation instrument. Activities towards the attainment of these strands were facilitated by means of discussions among participants, the researcher playing the role of facilitator (Nyumba *et al*., 2017:21). Some of the participants who took part in the focus-group interviews were, due to their experience and in-depth knowledge, selected to form a working group that made inputs towards Strands 4A to 4C. Figure 5.21 (below) illustrates the broad process map followed during strands 4A to 4C to finalise an ICT-evaluation instrument for the FET-Phase.

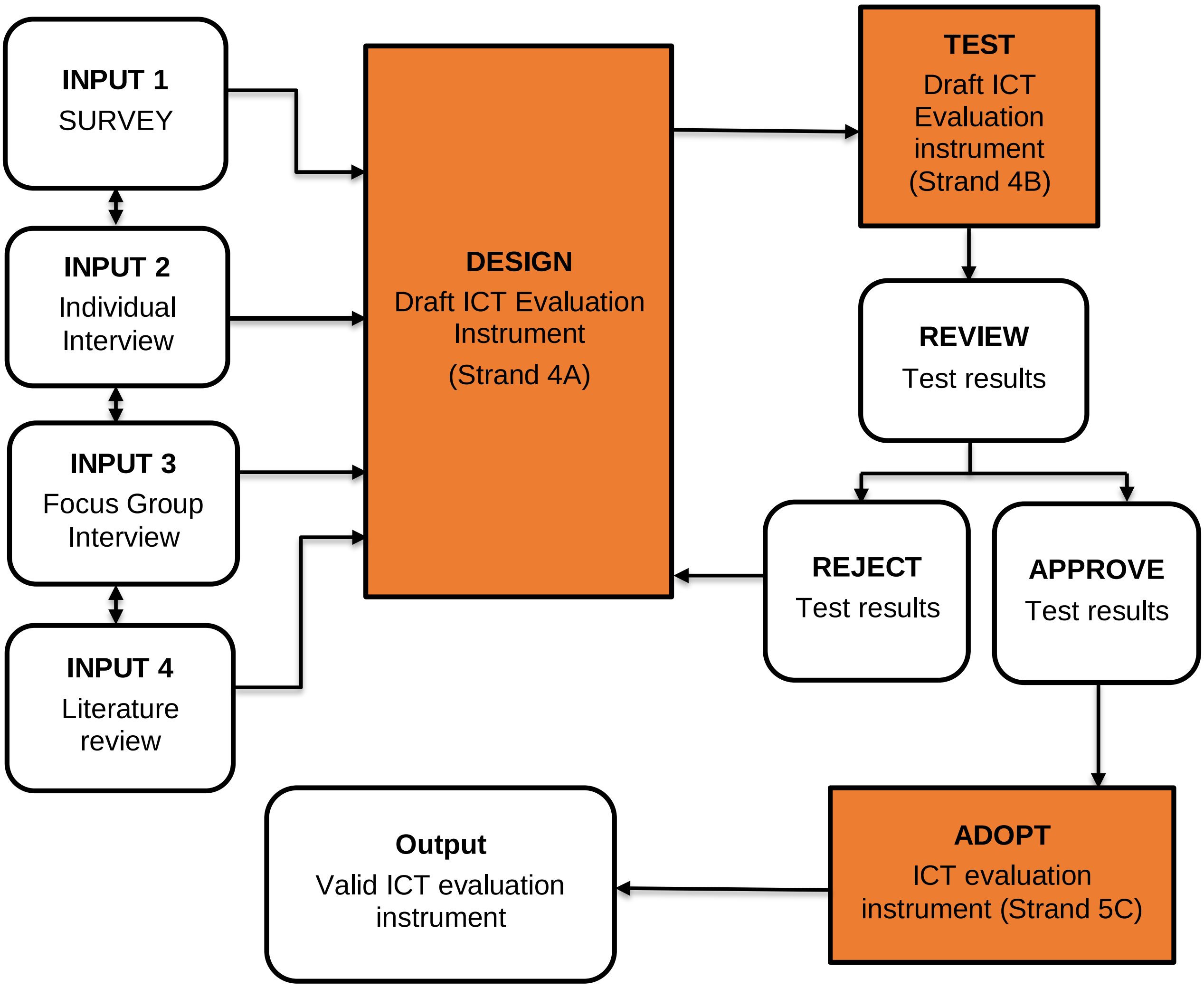


Figure 5-21: Broad Process Map showing of Strands 4A to 4C up to finalization of an ICT-evaluation instrument for the FET-Phase

Source: Author's own

As illustrated in Figure 5.21, strands 4A to 4C are highlighted in an orange shading. Relationships between these strands and earlier strands as well as a literature review, are displayed through flow arrows. Inputs from the survey, semi-structured individual, focus-group interviews and literature reviews were used to develop criteria for the draft ICT-evaluation instrument. The draft instrument was tested and finally adopted and approved as a final ICT-evaluation instrument, a deliverable output or end-product of this research work. Each of the strands is elaborated on in more detail in the following sections starting with Strand 4A below.

5.4.1 Strand 4A: Design draft ICT- evaluation instrument

In Strand 4A, a draft ICT-evaluation instrument was designed in collaboration with a sub-group of eight educators, hereafter referred to as a workgroup or group. Due to the COVID-19 restrictions, the group was consulted only via the Zoom-Interviews application. Based on those consultations with the group, the researcher took notes of points to consider in the development of the instrument. Figure 5.22 (below) illustrates the steps that were followed during the development of a draft ICT-evaluation instrument.

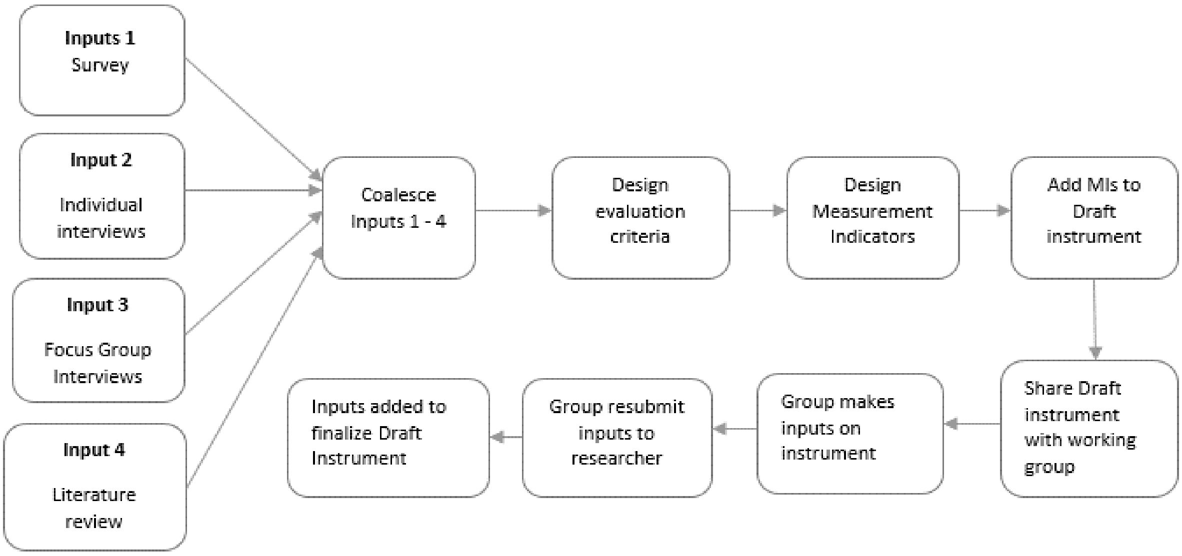


Figure 5-22: Steps followed during development of a draft ICT-evaluation instrument (Strand 4A)

As illustrated in Figure 5.22, the steps followed during Strand 4A were: (a) *Drawing inputs* – Researcher draws inputs from the survey (input 1), semi-structure individual interviews (input 2), focus-group interviews (input 3) as well as a literature review (input 4); (b) *Coalescing the inputs* – inputs 1 to 4 were analysed and coalesced to form common ideas; (c) *Designing evaluation criteria* – ideas based on inputs 1 to 4 were used to design evaluation criteria (broad statements that capture the main ideas of characteristics to be sought from ICTs during evaluation); (d) *Designing Measurement Indicators* – the broad evaluation criteria were narrowed down to MIs, the statements or questions for inclusion in the ICT-evaluation instrument to guide evaluators of ICT media; (e) *Adding MIs to draft instrument* – the MIs were written in the form of statements alongside which scores matching the level or adversity of MIs were also tabulated; (f) *Sharing instrument with group members* – the draft instrument was disseminated to the work group, (g) *Group inputs* – based on their knowledge and evaluation experience, group members viewed the draft instrument and made inputs or comments; (g) *Group re-submits inputs* – the group members gave feedback to the researcher; (h) *Finalization of draft ICT-evaluation instrument* – the researcher considered and added the group's inputs to form a draft ICT-evaluation instrument. After the final step of the process, a draft ICT-evaluation instrument was crafted and made available for strand 4B (Testing the draft ICT-evaluation instrument discussed in the next section

5.4.2 Strand 4B: Test Draft ICT- evaluation Instrument

To test the draft ICT-evaluation instrument (Strand 4B), the workgroup was presented with electronic copies and asked to conduct a mock evaluation using any ICT device that they are currently using in their learning environments as a sample. Within a week, the group tested the draft instrument, made more inputs and then the draft instrument was re-tested with the same ICT devices. Figure 5.23 (below) illustrates the steps that were followed during the testing of a draft ICT-evaluation instrument.

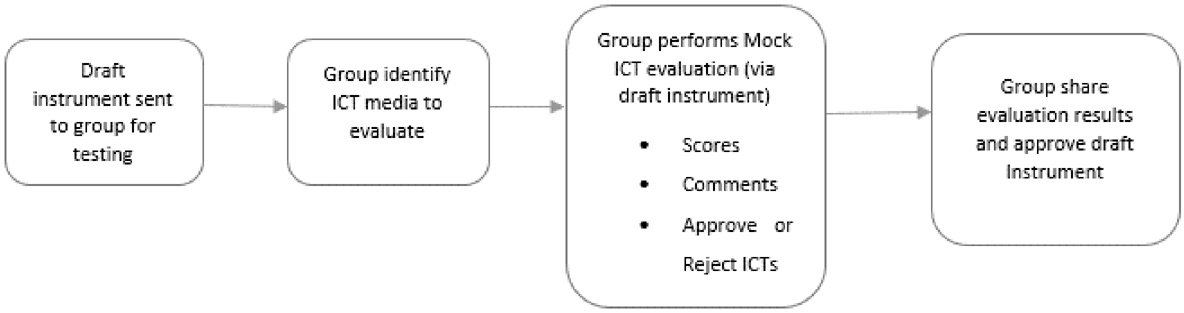


Figure 5-23: Steps followed during testing of the draft ICT-evaluation instrument (Strand 4B)

As depicted in Figure 5.23, the steps executed during Strand 4B were: (a) *Draft instrument sent to the group* – The draft instrument formerly developed with the support of the workgroup was sent back to the group for them to use in a mock ICT-evaluation; (b) *Group identify ICT media* – Each group member was asked to identify any ICTs that they would like to evaluate using the draft ICT-evaluation instrument; (c) *Mock ICT-evaluation* – Group members used the draft ICT-evaluation instrument to test its validity. The ICT media were scored based on their performance of MIs, comments were made where applicable (in provided spaces), and the ICTS were either approved, rejected or conditionally approved; (d) *Group Share results and approve instrument* – The group were requested to share their ICT-evaluation results and comment on whether the instrument was usable and acceptable for the next Strand. Based on the acceptance and absence of further comments, the draft ICT-evaluation instrument was moved to the next level, Strand 4c, for finalization and adoption, which is discussed in the subsequent section.

5.4.3 Strand 4C: Finalization and adoption of the ICT-evaluation Instrument

During Strand 4C, the researcher finally reviewed the draft ICT-evaluation instrument accepted in Strand 4B for possible adoption. Steps undergone in this strand are described with the aid of Figure 5.24 (below).

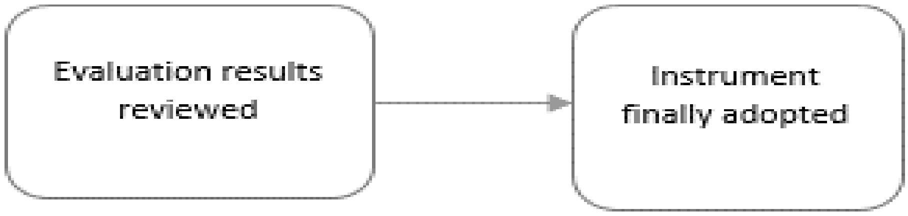


Figure 5-24: Steps during finalization and adoption of an ICT-evaluation instrument (Strand 4C)

Figure 5.24 projects the steps executed during Strand 4C, which were identified as: (a) *Review of evaluation results* – The researcher finally reviewed evaluation results that the workgroup shared; and (b) the researcher was finally satisfied and adopted the ICT-evaluation instrument for the FET-Phase (Annexure K) which can be accessed by clicking (Ctrl + Click) on the following link:

https://docs.google.com/forms/d/e/1FAIpQLSepvuXRuFBEOb3ppkzEfjW1yY71Wv0XmjsggQVSmoUmFYXRog/viewform?usp=sf_link

or

ICT-EVALUATION INSTRUMENT FOR FET-PHASE - Google Forms

Next is a description of triangulation in this BDR.

5.5 TRIANGULATION

As declared in Chapter one, section 1.7, trustworthiness of both the researcher (Shufutinsky (2020:50) and the participants as well as the data collection instrument was adopted as a key element of the research process. To establish trustworthiness in quantitative research, this study applied credibility, conformability, dependability (Nowell *et al.,* 2020:3) and transferability (Korstjens & Moser, 2018:122. Furthermore, in order to support and achieve trustworthiness, the researcher applied triangulation (Kemp, 2020:194).

Triangulation may be described as a convergent methodology which involves surveillance of the research topic based on various sources and angles to confirm, answer or highlight the research problem (Abdalla *et al.*, 2020:71). Different sources of data imply corroboration of data obtained from various participants, data types, and data collection methods (Creswell, 2008:267). Thus in this study, the researcher triangulated data (a) from school-based and office-based educators (various individuals); (b) for both qualitative and qualitative strands (data types); and (c) obtained from survey, focus-group, individual interviews as well as literature reviews (methods of data collection). As identified in Denzel (cited by Abdalla *et al., 2020),* the types of triangulation that were applied are (a) Theoretical triangulation (exploration of multiple theories); (b) Methodological triangulation (use of multiple methods) and (c) data triangulation (collection of data at different times from different individuals.

5.5.1 Triangulation of qualitative data

As pronounced in Chapter one, section 1.5.1.6, data from focus- and semi-structured individual interviews were collected, coded, sorted and constructed into themes and families of themes (Creswell and Creswell (2018:193). As exhibited on Figure 5.25 (below), themes from focus-group and semi-structured individual interviews were analysed and juxtaposed and also compared with literature reviews in order to draw conclusions and recommendations.

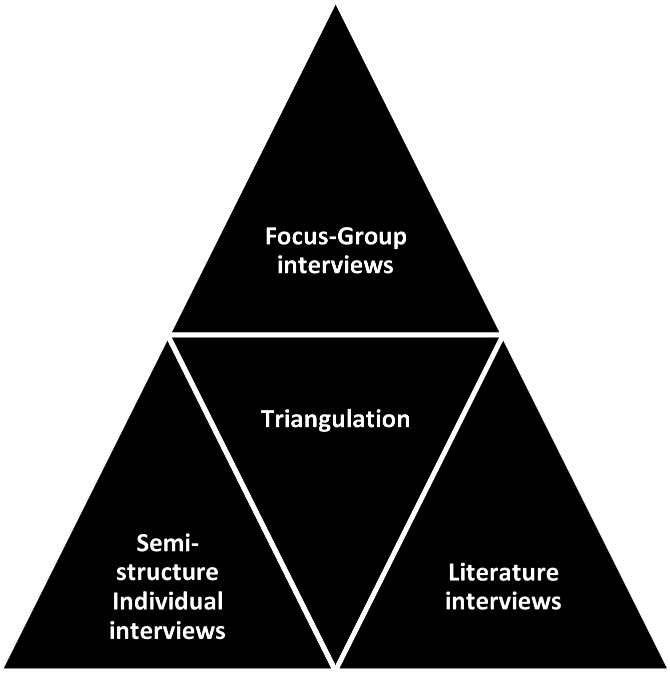


Figure 5-25: Triangulation of qualitative data

Source: Author's own

5.5.2 Aggregate triangulation of data

Data collected from the quantitative strand (survey) were analysed and compared, combined and interpreted against data from qualitative research (focus- and individual interviews) as well as reviewed literature. As reflected in Figure 5.26 (below), findings obtained from such amalgamation were utilised towards conclusions and recommendations that were spelled out in Chapter six.

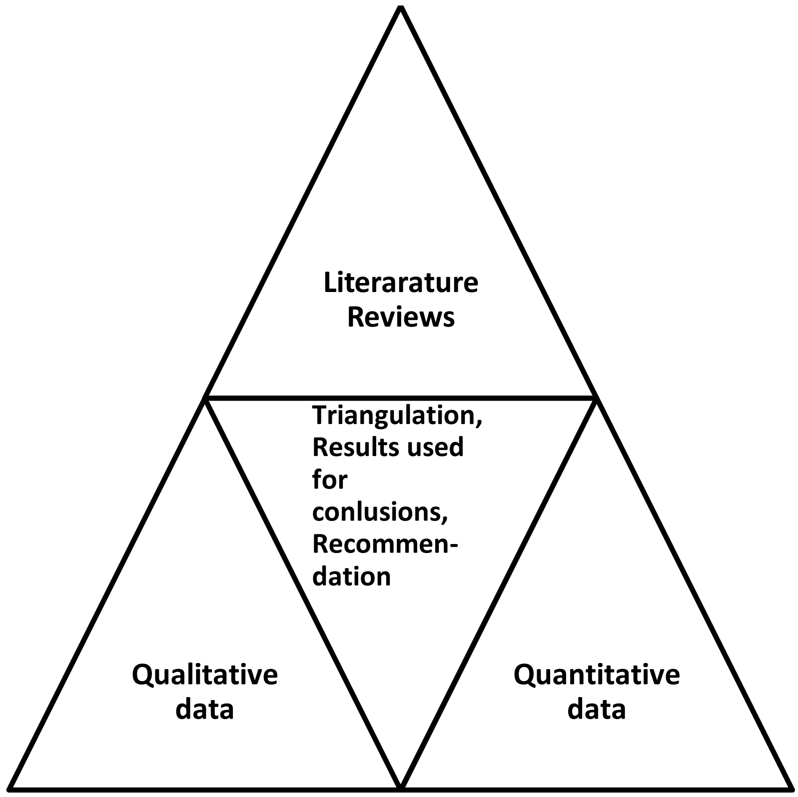


Figure 5.26: Triangulation of quantitative and qualitative data

Source Author's own

The above is the final section of Chapter five. Following is a conclusion to all the discussions contained in the chapter.

5.6 CHAPTER CONCLUSION

To conclude data analysis and findings of Chapter five, since this is mixed research, both quantitative, employing numerical data to quantify social phenomena (Ong & Puteh, 2017:14) and qualitative research, which concerns the systematic collection, organization, description and interpretation of textual, verbal or visual data (Hammarberg *et al.*, 2016:499) were applied. Strand one of the mixed multi-strand design comprised a survey questionnaire. Strand two formed the individual interviews, and strand three, focus-group interviews. The focus-group interviews were facilitated by means of discussions among participants, with the researcher serving the role of facilitator (Nyumba, *et al*, 2017:21).

To determine the validity and reliability of the survey questionnaire, the researcher applied factor analysis in which many variables, probably with a shared variance (Bork, Wijsen & Rhemtulla, 2018:586), were condensed into one. Questions 9, 13 and 14 of the survey were converted into three variables: participation, procedures and leadership.

Gender, age and qualifications of the respondents did not influence their responses. This is irrespective of the fact that the older generation is likely to be confronted with the DD either through lack of motivation or technophobia, which is characterised by resistance to ICT innovations. This is due to the DD being asserted to cause unequal participation in society (Ziemba, & Becker, 2019:6).

Responses to the three variables were analysed. Regarding participation, the majority of the responses gave doubt that educators were fully allowed to participate. There is also a possibility of lack of involvement due to lack of directive or perhaps lack of intrinsic motivation (Azeez, *et al.*, 2019:20).

Yet the responses imply that participation of educators is critical, pertaining to procedures, most respondents stated their wish for collaboration and inclusion. They also mentioned insufficient awareness measures. The general trend is that educators should be empowered to take leadership in the process and decision-making. Finally, the consideration of inputs from Strands one to three and a literature review were applied in the development of the ICT-evaluation instrument that was created and tested with the aid of a small working group. The next and final chapter is aimed at drawing conclusions and announcing the findings of the entire study based mainly on data collection (through the survey, literature reviews and interviews), classification and analyses.

CHAPTER 6: CONCLUSIONS AND RECOMMENDATIONS

6.1 INTRODUCTION

Chapter six serves as a conclusion to the long journey of research and literature review undertaken in this study, as evidenced in the preceding chapters (summarised in the overview section 6.2 below). This chapter is intended to provide a clear summary of deduction insights and viewpoints of the researcher that arose from the argumentation. These are brought to a final synthesis as the chapter concludes the investigation and essence of the argument. Furthermore, the chapter aims to indicate the level at which the identified gaps have been filled, and whether the research aims of the research have been achieved. This chapter also consists of sections dedicated to a detailed summary, contributions, limitations, and recommendations on further research regarding pertinent educational issues to consolidate and achieve these aims.

To interrogate the topic of the study, a two-pronged main research question and six sub-questions were set. The two-pronged main research question was: *"To what extent do Gauteng Department of Education (GDE) managers and educators implement policy-based processes and procedures during ICT-evaluation and -selection in the FET-Phase; and what is the ideal, all-inclusive set of criteria for an evaluation instrument suitable for self-directed learning environments?".* The six sub-questions were:

1. What evaluation procedures or instruments do managers and educators use to support selection of appropriate ICTs and what are the main challenges within the process globally and in South Africa?

2. What should the ideal evaluation instrument look like according to literature and educators so as to support implementation of ICTs in the FET-Phase learning environments?

3. To what extent do GDE managers and educators perceive an ICT-evaluation instrument as being a viable tool for evaluation in the FET-Phase curriculum?

4. To what extent do GDE managers involve educators in the process of ICT evaluation and -selection in the FET-Phase curriculum?

5. What suggestions made by subject teachers and GDE curriculum specialists can be infused with the ICT-evaluation instrument suitable for self-directed learning environments in the FET-Phase?

6. How can an ideal, all-inclusive ICT-evaluation instrument be integrated and utilized for the enhancement of self-directed learning in the FET-Phase curriculum?

The main and sub-questions were instrumental in the casting of the research main objective and sub-objectives respectively (listed in section 6.3 below). The researcher engaged in an intensive literature review and empirical study to find answers to address these questions and sub-questions and achieve the objectives. To initiate the mission of this chapter, an overview of the study in which each of the previous chapters is analysed follows below.

6.2 AN OVERVIEW OF THE STUDY

In this section, the author of this document offers a synopsis of each Chapter to highlight synergy with the objectives, background, purpose, rationale of the study, and other chapters.

6.2.1 Chapter one synopsis

Chapter one aimed to give an in-depth motivation for the entire study coupled with essential factors such as theoretical perspectives based on literature review; identified gaps; problem-statement; and research questions, aim, design, methodology, and methods. As part of Chapter one an exposition of and reference to ethical considerations was also made which govern the letter and spirit on which the study was established. This was coupled with a section on trustworthiness and, of optimal value, declaration of the contribution the study aspires to make to the education department(s), the teaching fraternity as well as the body of scholarship for the ultimate benefit to the end-users, i.e. the educator and the learner. As part of the problem-statement, the study was intended to establish whether GDE managers and educators implement policy-based processes and procedures during ICT-evaluation and -selection in the FET-Phase and what is the ideal, all-inclusive set of criteria for such an evaluation instrument.

6.2.2 Chapter two synopsis

In the mission to answer the research questions, Chapter two focused on SDL and dissected SDL models, theories and tenets, which were recommended for consideration when crating criteria for developing an ideal ICT-evaluation instrument. The crafted criteria would then be converted into evaluation indicators embedded in the ideal evaluation instrument. These evaluation indicators could be constructed in the form of quantitative or qualitative statements or questions to which evaluators respond when scoring ICTs.

To identify SDL tenets, in this chapter, the author of this document delved into SDL as a concept, its demands on the learner and educator, and the perception thereof as a twenty-first-century skill. The author of this document also portrays an educator's responsibilities as an evaluator using an ICT-evaluation instrument to achieve SDL objectives. Finally, an educator, an SDL practitioner and an educator's ICT benefits were summarised.

6.2.3 Chapter three synopsis

In collaboration with Chapter two, Chapter three aimed at and focused on ICT-evaluation perspectives in its quest to answer the overarching, two-pronged question, and six sub-questions. ICT-evaluation perspectives were factored in during the process of crafting the ICT-evaluation criteria and -instrument. The aspired ICT-evaluation instrument aimed to assist evaluators in selecting sound ICTs that possess specific minimum qualities to enhance SDL learning in the FET-Phase. Once optimally achieved, an ideal SDL environment, as well as appropriate ICTs, could form a steppingstone for education planners, managers and educators to adhere to the education department's agenda of producing world-class, competitive citizens and accountable members of their workforces who can compete in the ICT-dominated world (UNESCO, 2015:18). Pursuance of the above-stated aspirations could be hindered or nullified by the digital divide (DD), which was also intensively discussed.

6.2.4 Chapter four synopsis

In this chapter, the author of this document discussed the research design and methodology of the study to address the identified gap in the GDE. The author of this document also further endeavoured to answer the corresponding main question and its six secondary research questions. To map a way towards that endeavour, a mixed, multi-strand design approach was adopted. The mixed multi-strand design was discussed using both quantitative and qualitative strands as leverage. Quantitative research is concerned with data that can be represented or measured numerically (Goertzen, 2017:12). On the other hand, qualitative research provides detailed descriptions, challenges existing theories and exposes new theoretical directions (Bansal *et al.*, 2018:1189).

Chapter four also detailed research features under main headings such as purpose of the research; research design and methodology; data-collection methods; data sampling; and ethical considerations. The clarified research features included sampling methods and techniques, development and validation of the data-collection tools, research paradigms, and research methods and techniques. Collected data serve as input towards the development of the ideal ICT-evaluation criteria and instrument. There was also an assertion of the stance of this study to adopt a collaborative approach for all the processes, including interviews, discussions, crafting, testing, and finalising the ICT-evaluation instrument.

6.2.5 Chapter five synopsis

Chapter five advanced the journey towards answering the two-pronged main question of this study by analysing collected data, findings and analyses of quantitative and qualitative strands. The quantitative methodology employed numerical data to quantify social phenomena (Ong & Puteh, 2017:14), yet qualitative research concerns the systematic collection, organization, description and interpretation of textual, oral or optical data (Hammarberg *et al.*, 2016:499).

Quantitative research was performed in the form of a survey – Strand one. The survey comprised of a set of closed-ended questions that probed the participants (n=50) to provide quantitative or numeric data which allowed the researcher to present descriptions of trends, attitudes and opinions of the population (Creswell, 2018:12, 147). The questions were classified into various sections. Qualitative research consisted of both semi-structured individual interviews and focus-group interviews; Strands two and three. The semi-structured individual interviews involved clinical judgement, was not scripted, allowed the interviewer to divert and consisted of standardised questions and probes set on an interview schedule. The semi-structured individual interviews focused on issues that are meaningful to the participant and allowed diverse perceptions to be expressed (Evans, 2018:2). It directed the interview dialogue towards the research question (Kallio, Pietilä, Johnson, & Kangasniemi, 2016:11). Since several people were interviewed together utilizing a flexible and exploratory discussion format, the focus-group interviews capitalized on group dynamics (interpersonal and interactive) (Guest, Namey, Taylor, Eley & McKenna, 2017:693). The focus-group interviews emphasized communications between participants rather than between the interviewer and interviewees, with the interviewer serving the role of mediator (Qu & Dumay, 2011:245).

6.3 FINDINGS

The central aim of this study was to establish whether GDE managers and educators implement policy-based processes and procedures during ICT-evaluation and -selection in the FET-Phase and develop an ideal, all-inclusive set of criteria for an evaluation instrument suitable for SDL environments. To achieve and answer the research aim, the researcher formulated six secondary research questions, which are:

1. What evaluation procedures or instruments do managers and educators use to support selection of appropriate ICTs and what are the main challenges within the process globally and in South Africa?

2. What should the ideal evaluation instrument look like according to literature and educators so as to support implementation of ICTs in the FET-Phase learning environments?

3. To what extent do GDE managers and educators perceive an ICT-evaluation instrument as being a viable tool for evaluation in the FET-Phase curriculum?

4. To what extent do GDE managers involve educators in the process of ICT-evaluation and -selection in the FET-Phase curriculum?

5. What suggestions made by subject teachers and GDE curriculum specialists can be infused in an ICT-evaluation instrument to make it suitable for self-directed learning environments in the FET-Phase?

6. How can an ideal, all-inclusive ICT-evaluation instrument be integrated and utilized for the enhancement of self-directed learning in the FET-Phase curriculum?

Below is an illustration of how each of the secondary objectives of the research was achieved by merely answering corresponding sub-questions. In the following sub-section, the researcher focus on answering sub-question one: *What evaluation procedures or instruments do managers and educators use to support selection of appropriate ICTs and the main challenges within the process globally and in South Africa?*

6.3.1 Evaluation procedures and instruments used for ICT evaluation globally and in South Africa

The first research sub-question specifically enquired about evaluation procedures and instruments used globally and in South Africa. The bid was to identify and adopt these procedures to make input towards existing ICT policies governing development, identification, evaluation, selection, approval and procurement of ICTs at different levels of performance within education departments, focusing more on establishing SDL when using ICTs in learning and learning environments.

The South African ICT-evaluation perspective is influenced by policies, circulars and legislation that govern education and other literary works. This study endeavoured to isolate, from such documents, provisions related to ICT-evaluation and the selection and package such in the form of procedures and processes for ICT-evaluation. Such processes and procedures would then be packaged and utilized to develop an ICT step-by-step guide or process map, typical to the one recommended to education departments later in Figure 6.2, section 6.4. The process map would guide ICT managers and evaluators on various activities that could form part of the evaluation. Once these functions are fully executed, the selected ICTs should optimally benefit the education departments' most valued customer the learner and his partner, the educator who works closely with him/her.

As hinted above, carefully selected ICTs should create the following ideal situation to support the twenty-first-century learner and educator in their bid to achieve SDL outcomes (DoE White Paper, 2014), namely (a) enable students and teachers to engage in information selection, gathering, sorting and analysis; (b) enhance life-long learning and provide unlimited opportunities for personal growth and development to all; (c) advance high order thinking skills such as comprehension, reasoning, problem-solving and creative thinking and enhance employability; (d) develop citizens who are critical and active life-long self-directed learners; and to (e) create a learning culture that keeps pace with these changes, and equips people with the knowledge, skills, ideas and values needed for life-long learning.

6.3.1.1 International Perspectives on ICT Evaluation

Abdullah, Bakar and Mabob (2012:768) suggest effective integration between content, approach and ICTs used in a learning environment to address the needs and challenges of education in the twenty-first century in Malaysian schools. Abdullah *et al.* (2019:768) also suggest effective integration between content, approach and ICTs used in a learning environment to address the needs and challenges of education in the twenty-first century in Malaysian schools. There is propagation for a flexible virtual learning environment. This approach alludes to BL approaches discussed in earlier sections of this work and makes the ground fertile for SDL implementation.

The first research sub-question was coined to establish whether there are any procedures and processes laid down as a guide for ICT-evaluation and -selection. However, after interacting with the participants using surveys and interviews, there was no clear response regarding the existence or understanding of ICT-evaluation processes and procedures. Unclear understanding of ICT-evaluation process might negatively impact the entire ICT-evaluation process and synchronization of activities. The objectivity of ICT-evaluation might also be at stake. GDE policies that were studied do not spell out a specific process map with steps, responsibilities and functions except for the dated LOETA LTSM system (2006). The absence of a process map might, as suggested by some participants, mean that evaluations are performed centrally and exclude educators, the knowledgeable pedagogues.

In the above section, research sub-question one was answered. In the next section, the researcher focused on answering research sub-question two: *What should the ideal evaluation instrument look like according to literature and educators to support the implementation of ICTs in the FET-Phase learning environments?*

6.3.2 Characteristics of an ideal ICT-evaluation instrument to support ICT implementation in the FET-Phase learning environments

The second sub-question of this research work challenged the researcher to establish all-inclusive characteristics of an ideal evaluation instrument via literature review and data-collection methods, including survey, semi-structured individual and focus-group interviews. The question sought to show both internal (e.g. Measurement Indicators, statements, commentary boxes, etc.) and an instrument's external (outlook) characteristics. A combination of literature reviews and participant responses was considered to draw the following findings to determine the following characteristics of an ideal ICT-evaluation instrument.

Without consistent MIs, education managers, evaluators, and policymakers are disempowered (Chetty, *et al*., 2017) and, consequently, cannot implement their respective sectorial policies such as objective ICT-evaluation. In this work research, MIs were developed and subsequently embedded in an evaluation instrument created with the aid of a working group selected from among the interview participants. For this reason, this study sought to establish criteria that served as the basis for developing MIs that could be entered onto any ICT-evaluation instrument as required by the GDE policy (MGUIP, 2010:24). Since evaluation criteria are too broad, they should be split into MIs which are expressed as quantitative and qualitative statements. As formerly explicated in section 3.3.2, Chapter three, based on Evaluation Indicator Model (Rodríguez *et al.*, 2009:2), depending on their nature, developed MIs could be categorised as either input or process indicators (for intervention or adoption).

As described in section 6.2.2, an overview of Chapter two, MIs are statements/questions that are instrumental in probing and supporting those who utilize the evaluation instrument to evaluate and select ICTs for use in an SDL environment, and evidently optimally comply with CAPS and BL provisions. As illustrated in Figure 6.1 (below), to lay the foundation for casting evaluation criteria and MIs, tenets of Garrison's Comprehensive Model and NITT's Taxonomy of Blended Learning Models were being adopted with the consideration of CAPS requirements.

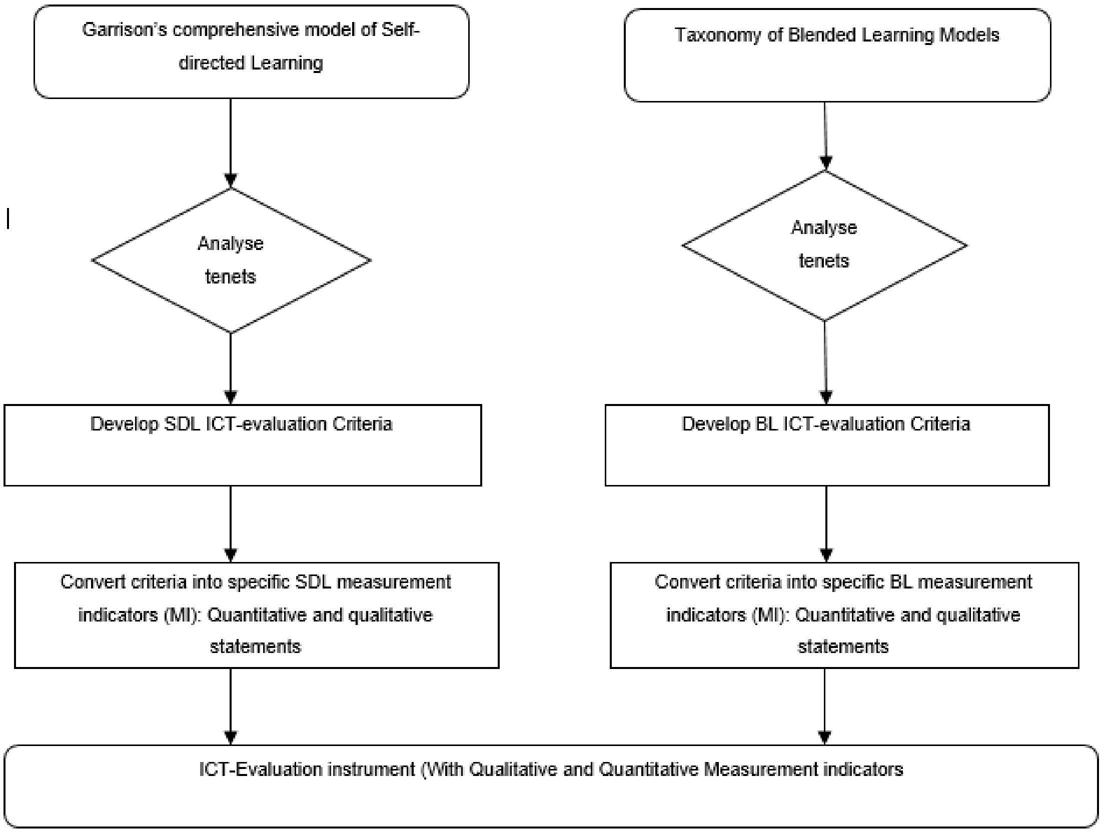


Figure 6-1: Using Garrison's Comprehensive Model and NITT's Taxonomy of Blended Learning Models to develop an ICT-evaluation instrument

Source: Author's own

Figure 6.1 is a breakdown of how an ICT-evaluation instrument could be developed applying both the GCM and NITT's Taxonomy of BL models. In the first step, tenets of each model are analysed. In the second step, ICT evaluation criteria for SDL and BL are created based on the tenets. Then the criteria are converted to MIs (quantitative and qualitative statements) which are added into an ICT-evaluation instrument. The developed ICT-evaluation instrument could be used to evaluate and select media that are suitable for BL and SDL environments.

Below is a demonstration of how the author of this document applied the GCM to develop MIs for an ICT-evaluation instrument. In the successive section, 6.3.2.2, the same is demonstrated applying a taxonomy of BL.

6.3.2.1 Evaluation criteria based on Garrison's Comprehensive Model

In his comprehensive Model, Garrison (1997) identifies three overlapping dimensions, which are listed as (a) self-management (task control), (b) self-monitoring (cognitive responsibility), and

(c) motivation (entering a task) which, in the context of this study, are recommended for the development of MIs for an ideal evaluation instrument. The exercise of MIs development using each dimension is illustrated below, starting with self-management.

6.3.2.1.1 Evaluation Criteria based on Self-management (task control)

The first dimension, self-management, is related to task control issues (Zhu *et al.*, 2020:4). Task control is a mechanism that facilitates the selection of activities that are directed towards specific tasks of execution (Kalanthroff *et al.*, 2017:603). Self-management focuses on social, rather than internal, cognitive aspects. It regards the social and behavioural implementation of learning intentions and enactment of learning goals, and the management of learning resources and support. It is the transactional (collaborative) control of external tasks and activities (Garrison, 1997). Self-management challenges learners as well as school and office-based stakeholders to resort to social collaboration whenever they execute their duties and responsibilities during the development of ICT-evaluation criteria and instrument, setting learning goals and managing resources. Stakeholders include office-based and school-based managers, planners, curriculum facilitators/educators, ICT or e-learning facilitators.

The salient tenets of self-management cater to social and behavioural implementation of learning goals, enactment of learning goals, management of learning resources and management of support. GDE educators and managers at different levels involved in the ICT-evaluation, selection, approval, and utilization need to be socially receptive and collaborative and select ICTs that will meaningfully support the learners to optimally attain these tenets. This would be a commitment to the learner-centred approach. Garrison (1997) stated in section 2.2.2, Chapter two, for resourcefulness and opinion regarding the learner's own learning goals and for assessment purposes, it is important to have a reciprocal social collaboration between the learner and others.

As alluded to earlier in section 3.5.1, Chapter three, in the principles of SDL, the learner equally needs to positively intend to learn and set his/her own goals, which Garrison's model illustrates enactment of learning goals. Although emancipated, due to the convictions of Interpretivist and Functional Pragmatism, a learner still has to select his/her learning goals with caution and responsibility (Garrison, 1997) in a process called goal enactment. Goal or plan enactment is how individuals enact their goals or plans (Keller *et al.*, 2017:54). One may add that goal setting is not the end but the beginning and precedes goal enactment and achievement. This appeals for the learner to responsibly collaborate in ensuring that the set goals are enacted, actioned and achieved in a reasonable time.

In addition to the above-stated, ICT-evaluation and utilization stakeholders, including learners, are also encountered with a responsibility of meaningfully and reasonably managing ICT resources which include personnel, host servers and software deployed thereon, software licenses, hardware leases, security and monitoring tools and process workflows (Chaddha *et al.*, 2020:2). Learners still rely on educators to select ICT resources (Khaloufi & Laabidi, 2017:57) to use in learning environments other than the traditional classroom, such as during online and home learning. Based on the above descriptions of this dimension, evaluation criteria and respective MIs should highlight learners' resource selection and management independently and under the educators' guidance.

6.3.2.1.2 Evaluation criteria based on Self-monitoring

The next dimension, self-monitoring, is related to cognitive and metacognitive processes (Mok & Mo, 2018; Tan *et al*., 2017). These processes include abilities to monitor one's learning strategies and to think about thinking (Garrison, 1997; Zhu *et al.*, 2020:4). It illustrates how the learner takes responsibility for constructing personal meaning to learning by integrating new ideas and concepts with previous knowledge, and constructing meaning through critical reflection and collaborative confirmation (Zhu *et al.*, 2020:4). The pursuit of self-monitoring within learning environments poses a task to ensure that some of the MIs on the ICT-evaluation instrument should be directed towards establishing whether ICTs emancipate learners to apply their cognitive and metacognitive capabilities when dealing with their SDL responsibilities. Also, selected ICTs should have features that enable learners to appraise their levels of self-monitoring.

One, therefore, suggests that to respond to the demands above, ICTs should have online self-monitoring interactive tools such as checklists, questionnaires, or review questions (Zhu *et al.*, 2020:13). However, collaboration with others, as was stated under self-management, is necessary since the learners also require constructive feedback on their self-monitoring (e.g. peers, educators) (Garrison, 1997). Therefore, it is suggested that to accommodate that reciprocity, the ICT-evaluation instrument should also have MIs that aim to select ICT media that caters for constructive feedback or peer assessment.

To sum it up, one could conclude that whereas it is positively influenced by motivation, self-monitoring has a significant impact on self-management in ICT learning environments (Zhu *et al.,* 2020:12). In brief, in the spirit of self-directedness, learners need to be motivated, both intrinsically and extrinsically, to optimise their cognitive and metacognitive skills and self-management. The educator has to perform a facilitation role to stimulate motivation and self-direction. The educator also gives guidance for learners to work collaboratively with others and perform individual activities that are aimed at achieving the outcomes of the curriculum.

6.3.2.1.3 Evaluation criteria based on Motivation

Since motivation plays a sizeable role in the origination and conservation of effort toward learning and the achievement of cognitive or intrinsic goals (Costley & Lange, 2017:72), MIs associated with that are vital for the ICT-evaluation instrument. Motivation also reflects the perceived value and anticipated success of learning goals at the time learning is initiated (Costley & Lange, 2017). In addition, as discussed in section 2.3.2.1, Chapter two, motivation is perceived as an optimistic way of alleviating the level of the DD. Thus, as it is being hoped, motivated users will be optimistic about partaking in ICT-evaluation and -utilization. In short, motivation mediates between context (control) and cognition (responsibility) during the learning process. Simply put, motivation is the desire to learn. The desire could either be driven by internal processes (intrinsic) or external, social and behavioural factors (extrinsic) (Azeez *et al.*, 2019). As alluded to earlier in Chapter two, 2.3.2.1, lack of intrinsic motivation could make the DD to be more adverse. Garrison's self-directed Comprehensive Learning Model is an attempt to integrate contextual, cognitive, and motivational dimensions of the educational experience (Garrison, 1997).

The interrelatedness of the three dimensions makes each dimension more meaningful. Thus, ICT –evaluation developers should strike a balance when crafting evaluation criteria and MIs around these three dimensions. To shortly describe their interrelations: once a self-directed learner is motivated, the learner's self-control increases, increased self-control, in turn, enhances levels of self-management. In their study, Zhu *et al.* (2020:2), using structural equation modelling, found empirical evidence that motivation directly affects self-monitoring and indirectly influences self-management through self-monitoring, which become important traits of a learner in SDL. In conclusion, self-directed learners' motivation impacts their self-monitoring skills and self-management, and self-monitoring skills impact self-management in learning environments.

6.3.2.2 Evaluation criteria based on the taxonomy of Blended Learning Models

Based on literature reviews, one may conclude that, like SDL, BL needs to be infused with developing criteria and an instrument for ICT-evaluation. Evaluation criteria associated with BL should seek to identify practical ICTs in reducing time students spend in the traditional classroom instead of remote learning environments (Dziuban *et al.*, 2018:3). More specifically, selected ICTs should be instrumental in supporting the educator to facilitate both face-to-face and online learning. Online learning is more widespread in the twenty-first century as it provides convenient access to information, and it may, over time, gradually totally replace face-to-face learning (Devrim & Orhan, 2016).

In terms of BL, evaluation criteria should encompass a conglomeration of different delivery methods such as collaboration software, web-based courses, various pedagogical approaches, knowledge management practices and any form of instructional technology (Abdillah, 2017:246). BL techniques to be sought by the evaluation criteria via its criteria and MIs should include, among other things, laboratory assessments, online instruction, e-mail, class web sites, computer laboratories, mapping and scaffolding tools, computer clusters, interactive presentations and e-mail, handwriting capture, evidence-based practice, electronic portfolios, learning management systems, and virtual apparatuses (Dziuban *et al.*, 2018:5).

The impact of BL is perceived as the focal point to education researchers, educators, ICT-evaluators and various other stakeholders. This is because the emergence of BL is popularized in the twenty-first-century teaching and -learning environments. The question becomes the extent of the impact, whether positive or negative, which aspects of BL are affected and how an education department including the GDE needs to equip itself to keep up with the impact's results. Thus this study propagates that criteria should enable the evaluator to select ICTs that are BL compatible. BL compatible ICTs should benefit the learner by engaging with the educator face-to-face and learning online whilst achieving CAPS curriculum objectives.

Some ICT-evaluation instrument MIs should specify that selected ICTs should positively impact the learner’s cognitive, affective and behavioural aspects. Positive impact on these aspects contributes to the potential of transforming the twenty-first-century learning environment to produce a learner who is a competitive, world-class citizen. Furthermore, an education department’s objective to promote BL correlates with a will to increase ICT access among end-users, thereby potentially alleviating the digital divide impact on disadvantaged learners, in particular (Dziuban *et al.*, 2018:2). As suggested in section 3.2.2.5, Chapter three, ICT access and availability makes it more practical to offer individual learners an opportunity to perform SDL-based activities with ease.

In the above section, research sub-question two was answered. In the next section, the author of this document focuses on answering research sub-question three: To what extent do GDE managers and educators perceive an ICT-evaluation instrument as being a viable tool for evaluating the FET-Phase curriculum?

6.3.3 GDE managers' perception of an ICT-evaluation instrument as a viable tool for evaluation in the FET-phase curriculum

The third sub-question of this study attempted to establish whether GDE managers perceive FET ICT evaluations as being a necessary, viable tool. The three data-collection tools contained specific questions to this effect.

When asked about their preferred format of an ICT-evaluation instrument, most of the respondents favoured an electronic ICT-evaluation instead of a print version for ease of use and analysis of results. Probably to accommodate those who might still struggle with ICTs (due to the DD or lack of equipment), some feel that the ICT-evaluation instrument should be both printed and electronic. Since education departments are geared towards keeping up with new ICT-innovations, a printable electronic instrument should be utilized to accommodate both groups. A printed version could assist in cases where ICTs are insufficient, or the ICT skills still lack due to the DD. Although taking this approach, education departments should bear in mind that they aim to convert their twenty-first-century educators into techno-pedagogues who are in the art of incorporating technology in designing teaching-learning experiences to enhance the learning outcome, for instance by making use of Internet technology, exploring it and retrieving information from it to use in the teaching-learning process (Sasirekha & Sathya, 2017:249).

The majority of respondents supported the existence of an ICT-evaluation instrument which, for approval, sets attainment of 75-90 percent of evaluation criteria, whereas more than 20 percent feel it should be 90-100 percent. The majority think that ICT-evaluations should be performed more than once per year. Of those, most feel it should be done every quarter or whenever necessary. An overwhelming majority are convinced that it is needed and indispensable to have an evaluation instrument when evaluating ICTs (Figure 5.16). As a conclusive point, utilization of an ICT-evaluation instrument is essential, and an education department needs to set a benchmark as high as 75 to 90 percent for ICTs to attain before selection. Also, evaluations need to be executed more than once a year as part of the educator's roles.

Lastly, all respondents indicated that there is a need for an ICT-evaluation instrument that makes it feasible for selecting ICTs that are compatible with some essential learning strategies. The most chosen popular combinations of teaching strategies are: (a) Face-to-face (FTF) coupled with SDL, and (b) FTF coupled with SDL and BL. As a standalone, BL was mostly selected, followed by SDL and FTF. Thus the required ICT-evaluation instrument should cater to all three approaches but, most notable for the context of this study, assist evaluators in selecting ICTs that cater to SDL.

More specifically concerning the validity and qualities of an ICT-evaluation instrument in the FET-Phase, in the first part of the first question of the semi-structured individual interview, the participants (GDE officials who mainly were e-learning practitioners) were asked whether they thought an instrument was necessary for evaluating ICTs. In the second part of the question, they were required to state what they thought could form part of the ideal qualities an ICT-evaluation instrument should possess. Participants were further probed about whether they knew any existing ICT-evaluation instrument within the GDE and to give more information regarding it. In response to the first part of the first question, the validity of the instrument, all the respondents expressed a need for the instrument.

Participants were asked whether they thought an ICT-evaluation was indispensable or necessary. An overwhelming majority thought ICT-evaluation was necessary and indispensable except for some who placed conditionality against its indispensability. As asserted earlier, one may conclude that utilising an ICT-evaluation instrument is viable and indispensable to support evaluators in their mission to select ICTs appropriate to enhance SDL in the FET-Phase. Otherwise, the absence of an ICT-evaluation instrument could reduce the probability of selecting valid ICTs that will meet the curriculum and pedagogical objectives.

In the section above, research sub-question three was answered. In the next section, the researcher will focus on answering research sub-question four: To what extent do GDE managers involve educators in the process of ICT-evaluation and -selection in the FET-Phase curriculum?

6.3.4 Involvement of educators in the process of ICT evaluation and selection in the FET-Phase curriculum

To endeavour to answer the fourth research question, the researcher engaged in a literature review and probed individual and focus-group interview respondents to advance their opinion or assessment of whether or not FET educators are involved in ICT-evaluation selection. If so, they were required to state the rate at which they are involved in the said ICT-evaluation processes. To answer this question, conclusions based on reviews of some of the existing literature and interview responses were grouped in accordance with two factors, namely social collaboration and the DD, as discussed below.

6.3.4.1 Social collaboration

Based on the reviewed literature, including departmental education policies, the deduced overarching principle of ICT-evaluation is social collaboration among all the stakeholders. The GDE, in its ICT-evaluation guidelines, does propagate social collaboration when schools are advised to establish School ICT-evaluation committees for management and utilization of ICTs (GMUIPS, 2010:24). However, there seems to be more emphasis on educators' utilization of ICTs rather than on their involvement in evaluation processes (PDFDL, 2017). The popular idea, which is in line with social collaboration and later supported by survey and interview responses, is that educators, the knowledgeable pedagogues, should not be side-lined. It is the researcher's opinion that the involvement of educators would add value to the ICT-evaluation and -selection process. Also, educators would gain knowledge and skills to evaluate the content, understand more what constitutes appropriate usage of such ICT content, and relevant copyright and intellectual property protections (Chetty *et al.*, 2017:9).

As propagated in the previous paragraph, social collaboration in the ICT-evaluation process would imply that meaning and knowledge are both personally and socially constructed to achieve outcomes that are "both personally meaningful and socially worthwhile" and to satisfy the educator's desire to be in control (Garrison, 1997; Svilla, 2014:36). Educators and their primary clients, learners, are the intended primary ICT end-users. Thus educators should have a democratic voice on ICT selection processes and procedures simply because they are in touch with reality at the learning environment level and are more advantaged to know, understand and address the academic, social, emotional and sensory needs to the twenty-first-century learner (Yotter, 2020:8). The twenty-first-century educators are also advantageous in knowing their needs as techno-pedagogues (Sasirekha & Sathya, 2017:249).

In addition to the above-stated, the educator's creativity and innovativeness implying social collaboration towards a common goal coupled with novelty are indispensable (Kalyani & Rajasekaran, 2018:3; Tan & Liu, 2017:245). A socially collaborative team implies that an educator will be an invaluable resource and will also have at his disposal others (educators, managers etc.) as resources to enrich his ICT-evaluation knowledge and skills to reasonably select ICTs that are useful to the goal of curriculum delivery and to enhance SDL environments. Social collaboration does not cease at the level of evaluation but is also essential during the utilization of ICTs. The implication is that the established cooperation will continue to the school or classroom level. The educator would still need to collaborate with his peers to share ideas, knowledge, experience and techniques to utilize ICTs to deliver the curriculum and enhance SDL fruitfully.

Inherently, once the social, collaborative culture is established, the educator should, as part of his pedagogical responsibility (Lemmetty & Collin, 2016:59), be equipped with skills and attitude to promote such culture to learners. The learners also need to collaborate with educators and peers to achieve their learning goals and become self-directed, competitive, independent, socially collaborative world-class citizens (UNESCO, 2015:18; Lai, 2015; Biemiller & Meichenbaum, 2017:89).

Based on the survey responses, dissemination of ICT-evaluation processes and procedures are not well-broadcasted in the GDE. These are only broadcasted to or among certain officials, including District ICT evaluators and not sufficiently disseminated to the educator's level. At school level, some information is disseminated only to ICT committee members or School Management. Although some educators do get informed, dissemination of ICT–evaluation processes and procedures is insufficient. Due to lack of dissemination and increased marginalization, most survey respondents did not show confidence when asked what processes and procedures they think should be opted for when evaluating ICTs. There were no definite inputs towards a probable ICT-evaluation process map and knowledge of ICT policy. There was a concern about the possible administrative burden. Educators have shown an interest in training regarding ICT-evaluation, reporting, data-capturing of evaluation reports and use of ICT media such as portals and webinars, which could be included in the ICT-evaluation process map. The majority of educators feel that since they are the ones who regularly are in contact with the learners, they understand their needs and therefore should participate in and lead ICT-evaluation processes and procedures. More awareness programs are necessary. They should form part of the leadership and decision-making processes.

As portrayed in the next section (6.3.4.2), a lack of social collaboration or inclusion of educators in ICT-evaluation processes and procedures might be ascribed to the DD. Next, a discussion follows on conclusions based on the DD factor.

6.3.4.2 The Digital divide

In some social spheres, the DD may be ascribed to inequitable access to technologies (Rowsell, Morrell & Alvermann, 2017:157) and used as a justification for limited social collaboration and maximum marginalization of educators from ICT processes and procedures. However, based on the survey and focus-group interviews of this study, issues concerning the DD- and ICT-evaluation processes and procedures are complex by varying opinions. The varying opinions are concerning the effectiveness of these ICT procedures and processes. Educators who are serving in the School Management teams, and officials of the department, believe that disseminating ICT-evaluation processes and procedures and inclusion of educators are done effectively. However, since most respondents were of the opinion that the procedures and processes lacked their input, evaluations are unlikely to be optimally objective.

The DD among older generations is caused by lack of motivation or technophobia; the resistance to ICT innovations. Consequently, the DD causes unequal participation (Ziemba, & Becker, 2019:6), hindrance to progress and probably marginalization of educators. To counter all these negative effects of the DD, education authorities need to devise pedagogical strategies. To devise the required strategies, officials need to understand the DD and its related aspects. Also indispensable is understanding various perceptions of global experts in the field to counter the DD since it is perceived as a deterrent to access to ICTs and innovations (Dziuban, *et al.*, 2018:4). Advertently, South Africa and its provincial education departments are no exception in dealing with the DD impact on different sectors of its population, especially the disadvantaged (Enriquez, 2019:11). These perspectives are influenced by the exploration of variables such as Physical access (including Geographical location and computation of the DD), Demographics (Socio-economic status and Gender) and Social Inequity (Language and Ethnicity, Motivational Access and ICT skills).

In the foregoing section, research sub-question four was answered. In the next section, the author of this document focuses on answering research sub-question five: What suggestions made by subject teachers and GDE curriculum specialists can be infused with the ICT-evaluation instrument suitable for self-directed learning environments in the FET-Phase?

6.3.5 Infusing suggestions made into an ICT- evaluation instrument suitable for SDL environments in the FET-Phase

The fifth sub-question was geared towards considering suggestions that educators or respondents made as curriculum specialists for infusion with the ICT-evaluation instrument. As specified earlier in section 1.2.1, Chapter two, the overarching SDL approach implies that learners can take charge of their own learning responsibly (Sumuer, 2018:30). It also means that learners' needs are highly prioritized. Contextually, the goal of putting the learner's needs first is valued by GDE, which is regarded as the pivotal leading agency (Tan *et al.*, 2017:15). For this goal to be realized, the learner should be allowed to enjoy autonomy, take own initiative, set own learning goals and, through self-assessment, decide on the learning outcomes to be realized (Siminica & Dumitru, 2013:121). Hence it is evident that MIs in an ideal evaluation instrument should assist the evaluator in selecting ICTs that will assist the educator in implementing SDL.

Furthermore, selected ICTs should be in line with the state and its education departments' aspiration to produce world-class citizens who are effective and accountable (UNESCO, 2015:18). A competitive world-class citizen is the one who shall, upon completing of formal learning, continue to serve in an ideally SDL-compliant workplace.

In brief, the ‘overarching mission of SDL is “a commitment to cultivating inquiry-led, self-directed and adaptable learners” (Lombard, 2018:14). The mission for selecting SDL-compliant ICTs as stated above, is to create a self-paced, autonomous learning environment that is often made possible by innovativeness. The ideal twenty-first-century innovative learners are proactive rather than reactive and apply SDL skills in their own life-long experiences (Knowles, as cited by Du Toit-Brits, 2018:376).

In short, one may conclude that innovativeness coupled with creativity and novelty by both the learner and the educator (Kalyani & Rajasekaran, 2018:3) is made feasible in an SDL environment. From the foregoing discussions, it becomes clear that SDL involves facilitation of learning content through social interaction between the learner and the educator, the educator or evaluator and other education officials, and that it also is a cognitive matter. Social interaction implies that although autonomy is revered in SDL, it should not be exaggerated and a constraint to SDL. Although emancipated, the learner still needs the educator’s involvement in learning; therefore, there should be a balance between autonomy and the educator’s support (Beckers *et al.*, 2018). It should be conscious in the educator’s mind that they should not abdicate their responsibility using emancipation of the learner as a pretext. Educators still need to focus on the learner's cognitive and emotional motivational needs notwithstanding the need for autonomy.

Furthermore, infused with the ideal ICT-evaluation instrument should be some MIs influenced by Garrison’s perspectives that SDL: (a) is the learner’s appealing desire to be in control of deciding what to learn and how to learn it; (b) focuses on the ability to learn on one's own; (c) has its genesis in independent and informal setups; (d) has as its three dimensions: sociological, pedagogical, and psychological (adopted from Long, 1989); (e) should focus on the critical issues of setting goals that are relevant and meaningful, cognitive strategies, and opportunities to question accepted orthodoxies; and (f) must go beyond task control and include the process of accepting responsibility for constructing meaning and for cognitively monitoring the learning process itself (i.e. metacognitive awareness).

Based on the semi-structured interview responses, the evaluation instrument should contain separate sections for content and devices. Each section should contain MIs specific to what is being evaluated. Some devices are supplied without any content uploaded, yet others with content. In the latter case, both content and device need to be evaluated using relevant MIs. When evaluating content only, the CAPS requirements, including assessment methods and techniques, should be strictly adhered to. A general feeling also prevailed that most of the MIs should be in the form of closed-ended questions.

In Addition to the above, one should state that from the pedagogical point of view, the ICT-evaluation instrument should test for learner-centeredness and self-directedness. During the COVID-19 lockdown period, a lesson was learnt as learners could not effectively learn in remote, virtual environments away from the traditional brick-and-mortar learning environment (Horn & Staker, 2017). Selected ICTs should make it pragmatic for learning to occur remotely, with the learner taking control and responsibility to attain the set goals. The ICT-evaluation instrument should cater to a selection of cost-effective ICTs that cater to online and SDL (Lombard, 2018:14) and innovativeness. The ideal ICT-evaluation should also be enabled to evaluate a broad spectrum of ICTs, including e-books and multimedia and stipulate their expected lifespan.

In the above section, research sub-question five was answered. In the next section, the researcher focuses on answering research sub-question six: How can an ideal, all-inclusive ICT-evaluation instrument be integrated and utilized to enhanc*e self-directed learning in the FET-Phase curriculum?*

6.3.6 Proposed means to integrate and utilize an ideal, all-inclusive ICT-evaluation instrument for the enhancement of SDL in the FET-phase curriculum

In the sixth sub-question participants were asked to share their knowledge and experience regarding factors to be considered to ensure that the ICT-evaluation instrument supports evaluators to select ICTs that are harmonious with CAPS. Subject advisors and e-learning staff should then form matrix teams to integrate their activities successfully. Subject advisors would give more input on content-related issues whereas e-learning staff would focus on technical ICT-evaluation. Thus, school ICT committees should balance and have the expertise of content and technical capacity or rather Technological Knowledge, Pedagogical Knowledge, and Content Knowledge (Zhang, Liu & Cai, 2019:4). when evaluating ICTs.

When asked about ICT integration, curriculum experts stated that an ICT-evaluation instrument should include a section of the MIs that caters for learners' different abilities. Selected ICT contents should enable the end-users to perform their respective tasks with efficiency. The ICTs should accommodate the diversity of learners, including learners with special needs as well as SDL. Furthermore, an integrative ICT-evaluation instrument should cater to a different spectrum of tasks and activities, including assessment types, including continuous and summative assessments, perhaps in an interactive manner. To avoid purchasing grade-specific ICTs every year, it would be cost-effective for ICTs to promote progression and integration between grades and within the phase or even integration among subjects in the same grade. An ICT-evaluation instrument should promote different learning methodologies to cement integration, including individual, pair, group, or even classwork. Selected ICTs should be usable, relevant to content and language, user-friendly, and embrace the local cultures, and if possible, include official languages.

Furthermore, the instrument's design should select ICT (contents) that enforce *durability, scalability,* and *flexibility*. *Durability* means that ICT modifications can be made without redesign or recoding; *scalability,* the proficiency of a system (both hardware and software) to be distributed to large numbers of learners in diverse locations; and *flexibility,* the ability to use and remix learning components from a range of learning sources (DoE White Paper, 2004). Hence some statements on the ICT-evaluation instrument are designed to address the three qualities mentioned above.

The ICT-evaluation instrument MIs should assist in testing the presence and interactive character of diagrams and illustrations and challenge learners' cognitive abilities to self-initiate activities that support their cognitive development. To maintain the national identity, diagrams should also be sensitive to local context group dynamics, including culture, religion or tradition. ICTs should allow an easy communication flow between learners and educators and cater for both inductive and deductive approaches to learning.

The above sections of the work were concerned with conclusions drawn based on the findings, which endeavoured to answer the set research questions and objectives in line with literature. The next section dissects the contribution that the study has made towards ICT-evaluation.

6.4 CONTRIBUTION OF THE STUDY

6.4.1 The study's contribution to the field of ICT evaluation

The empirical data obtained from the study in Chapter five provided evidence regarding an evaluation of ICTs in the FET-Phase to enhance SDL. As declared in Chapter one, the inquiry was to establish whether GDE managers and educators implement policy-based processes and procedures during ICT-evaluation and -selection in the FET-Phase and what is the *ideal, all-inclusive* set of criteria for such an evaluation instrument. To respond to the inquiry and as an output, the study contributes to the education system and the existing body of scholarship with: (a) a set of ICT-evaluation criteria; (b) ICT-evaluation processes and procedures; (c) a generic ICT-evaluation instrument for the FET-Phase suitable for SDL.

6.4.1.1 Evaluation processes and procedures

In terms of ICT evaluation processes and procedures, which are of utmost value to all stakeholders (Hong *et al.,* 2020:4), the contribution of this study is to offer stakeholders guidance regarding steps to be followed. Based on the reviewed literature, the steps to be followed are linked together in the form of an ICT-evaluation process map similar to the one formerly used for GDE LTSM (LOETA LTSM system, 2006). The ICT-evaluation process map covers detail ICT-evaluation, -selection and –utilization. It is recommended that education departments consider including the ICT-evaluation process map in their policies to influence their procedures and processes.

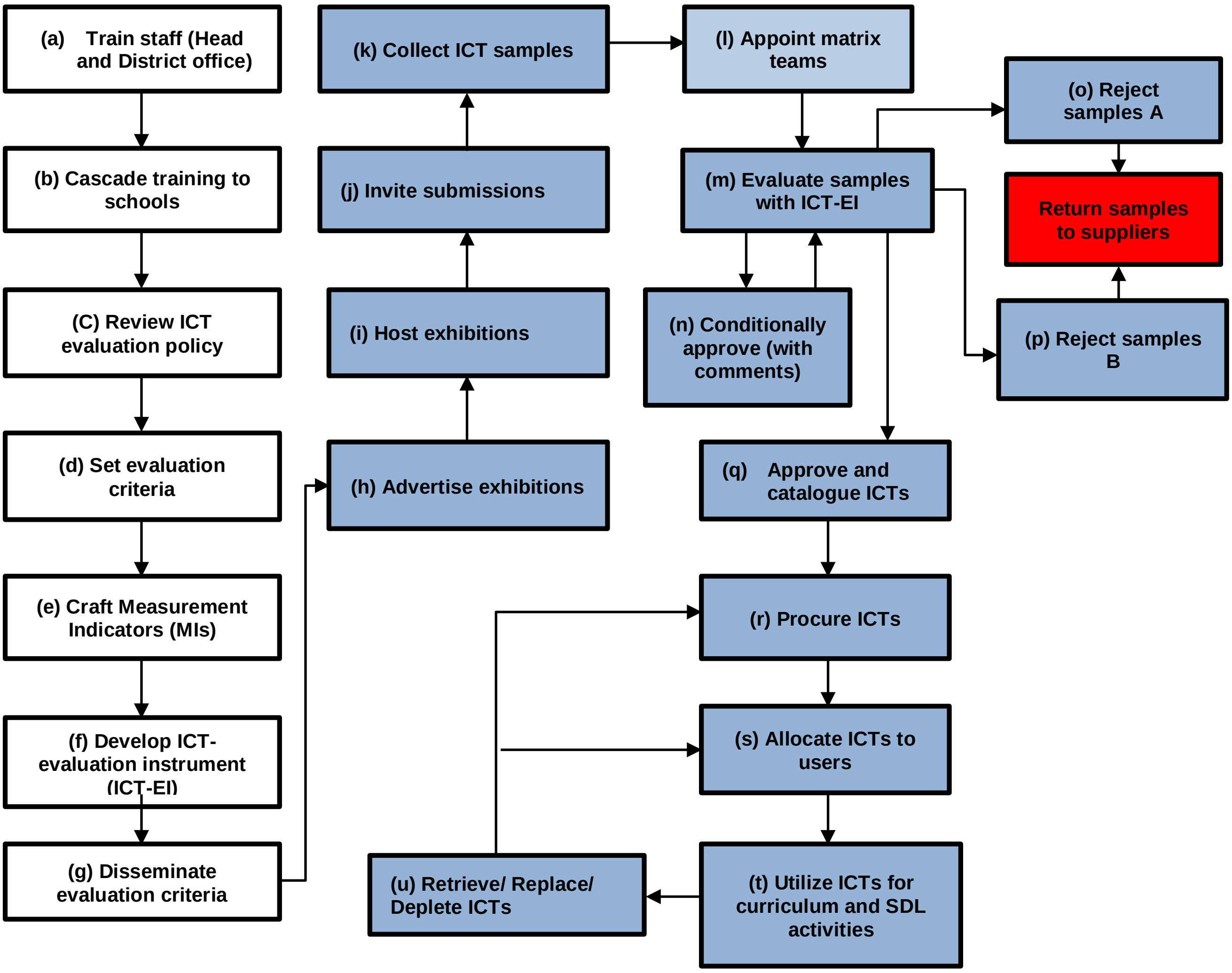


Figure 6-2: Processes and procedures during ICT evaluation (Blue blocks indicate steps to be executed at school level)

Source: Author's own

Figure 6.2 was designed to assume that ICT-evaluation could take place either at school, provincial or district level. At school level, a school intends to procure its ICTs and take the necessary step (marked in blue). The white blocks are Head and District office competencies. However, it is assumed that the District and Head Office teams will engage in social collaboration with educators when undergoing some of the steps. The steps in the Process Map are clarified next as follows:

(a) **Train staff (Head and District Office) –** Based on their strategic planning, the Head Office takes the initiative to plan and train staff on ICT-evaluation processes and procedures;

(b) **Cascade training to schools -** School-based educators (subject educators, school management teams, and ICT committee members) receive training;

(c) **Review ICT-evaluation policy –** The education department under Head Office leadership either develops a new ICT-evaluation policy or reviews an existing one. The policy may either be developed independently or as a section of the broader policy;

(d) **Set evaluation criteria –** Based on various literature sources, dialogue and empirical studies, the education department develops ICT-evaluation criteria;

(e) **Craft measurement indicators (MIs) –** Since evaluation criteria are too broad, they are converted and narrowed down into MIs, which are then embedded in the ICT-evaluation instrument;

(f) **Develop ICT-evaluation instrument –** An ICT-evaluation instrument is developed, edited, tested for validity and reliability and finally approved. It should either be in an electronic or printed form or both. Based on the survey, the most popular format was an electronic version;

(g) **Disseminate evaluation criteria –** Based on outcome-based and transparency principles, the crafted evaluation and MIs may be disseminated to materials and ICT developers before evaluation. Some may take heed and develop appropriate ICTs for submission;

(h) **Advertise Exhibitions –** The education department may need to arrange exhibition sessions whereby developers or suppliers are afforded the opportunity to demonstrate their ICT media to the schools and officials. An advert may need to be made to announce the exhibition dates and state conditions for participation;

(i) **Host exhibitions –** The department of education takes charge and host exhibitions anywhere based on planned logistics;

(j) **Invite submissions –** After being given an opportunity to exhibit and demonstrate, developers are invited to submit samples of their gadgets for detailed scrutiny – an evaluation based on the said criteria;

(k) **Collect ICT samples –** Education department collects samples from suppliers;

(l) **Appoint matrix teams –** Teams of evaluators are appointed to evaluate the submitted ICTs using the ICT-evaluation instrument;

(m) **Evaluate ICT samples with ICT-EI–** Each medium is evaluated by all team members and scored for feedback, reporting to the client and decision-making,

(n) **Conditionally approve (with comments) –** If the ICTs have minor improvement areas, they are conditionally approved and sent back to developers for change and resubmission (back to “m”) within a limited time. The score obtained must not be too low;

(o) **Reject samples A –** Submitted ICTs with a too low score and many defects or problems are out rightly rejected and returned to their owner;

(p) **Reject samples B –** ICTs that were initially conditionally approved and upon resubmission still failed to meet the requirements;

(q) **Approve and catalogue ICTs –** ICTs that meet the requirements and achieve at least the minimum score are approved and added to a catalogue or list of recommended ICTs. This is not a prescribed list but a list of highly recommended ICTs;

(r) **Procure ICTs –** Institutions exercise their rights and procure ICTs that were approved and meet requirements;

(s) **Allocate ICTs to users –** The procured ICTs are being allocated to their end-users, normally educators and learners;

(t) **Utilize ICTs for curriculum and SDL activities –** End-users use and apply their ICTs in a self-directed manner; and

(u) **Retrieve/ Replace/ Deplete ICTs –** ICTs are retrieved back to stock for storage at the end of the season to be allocated to other users (back to "s") in the next season. Another evaluation is performed to ascertain the condition of the ICTs. Damaged ICTs are logged and replaced or discarded, depending on the policy stipulation of the institution. New ones are procured (back to "r").

6.4.1.2 ICT evaluation criteria

The second sub-question of this research work challenged the researcher to establish all-inclusive characteristics of an ideal evaluation instrument via literature review and data-collection methods, including survey, semi-structured individual and focus-group interviews. The question sought to establish internal (e.g. MIs, statements, commentary boxes etc.) and external (outlook) characteristics of an ICT-evaluation instrument. Based on literature reviews and participant responses, the following ICT-evaluation criteria and MIs were developed.

The applied step-by-step development of ICT-evaluation criteria using both the Garrisons Comprehensive and the taxonomy of BL models, were explained in detail in Chapter three, sections 3.4 and 3.5. As directed in Figure 6.1, section 6.3.2, the developed criteria were converted to MIs, which were in turn embedded in the ICT-evaluation instrument. Again as it was declared in Chapter three, section 3.4, it should be reiterated that using these models for development of ICT-evaluation criteria is an archetype and not mandatory. More so, an ICT evaluation team may opt for just one, both or none of these models. The next section displays ICT-evaluation criteria based on the Garrisons Comprehensive Model. Later, in section 6.4.1.2.2, the same is displayed based on the BL taxonomy models.

6.4.1.2.1 ICT evaluation criteria based on the Garrison's Comprehensive Model.

Table 6.1 (below) depicts proposed self-management MIs for the development of an ICT-evaluation instrument.

Table 6-1: Proposed self-management Measurement indicators for development of an ICT-evaluation instrument

SALIENT TENETS	MEASUREMENT INDICATORS (to enhance SDL)
Social Aspects	Determine whether the ICT medium: (a) stimulates learner to work collaboratively/ transactional/ interactively with others during external task negotiation and control

SALIENT TENETS	MEASUREMENT INDICATORS (to enhance SDL)
	(b) allows the learner to reciprocate (respond to the educator's stimuli/ responses) during the execution of SDL tasks
Behavioral Aspects	Ascertain whether the ICT medium: (a) permits the learner to collaborate with peers/ educators during SDL activities (b) enables the learner to collaborate with other learners and educators during task control (c) caters for learner, peers and educators to responsibly negotiate, perform and review learning goals and intentions towards SDL
Enactment of learning goals	Establish whether the ICT medium: (a) has widespread databases or mechanism for self-directed goal development (b) empowers learners to take charge and act responsibly when selecting their own learning goals (c) allows the learner to execute self-directed learning goals independently (d) has in-built enablers to assist the learner to achieve and complete set SDL goals (e) fundamentally complies with specific educational, curricular and philosophical parameters (f) makes room for adequate holistic learner support by educator (g) emancipates individual learner to independently, with minimal interruptions, self-managed learning tasks
Management of learning resources	Verify whether the ICT medium: (a) emancipates the learner to independently select and integrate the ICT medium with other media and resources (b) makes it possible for the learner to obtain support from educator and other GDE stakeholders to select and integrate resource (c) is practical for implementation of BL (online and face-to-face) and SDL (including home learning) (d) supports both learner and educator to develop resource management activities/ strategies
Management of Support	Authenticate whether the ICT medium: (a) Cater and/ supports the involvement of stakeholders in the learner and educator support programs (b) has systems that enable the educator to offer adequate support to the emancipated learner

Based on Table 6.1, MIs are grouped according to tenets of the GCM (1997) self-management. The tenets to ensure that ICTs accommodate self-management are: (a) Social aspects; (b) Behavioural aspects; (c) Enactment of learning goals; (d) Management of learning resources; and e) Management of support (Garrison, 1997). Table 6.2 (below) depicts proposed self-monitoring Measurement Indicators for the development of an ICT-evaluation instrument.

Table 6-2: Proposed self-monitoring Measurement indicators for the development of an ICT-evaluation instrument

SALIENT TENETS	MEASUREMENT INDICATORS (to enhance SDL)
Construction of personal meaning	Determine whether the ICT medium: (a) enables the learner to integrate new and previous concepts, ideas and knowledge (b) emancipates learner to think critically and construct new meaning, concepts, ideas and knowledge (c) will create a learning environment in which the learner collaboratively confirms the new and previous meaning
Appraisal on self-awareness	Ascertain whether the ICT medium: (a) caters for the learner to appraise his/ her self-awareness (e.g. self-concept, self-esteem) (b) allows the learner to appraise his/ her learning progress against own set learning goals
Appraisal about learning progress	Establish whether the ICT medium: (a) emancipates learner to find own new alternatives to reach the set learning goals
Emancipation of Learner to think critically	Verify whether the ICT medium: (a) emancipates the learner to independently develop and use his/ her own cognitive and metacognitive capabilities to construct meaning and execute tasks self-directly
Interactive feedback	Authenticate whether the ICT medium: (a) caters for the learner to obtain feedback from others (educator, peers, stakeholders) (b) has in-built or online self-monitoring tools for feedback to/ from the learner, e.g. questionnaires, checklists, review questions.

Depicted in Table 6.2, still based on the GCM (1997), the following MIs were grouped according to the tenets known as: (a) Construction of personal meaning, Appraisal on self-awareness; (b) Appraisal of learning progress; and (c) Emancipation of learner to think critically. Table 3 (below) illustrates Proposed Motivation Measurement Indicators for the development of an ICT-evaluation instrument

Table 6-3: Proposed motivation Measurement indicators for the development of an ICT-evaluation instrument

SALIENT TENETS	MEASUREMENT INDICATORS (to enhance SDL)
Initiation, monitoring and maintaining efforts towards learning	Determine whether the ICT medium: (c) attracts the learner to initiate learning using the ICT-medium independently (d) will consistently maintain the learner's interest
Achievement of cognitive goals	Ascertain whether the ICT medium: (a) motivates learner to set cognitively learning goals (b) supports the learner to achieve set cognitive goals
The perceived value of learning goals	Establish whether the ICT medium: (a) Has the capacity to assist the learner to value the set learning goals (b) Has the capacity to motivate the learner to value full attainment of learning goals
Mediation between context and cognition	Verify whether the ICT medium: (a) challenges learner to apply new and existing ideas, knowledge and content in real-life contexts (control) (b) matches appropriate learner's level of cognitive development

From Table 6.3, based on the GCM (1997), the following MIs were grouped according to the tenets known as: (a) Initiation, monitoring and maintaining efforts towards learning; (b) Achievement of cognitive goals; (c) The perceived value of learning goals; (d) Mediation between context and cognition; and (e) Various types of motivation influence learning so as to ensure that ICTs accommodated self-monitoring, the cognitive and metacognitive development of learners.

6.4.1.2.2 ICT evaluation criteria based on the taxonomy of BL models

As it was detailed earlier, in this section the author of this document presents ICT-evaluation criteria and MIs developed based on the NITT taxonomy of BL (Dziuban *et al.,* 2018; Valiathan (2002). In that exercise, MIs for Skill-Driven Model, Attitude-Driven Model and Competency-Driven Model are presented in each of the tables below.

SKILL-DRIVEN MODEL

TENETS

1. Regular feedback
2. Self-paced Learners
3. Educator oversight
4. Synchronisation

EVALUATION CRITERIA

1. Learner should get regular feedback
2. Learner to work at own pace
3. Educator should be present
4. Learner and educator should synchronise with other learners and educators at own and other learning environments

MIs

1. Does ICT-medium”
   - have regular feedback features
   - Stimulate educator and others to give feedback to learners?
2. Allow learners to work at own pace through activities?
3. Have features that enable educator to oversee/assess learners’ work progress?
4. Make it possible for learner to synchronise own work activities, goals, outcomes with others (learners and educators)?

Figure 6-3: Development of ICT- evaluation criteria and Measurement Indicators based on tenets of the Skill-Driven Model of Blended Learning, (National Institute of Information Technologies; Dziuban *et al.,* 2018*;* Valiathan, 2002

ATTITUDE-DRIVEN MODEL

TENETS

1. Content with new attitudes and behaviour
2. Peer-peer interaction
3. Risk-free learning environment conducive for activities
4. Flexibility for collaboration

EVALUATION CRITERIA

1. Learner should get regular feedback
2. Learner to work at own pace
3. Educator should be present
4. Learner and educator should synchronise with other learners and educators at own and other learning environments

MIs

Does / is ICT-medium"

1. have or give way for development of content that is in line with learner attitudes and behaviours?
2. Enable learner to interact with peers in a variety of ways/ paths?
3. Risk free or promoting risk-free learning activities?
4. Permit the learner to flexibly collaborate with others?

Figure 6-4: Development of ICT- evaluation criteria and Measurement Indicators based on tenets of the Attitude-Driven Model of Blended Learning, (National Institute of Information Technologies; Dziuban *et al.,* 2018; Valiathan, 2002)

COMPETENCY-DRIVEN MODEL

TENETS	EVALUATION CRITERIA	MIs
1. Interact with and observe experts 2. Assign/ appoint expert and mentors 3. Capture and transfer tacit knowledge	1. Educator and learner should interact with and learn from experts 2. Experts and mentors should be provided for? 3. Tacit knowledge should be captured, transferred and safely kept	Does / is ICT-medium" 1. Make it possible for experts to be contactable when needed? 2. Give information on mentorship? 3. Provide or have features for knowledge capturing and record/ data saving (Memory space and speed capacity)

Figure 6-5: Development of ICT- evaluation criteria and Measurement Indicators based on tenets of the Competency-Driven Model of Blended Learning, (National Institute of Information Technologies (Dziuban *et al.,* 2018*;* Valiathan, 2002)

6.4.1.3 ICT-evaluation instrument

As earlier indicated, the ICT-evaluation instrument in Chapter 5, section 5.4 was developed based on the MIs, which were originated from evaluation criteria based on literature review, learning models, as well as input from participants' responses during surveys, interviews as well as focus group discussions. The findings indicate that this instrument is essential, should be used by managers and educators at different levels around the globe, integrate e-learning and curriculum objectives, support the educator in curriculum delivery, learner management and control, assist educator to audit skills of self and learners. Furthermore, the instrument should be dynamic and even measure for ICT dynamism against out-datedness. It should be used for pre-procurement evaluations as well as on a regular basis to determine whether ICT media are still up to date.

6.5 RECOMMENDATIONS

The following recommendations on ICT evaluation processes and procedures, as well as the development of an instrument that are based on research findings obtained from literature reviews and empirical study, may be helpful to education departments:

6.5.1 Involve Educators more in ICT evaluation

Educators are knowledgeable pedagogues and may be helpful in evaluating and selecting ICTs for their SDL learning environments. Involving educators in this process may assist in: (a) reducing workload from officials; (b) increasing social collaboration among educators and officials; (c) assisting educators in claiming more ownership to ICT media and processes (improve attitudes); (d) assisting managers in identifying gaps in ICT skills; (e) detecting the extent of the digital divide and implementing strategies to eradicate it; (f) making it possible to specify, via educators, realizing the needs of the learner and consequently identifying and selecting ICTs that are required and appropriate; and (g) increasing their ICT knowledge, skills and attitudes.

6.5.2 Adopt the proposed ICT-evaluation instrument

Education departments globally may need to consider adopting and adapting the proposed generic ICT-evaluation instrument and pursue the strategy further by developing subject-specific evaluation instruments based on the same principles rooted in ICT policy documents, including the GMUIP (2010) and PDFDL (2017) and other literature studies. The subject-specific instrument may either be a standalone or added as sections within the existing generic instrument. Measurement indicators used could, amongst other pivotal factors, aim for or test whether the ICTs: (a) liberate learners should take charge of their learning experience; (b) are learner-centred and cater primarily for the needs of the learner; (c) promote learners' autonomy and ownership; (d) cater to various assessment strategies/types; (e) promote learners to be inquiry-led; (f) are compatible to twenty-first-century demands on the learner and educator; (g) cover Pedagogic, Cognitive, Psychological and Sociological Aspects of learning; (h) have specific sections dealing exclusively with device and contents; (i) are safe, user-friendly and correspond with age and developmental level of the learner; (j) promote integration between grades, phases, subjects and other areas of learning; (k) have reasonable durability, scalability and flexibility; (l) are 75 – 90 percent compliant with evaluation criteria and MIs; and (m) are in line with CAPS requirements.

The unanticipated 2020 worldwide COVID-19 pandemic lockdown circumstances might need to be treated as a learning curve. Due to ICT limitations during the lockdown, optimal online learning at remote learning centres probably was a huge challenge. To be cost-effective and avoid the prevalence of the DD, an education department needs to reconcile between digital transformation, a strategic organizational response to leverage changes and digitization, the physical ICT offerings (Vial, 2019:5) and close the possible gaps by: (a) focusing on issues of broadband or other means of connectivity; (b) investing more on educator training and development; (c) profiling learner ICT skills; (d) developing compatible learning programmes; (e) supplying more ICT media which are compatible with the circumstances, and (f) developing a policy to provide for remote learning.

6.5.3 Perform ICT evaluation at regular intervals

ICT evaluations should not be a once-off event that is done before ICTs are bought. Globally, education departments may consider performing the function at different times and stages (e.g. Before ICT selection and purchase, during the utilization period (over the years) and during ICT exit - when the ICT media have aged (outdated or worn) or when they are retrieved from learners). To document ICT evaluations, education departments should consider developing a manual of ICT -evaluation, -selection and -approval. Contained in that manual should be an ICT-evaluation process map (similar to the one on Figure 6.2 above), players and timeframes. Coupled with regular ICT evaluations, the GDE may have to consider reviewing its policy on ICT evaluation to add new developments and adapt to new changes on a regular basis. The policy could also include a fully-fledged plan to counter or eradicate the DD to convert its educators to techno-pedagogues (Sasirekha & Sathya, 2017: 249). The following section deliberates on the limitations of this study

6.6 LIMITATIONS OF THE STUDY

The following were some of the limitations that were experienced during the study:

6.6.1 Time constraints

Although an intensive literature review was undertaken, time was a constraint regarding fieldwork. More time would have made more impact in terms of the findings. COVID-19 lockdown exercised more constraint; consequently, data-collection methods had to be adapted. Focus-group and Individual Interviews had to be conducted online instead of on personal contact. Organizing these sessions was a daunting logistical ‘nightmare’, especially because schools were locked down for lengthy periods.

6.6.2 Limited methodological scope

There also was a limited methodological scope in terms of the number of individual interviews for a study that is of this utmost significance for contribution to the entire province, country and world. The scope limits the endeavour to generalize the findings.

6.6.3 Obtaining fieldwork permission

Obtaining permission from the GDE Head Office to perform research at their institutions was also a challenge. Although the Directorate- Education and Knowledge Management is very organized, there were times at which they could not ratify the researcher's application because they worked from home and could not access some of their resources. Further to that, the researcher needed to approach all the districts within his research area to obtain their acknowledgement to contact their institutions (schools and offices). He had to make several calls to receive responses. Schools were also challenging to find as some of the phones were unanswered, telephone messages not returned, and emails not replied to. In no way the researcher would drive to the schools as they were closed, and besides, he was not allowed to access them.

6.7 RECOMMENDATIONS FOR FURTHER STUDY

Further research could inquire about perceptions of educators and learners regarding the necessity of face-to-face versus online learning in the post-COVID-19 pandemic educational environment. Researchers could also investigate how patriotism or lack thereof impacts educators' curriculum deliverance within the South African socio-political milieu.

Last, in this study, literature reviews and fieldwork showed that there could be more need for research in areas related to implementation of ICT evaluation guidelines. Although authors' contributions regarding ICT and technology evaluation thereof is hardly ever done. Considering the fiscals invested in ICTs, it is incomprehensible why ICT evaluations are not prioritised. Even when done, they are not as formal and stringent as they should be. Therefore, more research needs to be undertaken in the above-mentioned research areas. Evaluations should have a special section in all organizations and institutions, including Provincial offices, National offices, private companies, and Higher Education Institutions. This organizational change would add value to money spent on ICTs and further prepare end-users to be experts. It is a matter of digital transformation versus digitization. Perhaps this could be advocated via conference papers.

6.8 CHAPTER CONCLUSION

In this research journey the researcher engaged in a literature review and empirical research to evidence the significance of evaluating ICTs to enhance SDL. In this chapter, the author of this document has endeavoured to show congruence of different chapters towards achievement of the study's set goals and objectives. Together with sub-objectives and questions answered through research methods, these objectives were included in surveys and interviews.

The study has evidenced the extent to which GDE managers and educators adhere to policies and procedures for evaluating ICTs and the value and existence of evaluation criteria, MIs and the ICT-evaluation instrument. To contribute to the educational field and scholarship, evaluation methods and techniques were unveiled, and models were constructed to propose performing ICT-evaluations.

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ANNEXURE A: SURVEY QUESTIONNAIRE

The North-West University invites you to participate in a research project that it is undertaking with the purpose to gather information based on an "Evaluation of Information and Communication Technologies (ICTs) in the FET-phase to enhance self-directed learning (SDL)". The results of this study will be used in my dissertation for a Doctoral Degree in Education. The purpose of this survey is to propose processes and procedures to be implemented during evaluation of ICTs for the FET Phase with the support of an empirically validated evaluation instrument. You have been selected to take part in this survey in order to share your knowledge, experience and opinions.

CONSENT INFORMATION:
Please be advised that participation in this study is absolutely voluntary and that you are *not being forced to take part in this survey. The choice of whether to participate or not is yours alone. If you choose not to take part, you will not be affected in any way whatsoever. If you agree to participate, you may stop participating at any time and tell me that you do not want to continue. If you do this, there will be no penalties, and nothing will happen to you as a result of this decision. The same applies should there be specific questions you do not want to respond to. There are no known risks to participation in this project. Your participation is crucial, and your responses are of outmost significance for the advancement of educational goals. Everything you share will be kept confidential and will not be used against you. You are <u>not</u> required to provide your name on this survey form.*

Do you consent to participate in this group discussion? Yes/No

If you consent, I kindly request you to complete the following short survey questionnaire. This survey should take no longer than 25 minutes of your time and your response is of utmost importance to me. Wherever applicable, feel free to select more than one answer per question.

Thank you

Regards

Sipho Mahlaba, PHD Candidate
North-West University
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Section A: Demographic information

1. Gender

Male	Female
1	2

2. Age

18 -24	25 -31	32-38	39-45	46 and above
1	2	3	4	5

2. Highest Qualification

Post matric Diploma or Certificate	1
Baccalaureate Degree(s)	2
Post Graduate Degree (s)	3

3. What is your current position?

Subject educator	1
Subject Head	2
Departmental Head (school)	3
Deputy Principal	4
Principal	5
Official (District office)	6
Official (Provincial office)	7
Other (Please specify)	8

4. ICT Education and Training Level

Short course(s) or certificate up to a month	1
Short course(s) or certificate more than a month up to six months	2
ICT Diploma or certificate	3
ICT subject courses within a degree	4
Full ICT Degree	5
Other ICT qualification not listed above	6

5. Teaching experience [in years]

0 – 3	3 - 6	6 - 9	9 – 12	12 and above
1	2	3	4	5

6. Experience of teaching in the ICT environment [in years]

0 – 3	3 - 6	6 - 9	9 – 12	12 and above
1	2	3	4	5

Section B: Educator involvement in ICT evaluation

***7.* Evaluation awareness programs**

(As an educator, you are likely to be approached by several LTSM or ICT developers who come to your school with samples of what they suggest you to use in the classroom. Prior to accepting those, you might need to perform an evaluation. Below, please indicate how familiar you are with evaluation of LTSM including ICTs)

A circular was sent from the department of education to alert us	1

A colleague or friend told me about it	2
Our line manager told us about it	3
A private company or organization told us about it	4
It is my first time to learn about it	5

8. Participation of educators

(Should your school receive samples of ICTs, what is the educators' level of involvement) NOTE: ICTs for teaching include resources like computers; laptops; tablets; smartphones; electronic books, dictionaries and bibles; calculators; TVs'; software applications etc.)

	1	2	3	4
	Often	**Sometimes**	**Seldom**	**Never**
1. School Management never give us samples to evaluate				
2. All educators are invited to partake in the evaluation				
3. ICT evaluations are done by selected educators only				
4. ICT evaluations are only done by senior staff only				
5. Educators are only informed of evaluation results				
6. Educators do not know who selects ICTs for school				

9. Experience of evaluating LTSM including ICT

(You may tick more than one applicable statements depending on the level of your past involvement in the process)

I have in the past participated in evaluation	1
I have done evaluation alone for my class	2
I have done it as part of an evaluation team	3
I have been invited by the district/ head office to evaluate LTSM or ICTs	4
I have done evaluation as part of management	5

10. Training on evaluation of LTSM and ICT

(When responding to the following statement, consider both formal and informal training irrespective of duration. It might also not be a special course but part of another training program/s)

I have been trained on evaluation of LTSM	1
I have never been trained on evaluation of LTSM	2
I have been trained on evaluation of ICT	3
I have never been trained on evaluation of ICT	4

11. Indicate how significant you think ICT evaluation is

(This does not depend on your previous involvement in the process. It challenges your opinion as an educator within ICT environments)

It is strongly insignificant	1
It is insignificant	2
It is averagely significant	3
It is significant	4
It is strongly significant	5

Section C: Evaluation procedures

12. Procedures and processes followed during evaluation

(This is a for possible future recommendations that could be made not disregarding the present situation at the GDE and its schools)

	1	2	3	4	5
	Strongly Agree	**Agree**	**Neutral**	**Disagree**	**Strongly Disagree**
1. Educators are normally provided with criteria to select ICT for the schools					
2. In a school year, ICT evaluation and selection are done in a particular time					
3. A variety of ICT brands from different suppliers are provided for possible selection					

4. Educators also have a say in the process of ICT evaluation at school level					
5. Formal reports on approved ICTs are done					
6. Evaluation results are shared with educators					
7. ICTs already in use are periodically evaluated for potential out-datedness					

13. Evaluation leadership and approval

(Subject/ Learning area educators have a primary responsibility to deliver the curriculum in the classroom. However, they might be involved in evaluation of ICT tools to be used for that purpose. Please voice your opinion how they need to be involved in that process)

	1	2	3	4	5
	Not important	**Slightly important**	**Moderately important**	**Important**	**Very important**
1. Form part of the evaluation team					
2. Take over as leaders of the evaluation team					
3. Make final decisions on ICT approval					
4. Be passive and wait for recommendations					

Section D: Qualities and viability of an evaluation instrument

(In case an evaluation instrument is developed, it should possess certain qualities to assist educators to select ICTs that enable them to optimally perform their pedagogical roles including activities that enhance Self-directed learning. Below please indicate your view on some of the technical and curricular qualities of an evaluation instrument).

14. User-friendliness of instrument

(For convenience and user-friendliness, in what format should an evaluation instrument be?)

1.Print form	1
2.Electronic form	2
3.Both Print and Electronic form	3

15. How often should ICT evaluations be done?

(The following statement considers administrative workloads, continuity, out datedness as well as well as teacher-support for classroom management)

Once per year	1
Twice per year	2
Every quarter	3
Any time when deemed necessary	4

16. Scoring of ICT

(*In order to avoid ICTs that are inappropriate or below standard, evaluators need to decide the average percentage score for approval.* In order to be approved for selection and utilization in the classroom, what percentage points should an ICT score?

50 to 74 percent	1
75 to 90 percent	2
90 to 100 percent	3

***17.* Viability of an instrument**

(Stipulate how necessary you deem the use of an ICT instrument)

1.ICT evaluations should be done informally without any instrument	1
2.An instrument should be used only by those who wish	2
3.An instrument is necessary and should be compulsory when evaluating ICTs	3
4.Evaluations are not possible without an instrument	4

18. Teaching strategies

(Which of the following is of outmost importance regarding what a selected ICT should provide for?) NOTE: You can select more than one response.

Face-to-face instruction	1
Self-directed learning (SDL)	2
Blended learning	3
None of the above	4

SECTION E:

19. The Digital Divide

The digital divide defines an adverse Learner-to-Computer Ratio. It is a hindrance to healthy teaching and learning including SDL. On average, how severe do you think the situation is at your school/s regarding ICTs in general?

Every learner is well catered for to partake in activities with ease	1
Learners share reasonably and partake in SDL activities with some difficulty	2
Learners share but not reasonably and partake in SDL activities with much difficulty	3
Learners stumble on each other for ICTs and cannot partake in SDL activities	4
Learners are not catered for with ICTs at all	5

THANK YOU FOR YOUR PARTICIPATION

Study Leader (Title, Initials & Surname)	Study Title
Prof C van der Westhuizen	An evaluation of information and communication technologies in the FET-phase to enhance self-directed learning

NWU Ethics Number															
	N	W	U	-						-			-		

8.2 Sec 8b: Statistical Consultant (If applicable)

The statistician of the Statistical Consultation Service of the North-West University completes this section (where applicable).

8.2.1 Have you ascertained that the statistical analyses to be used in this study is justifiable according to your judgement?

Please mark with X in the appropriate box and provide details.

Yes	No	
☒	☐	

Name (Title, Full Names & Surname)	Qualifications
Prof Susanna Maria Ellis Pr Sci Nat	PhD (Statistics)

Signature	Date
	2019-11-29 (ccyy-mm-dd)

ANNEXURE B: SEMI-STRUCTURED INTERVIEW SCHEDULE

SEMI-STRUCTURED INTERVIEW SCHEDULE

Note to researcher:

*Instructions to researcher are given below. Questions to read out are in the **tables**. **Prompts** are also provided, to be read out if and when needed (for example, if people do not understand a question, or to help encourage further discussion).*

1. OPENING:

(Establish Rapport) [shake hands/elbow touch] My name is ___________________.

The North-West University invites you to participate in a research project that it is undertaking with the purpose to gather information based on an *"Evaluation of Information and Communication Technologies (ICTs) in the FET-phase to enhance self-directed learning (SDL)"*. The results of this study will be used in my dissertation for a Doctoral Degree in Education. You have been selected to take part in this interview in order to share your knowledge, experience and opinions.

CONSENT INFORMATION:

Please be advised that participation in this study is absolutely voluntary and that you are *not being forced to take part in this interview. The choice of whether to participate or not is yours alone. If you choose not to take part, you will not be affected in any way whatsoever. If you agree to participate, you may stop participating at any time and tell me that you do not want to continue. If you do this, there will be no penalties, and nothing will happen to you as a result of this decision. The same applies should there be specific questions you do not want to respond to.*

There are no known risks to participation in this project. Your participation is crucial, and your responses are of outmost significance for the advancement of educational goals. Everything you share will be kept confidential and will not be used against you.

Do you consent to participate in this individual interview? Yes/No

IF YES, ISSUE CONSENT FORM AND ALLOW THE PARTICIPANT TO READ, ASK QUESTIONS AND SIGN. Remember to take note of the session and to record this on Otter-i during that session. (Obtain consent to record session).

2. STATE PURPOSE OF INTERVIEW SESSION:

I would like to ask you some questions about your background, education, experiences regarding evaluation of Information and Communication Technologies in the FET Phase to enhance SDL in the classroom.

3. MOTIVATION:

I hope to use this information to develop an instrument for ICTs evaluation and recommend education departments to use such in the future to evaluate and select ICTS as well and consider that in their policy framework development.

4. TIMELINE:

The interview should take about 15 minutes. I also request you to freely answer the questions as much as possible.

5. STRUCTURE OF INTERVIEW:

The interview schedule consists of 2 sections, the first of which is about your personal information and the second is your knowledge, input and experiences.

SECTION A: PERSONAL INFORMATION:

20. Gender

Male	Female
1	2

2. Age

18 -24	25 -31	32-38	39-45	46 and above
1	2	3	4	5

21. Highest Qualification

Post matric Diploma or Certificate	1
Baccalaureate Degree(s)	2
Post Graduate Degree (s)	3

22. What is your current position?

Subject educator	1
Subject Head	2
Departmental Head (school)	3
Deputy Principal	4
Principal	5
Official (District office)	6
Official (Provincial office)	7
Other (Please specify)	8

23. ICT Education and Training Level

Short course(s) or certificate up to a month	1
Short course(s) or certificate more than a month up to six months	2
ICT Diploma or certificate	3
ICT subject courses within a degree	4
Full ICT Degree	5
Other ICT qualification not listed above	6

24. Teaching experience [in years]

0 – 3	3 - 6	6 - 9	9 – 12	12 and above
1	2	3	4	5

25. Experience of teaching in the ICT environment [in years]

0 – 3	3 - 6	6 - 9	9 – 12	12 and above
1	2	3	4	5

SECTION B: KNOWLEDGE AND EXPERIENCE

QUESTION 1: Qualities of an instrument	**PROBE**
a. Do you think when ICTs are chosen for the classroom, there should be some sort of an instrument to serve as a guide? b. In the presence of an instrument to evaluate ICTs for the classroom, give significant qualities that you think it should possess.	*a. Or should educators do it without an instrument because they are experienced anyway?* *b. - If there is one instrument you know of, tell us about it.* *- If there is none, tell us about an ideal instrument that educators could use to evaluate ICTs for the classroom.*
Notes:	
Comments:	
Comments:	

QUESTION 2: Educator participation	PROBE
What is your opinion regarding the level at which educators are involved in ICT evaluation processes?	*Do you think it is a pure administrative or management function or should involve subject educators?*
Notes:	
Comments:	

QUESTION 3: Suggested components	PROBE
Describe characteristics that could be vital for an ideal instrument for ICT evaluation	*Consider anything that comes to your mind: Its outlook, sections to be covered, type of questions, curriculum relevance, scoring system etc.*
Notes:	
Comments:	
QUESTION 4: Instrument integration	**PROBE**

- How do you think that an instrument could be harmoniously integrated in curriculum processes implementation? - Suggest ways in which the instrument could be utilized as a means to support the educator in implementing curriculum.	a. *Consider how it will guide selection of ICTs that are harmonious with the pedagogical activities as suggested in the CAPS* b. *Consider how it will guide selection of ICTs that boost curriculum implementation or strategies as per the CAPS.*
Notes:	
Comments:	

ENDING THE SESSION

Finally, summarize the discussions and thank the participant for his/ her time.

NB: Remember to collect the Participant Consent Forms.

Below please note any notable participant's attitude(s) towards you, the interviewer, and the interview in general:

____
____
____
____
____

Below please note down and describe any notable unusual or disruptive actions, circumstances as well as events that had any bearing on the interview (whether verbal, non-verbal) for example interruptions:

Below please describe anything notable that happened during the interview that has any bearings on the objectives of research/ subject:

Other comments:

ANNEXURE C: FOCUS-GROUP INTERVIEW SCHEDULE

FOCUS-GROUP INTERVIEW SCHEDULE

Note to researcher:

Instructions to researcher are given below. Questions to read out are in the tables. Prompts are also provided, to be read out if and when needed (for example, if people do not understand a question, or to help encourage further discussion).

Running the Focus Group Sessions

Please refer back to these notes just before the group is due to meet to refresh your memory.

Remember to take a note of the group session and to record this on Otter-i during that session.

(Obtain a consent to record session).

It is important to remember that you are seeking to reach a group viewpoint as far as possible. You should try to get everyone involved in the discussion. This does not mean that everyone must have the same view, but the discussion should lead to some conclusions. You need to record both majority and minority views.

Before the group assembles

Test the recording equipment to make sure it is working and that the sound is recording at an acceptable level. Ensure you have any paperwork ready before the participants arrive, e.g. notes, name badges, and Participation Consent Forms.

Preparing to start the session

Once people are settled, check with the group whether they all know each other. If not, start by going round the group and getting everyone to introduce themselves. For your own convenience it helps to draw a 'map' of where everyone is sitting. You may not be able to do this if the group all know one another beforehand, but you can develop it as the session proceeds.

Make sure that everyone is comfortable before you start and that everyone can see each other. Read out the statement on confidentiality:

For ethical reasons participants should be asked to sign a Participation Consent Form, addressing the following:

- an explanation of the nature and purpose of the study.
- An explanation of what participants will need to do to take part
- contact details for the researcher involved.
- Understanding that participants may withdraw themselves and their data at any time, without consequences.
- It will not be possible for them to be identified when the results are made available

Go through this information with participants and ask them to sign the forms. Also mention the interview session duration (30 Minutes).

Check that there are no objections to the use of the audio recorder; then switch it on.

<u>Introduction to the session</u>

You need to start off by reiterating the purpose of the meeting. Use a statement such as:

- *I am very grateful to you all for spared time to come talk about an evaluation of ICT in the FET Phase to enhance Self Directed Learning. The purpose of this focus group is to establish a base of evidence as to how to develop criteria to evaluate ICT as well as to develop an instrument for ICT evaluation. I would like to first concentrate on ICT-evaluation awareness, then educator involvement, its significance, procedures and lastly qualities of an evaluation instrument.*
- *There are no right or wrong opinions and I would like you to feel comfortable saying what you really think and how you really feel.*

QUESTION 1	**PROBE**
How well-announced do you think ICT evaluation is?	- *Do they get officially notified about ICT or LTSM evaluation processes?* - *If so, from whom and how?* - *If not, what could be the issues?*
Notes:	
Was there (please tick one):	

……. Consensus ……. Partial agreement ……. Widely diverse opinions
Comments:

QUESTION 2	**PROBE**
Whom do you think is privileged to evaluate ICTs for teaching in schools?	- *Do they think it is a function of the officials or educators?* *How will the location of this function affect the classroom teaching and learning?*
Notes:	
Was there (please tick one): ……. Consensus ……. Partial agreement ……. Widely diverse opinions	
Comments:	

QUESTION 3	**PROBE**

Do you think ICT evaluation is indispensable?	- *What they think approval of ICT without evaluation could result to?* - *Do they think evaluation is unnecessary?*
Notes:	
Was there (please tick one): ……. Consensus ……. Partial agreement ……. Widely diverse opinions	
Comments:	

QUESTION 4	**PROBE**
What processes and procedures do you think should be opted for when evaluating ICTs?	- *They need to state the potential flow chart as well as policy clauses regarding ICT evaluation* - *They should consider steps in the flow chart*
Notes:	
Was there (please tick one): ……. Consensus ……. Partial agreement ……. Widely diverse opinions	
Comments:	

QUESTION 5	PROBE
Should an instrument be designed to evaluate ICT, what should it be like?	- *They should consider the ease of use, scoring system, curriculum issues, methodologies and Self-Directedness*
Notes:	
Was there (please tick one): ……. Consensus ……. Partial agreement ……. Widely diverse opinions	
Comments:	

ENDING THE SESSION

Finally, summarize the discussions and thank participants for their time.

Remember to collect the Participation Consent Forms.

Below please note any notable participant's attitude(s) towards you, the interviewer, and the interview in general:

____

____

____

Below please note down and describe any notable unusual or disruptive actions, circumstances as well as events that had any bearing on the interview (whether verbal, non-verbal) for example interruptions:

____

____

____

Below please describe anything notable that happened during the interview that has any bearings on the objectives of research/ subject:

Other comments:

ANNEXURE D: RESEARCH ETHICS TRAINING CERTIFICATE

TRREE

Zertifikat Certificado

Certificat Certificate

Promouvoir les plus hauts standards éthiques dans la protection des participants à la recherche biomédicale
Promoting the highest ethical standards in the protection of biomedical research participants

Clinical Trials Centre
The University of Hong Kong

Certificat de formation - Training Certificate

Ce document atteste que - this document certifies that

sipho mahlaba

a complété avec succès - has successfully completed

Introduction to Research Ethics

du programme de formation TRREE en évaluation éthique de la recherche
of the TRREE training programme in research ethics evaluation

May 13, 2017
CID : VfwmTIzVai

Professeur Dominique Sprumont
Coordinateur TRREE Coordinator

FMH Continuing Education Program (5 Credits)
Programme de Formation continue (5 Crédits)

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[REV : 20170310]

ANNEXURE E: CONFIRMATION OF ETHICS APPROVAL

NORTH-WEST UNIVERSITY ®
YUNIBESITI YA BOKONE-BOPHIRIMA
NOORDWES-UNIVERSITEIT
POTCHEFSTROOM CAMPUS
Fakulteit Opvoedkunde / Faculty Education
Privaatsak / Private Bag X6001, Potchefstroom
Suid-Afrika / South Africa 2520
T: 018 299 4656
F: 086 661 8589
http://www.nwu.ac.za

6 March 2020

To Whom It May Concern

I hereby confirm that the ethics application, as stated below, was approved at the Ethics Committee meeting of the Faculty of Education of 27 February 2020.

Ethics number: NWU-00911-19-A2

Project head: Prof C van der Westhuizen

Project team: FS Mahlaba (PhD student - 28786432), Prof C du Toit-Brits

Title of study: An evaluation of information and communication technologies in the FET-phase to enhance self-directed learning

Period: 27 February 2020 – 27 February 2021

Risk level: Low

Should you have further enquiries in this regard, you are welcome to contact Prof Jako Olivier at 018 285 2078 or by email at Jako.Olivier@nwu.ac.za or Ms Erna Greyling at 018 299 4656 or by email at Erna.Greyling@nwu.ac.za .

Yours sincerely

Prof J Olivier
Chair Edu-REC

ANNEXURE F: INFORMED CONSENT FORM

NWU®
NORTH-WEST UNIVERSITY
NOORDWES-UNIVERSITEIT
YUNIBESITI YA BOKONE-BOPHIRIMA

Private Bag X6001, Potchefstroom
South Africa 2520

Tel: 018 299-1111/2222
Web: http://www.nwu.ac.za

Faculty of Education

(Research entity details)

Tel: 018 111 1111
Email: Name.Surname@nwu.ac.za

(Recipient name)
(Recipient address)
(Recipient address)
(Recipient address)

Date

PARTICIPANT INFORMATION AND CONSENT FORM

I herewith wish to request your consent to participate in this research, which involves responding to a survey questionnaire, individual and Focus-group interviews as well as development of an instrument to evaluate Information and Communication Technologies in the FET Phase.

Please acquaint yourself with the information below.

The details of the research are as follows:

TITLE OF THE RESEARCH PROJECT:

An evaluation of Information and Communication Technologies in the FET to enhance Self-Directed Learning

ETHICS APPLICATION NUMBER

NWU-00911-19-A2

PROJECT SUPERVISOR: Professor Christo Van Der Westhuizen
CO-SUPERVISOR: Professor Charlene Du Toit-Brits
ADDRESS: Private Bag X6001, Potchefstroom
South Africa 2520

CONTACT NUMBER: 018 299 4734

MEMBER OF PROJECT TEAM PhD-Student: Frans Sipho Mahlaba

ADDRESS: PO BOX 2166, WITKOPPEN
South Africa 2086

CONTACT NUMBER: 011 040 1148

FACULTY OF EDUCATION RESEARCH ETHICS COMMITTEE

Contact person: Ms Erna Greyling, E-mail: Erna.Greyling@nwu.ac.za, Tel. (018) 299 4656

This study has been approved by the Research Ethics Committee of the Faculty of Education of the North-West University and will be conducted according to the ethical guidelines of this committee. Permission was also asked from the provincial Department of Basic Education as well as the school principal.

What is this research about?

The aims of this research is:

- To establish whether GDE managers and educators implement policy-based processes and procedures during ICT-evaluation and -selection in the FET-Phase and develop an ideal, all-inclusive set of criteria for an evaluation instrument suitable for SDL environments.

- Describe by means of a literature review whether managers and educators use ICT evaluation procedures to select appropriate ICT and determine the main barriers within the process globally and in South Africa.
- Determine what an ideal evaluation instrument should look like according to literature and educators in order to support the implementation of ICTs in the FET-phase curriculum in self-directed learning environments.

- Understand whether GDE managers and educators perceive the ICT-evaluation instrument as a viable tool for evaluation for the FET-phase curriculum.

- Determine whether education managers involve educators in the process of ICT evaluation and selection for the FET-phase curriculum.

- Gather suggestions from subject teachers and GDE curriculum specialists that can be infused in an ICT-evaluation instrument to make it suitable for self-directed learning in the FET-Phase.

- Propose means to integrate and utilize an ideal, all-inclusive ICT- evaluation instrument for the enhancement self-directed learning in the FET-phase curriculum.

Participants

- Educators

What is expected of you as participant?

- responding to a survey questionnaire
- individual and Focus-group interviews
- development criteria of an instrument to evaluate ICT

Benefits to you as participant

- Being part of a team that makes a contribution to the education system and existing body of knowledge/literature with regard to ICT evaluation processes within the FET phase.
- Get some guidance on processes and principles of evaluation, selection, approval and utilization of ICT in the FET classroom.
- subject-specific skills on Self-Directed Learning

Risks involved for participants

- Minimal Risks

Confidentiality and protection of identity

- Strict confidentiality will be observed
- Identity information will be kept safely and not shared with third parties

Dissemination of findings

- Findings of this research will be communicated via the GDE and directly by e-mail

If you have any further questions or enquiries regarding your participation in this research, please contact the researchers for more information.

Yours sincerely

(Researcher)

SIPHO MAHLABA

DECLARATION BY PARTICIPANT:

By signing below, I ……………………………..………… agree to take part in a research study entitled:

An evaluation of Information and Communication Technologies in the FET to enhance Self-Directed Learning

I declare that:

- I have read this information and consent form and understand what is expected of me in the research.
- I have had a chance to ask questions to the researcher and all my questions have been adequately answered.
- I understand that taking part in this study is voluntary and I have not been pressurised to take part.
- I may choose to leave the study at any time and will not be penalised or prejudiced in any way.
- I may be asked to leave the research process before it is completed, if the researcher feels it is in my best interests, or if I do not follow the research procedures, as agreed to.

Signed at (place)___________________________on (date) ______/______/20____

______________________ ______________________

Signature of participant **Researcher**

ANNEXURE G: GDE APPROVAL LETTER

GAUTENG PROVINCE
Department: Education
REPUBLIC OF SOUTH AFRICA

8/4/4/1/2

GDE RESEARCH APPROVAL LETTER

Date:	01 June 2020
Validity of Research Approval:	04 February 2020 – 30 September 2020 2019/456
Name of Researcher:	Mahlaba F.S
Address of Researcher:	6 Alexis Preller
	Witkoppen
Telephone Number:	0826404630
Email address:	28786432@student.g.nwu.ac.za
Research Topic:	An evaluation on information and communication technologies in the FET –Phase to enhance self-directed learning
Type of qualification	PHD
Number and type of schools:	10 Secondary School
District/s/HO	Ekurhuleni North, Ekurhuleni South, Johannesburg East, Johannesburg South, Johannesburg North, Johannesburg West, Sedibeng East

Re: Approval in Respect of Request to Conduct Research

This letter serves to indicate that approval is hereby granted to the above-mentioned researcher to proceed with research in respect of the study indicated above. The onus rests with the researcher to negotiate appropriate and relevant time schedules with the school/s and/or offices involved to conduct the research. A separate copy of this letter must be presented to both the School (both Principal and SGB) and the District/Head Office Senior Manager confirming that permission has been granted for the research to be conducted.

01/06/2020

The following conditions apply to GDE research. The researcher may proceed with the above study subject to the conditions listed below being met. Approval may be withdrawn should any of the conditions listed below be flouted:

1

Making education a societal priority

Office of the Director: Education Research and Knowledge Management
7th Floor, 17 Simmonds Street, Johannesburg, 2001
Tel: (011) 355 0488
Email: Faith.Tshabalala@gauteng.gov.za
Website: www.education.gpg.gov.za

2. *The District/Head Office Senior Manager/s must be approached separately, and in writing, for permission to involve District/Head Office Officials in the project.*
3. *A copy of this letter must be forwarded to the school principal and the chairperson of the School Governing Body (SGB) that would indicate that the researcher/s have been granted permission from the Gauteng Department of Education to conduct the research study.*
4. *A letter / document that outline the purpose of the research and the anticipated outcomes of such research must be made available to the principals, SGBs and District/Head Office Senior Managers of the schools and districts/offices concerned, respectively.*
5. *The Researcher will make every effort obtain the goodwill and co-operation of all the GDE officials, principals, and chairpersons of the SGBs, teachers and learners involved. Persons who offer their co-operation will not receive additional remuneration from the Department while those that opt not to participate will not be penalised in any way.*
6. *Research may only be conducted after school hours so that the normal school programme is not interrupted. The Principal (if at a school) and/or Director (if at a district/head office) must be consulted about an appropriate time when the researcher/s may carry out their research at the sites that they manage.*
7. *Research may only commence from the second week of February and must be concluded before the beginning of the last quarter of the academic year. If incomplete, an amended Research Approval letter may be requested to conduct research in the following year.*
8. *Items 6 and 7 will not apply to any research effort being undertaken on behalf of the GDE. Such research will have been commissioned and be paid for by the Gauteng Department of Education.*
9. *It is the researcher's responsibility to obtain written parental consent of all learners that are expected to participate in the study.*
10. *The researcher is responsible for supplying and utilising his/her own research resources, such as stationery, photocopies, transport, faxes and telephones and should not depend on the goodwill of the institutions and/or the offices visited for supplying such resources.*
11. *The names of the GDE officials, schools, principals, parents, teachers and learners that participate in the study may not appear in the research report without the written consent of each of these individuals and/or organisations.*
12. *On completion of the study the researcher/s must supply the Director: Knowledge Management & Research with one Hard Cover bound and an electronic copy of the research.*
13. *The researcher may be expected to provide short presentations on the purpose, findings and recommendations of his/her research to both GDE officials and the schools concerned.*
14. *Should the researcher have been involved with research at a school and/or a district/head office level, the Director concerned must also be supplied with a brief summary of the purpose, findings and recommendations of the research study.*

The Gauteng Department of Education wishes you well in this important undertaking and looks forward to examining the findings of your research study.

Kind regards

....

Mr Gumani Mukatuni
Acting CES: Education Research and Knowledge Management

DATE: ……01 June 2020……………………………………

2

Office of the Director: Education Research and Knowledge Management
7th Floor, 17 Simmonds Street, Johannesburg, 2001
Tel: (011) 355 0488
Email: Faith.Tshabalala@gauteng.gov.za
Website: www.education.gpg.gov.za

ANNEXURE H: GDE NO SCHOOL ACCESS LETTER

GAUTENG PROVINCE
EDUCATION
REPUBLIC OF SOUTH AFRICA

Enquiries: Gumani Mukatuni
Directorate: ER & KM
Tel: (011) 355 0775/ 082 515 5412
Gumani.Mukatuni@gateng.gov.za

MEMO

TO:	**Head of the Department, DDGs, Chief Directors, Directors, Districts, Principals, Universities and Research organisations**
FROM:	**Faith Tshabalala** **Acting Director: Education Research and Knowledge Management**
SUBJECT:	**Regulations on access to schools by Researchers due to COVID 19 pandemic**
DATE:	10/06/2020

Dear Sir/madam

Kindly note that visitors are currently NOT permitted into the GDE school premises because of the pandemic (Covid 19) challenges, as the Department is not certain of the status of the learners or teachers; this includes Researchers.

Researchers may, however collect data online, telephonically or may make arrangements for Zoom with the school Principal. Requests for such arrangements should be submitted to the GDE Education Research and Knowledge Management directorate. The approval letter will then indicate the type of arrangements that have been made with the school.

The Researchers are advised to make arrangements with the schools via Fax, email or telephonically with the Principal.

Yours sincerely

....

Ms Faith Tshabalala
Acting Director: Education Research and Knowledge Management
Date: 10/06/2020

ANNEXURE I: NWU-STATISTICAL CONSULTATION SERVICES LETTER

Private Bag X6001, Potchefstroom
South Africa 2520

Tel: 018 299-1111/2222
Web: http://www.nwu.ac.za

Statistical Consultation Services
Tel: +27 18 299 2558
Fax: +27 0 87 231 5294
Email: shawn.liebenberg@nwu.ac.za

08 February 2021

Re: Dissertation, Mr Frans Sipho Mahlaba, student number: 28786431

We hereby confirm that the Statistical Consultation Services of the North-West University analysed the data of the above-mentioned student and assisted with the interpretation of the results. However, any opinion, findings or recommendations contained in this document are those of the author, and the Statistical Consultation Services of the NWU (Potchefstroom Campus) do not accept responsibility for the statistical correctness of the data reported.

Kind regards

Shawn Liebenberg

ANNEXURE J: DECLARATION LETTER FROM LANGUAGE EDITOR

24 May 2021

I **Ms Cecilia van der Walt** hereby declare that I took care of the **editing** of the **thesis** of **Mr Frans Sipho Mahlaba** titled ***An evaluation of Information and Communication Technologies in the FET-Phase to enhance self-directed learning.***

MS CECILIA VAN DER WALT

BA (*Cum Laude*)
THED (*Cum Laude*),
Plus Language editing and translation at Honours level (*Cum Laude*),
Plus Accreditation with SATI for Afrikaans and translation
Registration number with SATI: 1000228

Email address: ceciliavdw@lantic.net

Mobile: 072 616 4943

ANNEXURE K: ICT EVALUATION INSTRUMENT

ICT Evaluation Instrument - FET Phase

GRADES 10, 11 AND 12

1. Date of evaluation *

   Example: January 7, 2019

2. Name of Institution (e.g. school) and EMIS Number *

3. Name of Evaluator(s) and Persal/ Unique Number *

4. Name of Quality Assurer(s) and Persal/ Unique Number *

5. Grade *

Mark only one oval.

- 10
- 11
- 12

6. Subject e.g. Geography (If applicable)

7. Name of supplier/manufacturer/ publisher *

8. Brand name and model *

9. Serial number *

10. Date of manufacture *

Example: January 7, 2019

11. Type of ICT medium (select one or more if it is a set) *

Mark only one oval.

- Audio Equipment
- Calculator
- Educational game
- Hard dive
- Laptop computer
- Desk top computer
- Printer
- Projector
- Radio
- Server
- Smartboard
- Software Application
- Tablet
- Television
- Monitor
- Other

12. Price (South African Rand)

SELF-MANAGEMENT OR TASK CONTROL

Rating scale: 1=Not Applicable 2= Inappropriate 3= partially appropriate 4= Mostly appropriate 5= Highly appropriate (For each of the following Measurement Indicators, select the score that best describes the ICT medium)

13. SOCIAL ASPECTS*

Determine whether the ICT medium:

Mark only one oval per row.

	1	2	3	4	5
stimulates learner to work collaboratively/ transactional/ interactively with others during external task negotiation and control	⬭	⬭	⬭	⬭	⬭
allows the learner to reciprocate (respond to the educator's stimuli/ responses) during the execution of SDL tasks	⬭	⬭	⬭	⬭	⬭

14. BEHAVIOURAL ASPECTS*

Ascertain whether the ICT medium:

Mark only one oval per row.

	1	2	3	4	5
permits the learner to collaborate with peers/ educators during SDL activities	⬭	⬭	⬭	⬭	⬭
enables the learner to collaborate with other learners and educators during task control	⬭	⬭	⬭	⬭	⬭
caters for learner, peers and educators to responsibly negotiate, perform and review learning goals and intentions towards SDL	⬭	⬭	⬭	⬭	⬭

15. ENACTMENT OF LEARNING GOAL*

Establish whether the ICT medium:

Mark only one oval per row.

	1	2	3	4	5
has widespread databases or mechanism for self-directed goal development	⬭	⬭	⬭	⬭	⬭
empowers learners to take charge and act responsibly when selecting their own learning goals	⬭	⬭	⬭	⬭	⬭
allows the learner to execute self-directed learning goals independently	⬭	⬭	⬭	⬭	⬭
has in-built enablers to assist the learner to achieve and complete set SDL goals	⬭	⬭	⬭	⬭	⬭
fundamentally complies with specific educational, curricular and philosophical parameters	⬭	⬭	⬭	⬭	⬭
makes room for adequate holistic learner support by educator	⬭	⬭	⬭	⬭	⬭
emancipates individual learner to independently, with minimal interruptions, self-managed learning tasks	⬭	⬭	⬭	⬭	⬭

16. MANAGEMENT OF LEARNING RESOURCES*

Verify whether the ICT medium:

Mark only one oval per row.

	1	2	3	4	5
emancipates the learner to independently select and integrate the ICT medium with other media and resources	⬭	⬭	⬭	⬭	⬭
makes it possible for the learner to obtain support from educator and other GDE stakeholders to select and integrate resource	⬭	⬭	⬭	⬭	⬭
is practical for implementation of BL (online and face-to-face) and SDL (including home learning)	⬭	⬭	⬭	⬭	⬭
supports both learner and educator to develop resource management activities/ strategies	⬭	⬭	⬭	⬭	⬭

17. MANAGENT OF SUPPORT*

Authenticate whether the ICT medium:

Mark only one oval per row.

	1	2	3	4	5
Cater and/ supports the involvement of stakeholders in the learner and educator support programs	⬭	⬭	⬭	⬭	⬭
has systems that enable the educator to offer adequate support to the emancipated learner	⬭	⬭	⬭	⬭	⬭

SELF-MONITORING – COGNITIVE AND METACOGNITIVE FACTORS

Rating scale: 1=Not Applicable 2= Inappropriate 3= partially appropriate 4= Mostly appropriate 5= Highly appropriate (For each of the following Measurement Indicators, select the score that best describes the ICT medium)

18. CONSTRUCTION OF PERSONAL MEANING*

Determine whether the ICT medium:

Mark only one oval per row.

	1	2	3	4	5
enables the learner to integrate new and previous concepts, ideas and knowledge	⬭	⬭	⬭	⬭	⬭
emancipates learner to think critically and construct new meaning, concepts, ideas and knowledge	⬭	⬭	⬭	⬭	⬭
will create a learning environment in which the learner collaboratively confirms the new and previous meaning	⬭	⬭	⬭	⬭	⬭

19. APPRAISAL ON SELF-AWARENESS*

Ascertain whether the ICT medium:

Mark only one oval per row.

	1	2	3	4	5
caters for the learner to appraise his/ her self-awareness (e.g. self-concept, self-esteem)	⬭	⬭	⬭	⬭	⬭
allows the learner to appraise his/ her learning progress against own set learning goals	⬭	⬭	⬭	⬭	⬭

20. APPRAISAL ABOUT LEARNING PROGRESS*

Establish whether the ICT medium:

Mark only one oval per row.

	1	2	3	4	5
emancipates learner to find own new alternatives to reach the set learning goals	⬭	⬭	⬭	⬭	⬭

21. EMANCIPATION OF LEARNER TO THINK CRITICALLY*

Verify whether the ICT medium:

Mark only one oval per row.

	1	2	3	4	5
emancipates the learner to independently develop and use his/ her own cognitive and metacognitive capabilities to construct meaning and execute tasks self-directly	⬭	⬭	⬭	⬭	⬭

22. INTERACTIVE FEEDBACK*

Authenticate whether the ICT medium:

Mark only one oval per row.

	1	2	3	4	5
caters for the learner to obtain feedback from others (educator, peers, stakeholders)	⬭	⬭	⬭	⬭	⬭
has in-built or online self-monitoring tools for feedback to/ from the learner, e.g. questionnaires, checklists, review questions.	⬭	⬭	⬭	⬭	⬭

MOTIVATION (DESIRE TO LEARN)

Rating scale: 1=Not Applicable 2= Inappropriate 3= partially appropriate 4= Mostly appropriate 5= Highly appropriate (For each of the following Measurement Indicators, select the score that best describes the ICT medium)

23. INITIATION, MONITORING AND MAINTAINING EFFORTS TOWARDS LEARNING*

Determine whether the ICT medium:

Mark only one oval per row.

	1	2	3	4	5
attracts the learner to initiate learning using the ICT-medium independently	◯	◯	◯	◯	◯
will consistently maintain the learner's interest	◯	◯	◯	◯	◯

24. ACHIEVEMENT OF COGNITIVE GOALS*

Ascertain whether the ICT medium:

Mark only one oval per row.

	1	2	3	4	5
Motivates learner to set cognitively learning goals	◯	◯	◯	◯	◯
supports the learner to achieve set cognitive goals	◯	◯	◯	◯	◯

25. THE PERCEIVED VALUE OF LEARNING GOALS*

Establish whether the ICT medium:

Mark only one oval per row.

	1	2	3	4	5
has the capacity to assist the learner to value the set learning goals	◯	◯	◯	◯	◯
has the capacity to motivate the learner to value full attainment of learning goals	◯	◯	◯	◯	◯

26. MEDIATION BETWEEN CONTEXT AND COGNITION*

Verify whether the ICT medium:

Mark only one oval per row.

	1	2	3	4	5
challenges learner to apply new and existing ideas, knowledge and content in real-life contexts (control)	⬭	⬭	⬭	⬭	⬭
matches appropriate learner's level of cognitive development	⬭	⬭	⬭	⬭	⬭

27. VARIOUS TYPES OF MOTIVATION INFLUENCE LEARNING*

Authenticate whether the ICT medium:

Mark only one oval per row.

	1	2	3	4	5
complements and appeals to the already motivated learner	⬭	⬭	⬭	⬭	⬭
allows for line managers to collaboratively complement the learner's efforts	⬭	⬭	⬭	⬭	⬭
is user-friendly and developmental to increase or boost the leaner's self-perception of effectiveness, efficiency and worth	⬭	⬭	⬭	⬭	⬭
enables the learner to set own learning goals which in turn motivate the learner to be positive towards self-direction in learning	⬭	⬭	⬭	⬭	⬭

HARDWARE AND SOFTWARE COMPATIBILITY*

Rating scale: 1=Not Applicable 2= Inappropriate 3= partially appropriate 4= Mostly appropriate 5= Highly appropriate (For each of the following Measurement Indicators, select the score that best describes the ICT medium)

28. DURABILITY AND EXPIRATION*

Mark only one oval per row.

	1	2	3	4	5	Column 6
ITC medium will last for a minimum prescribed period (e.g. 5 years) or by due date	⬭	⬭	⬭	⬭	⬭	⬭
The expiration due date is reasonable enough considering budget and cost of ICT medium	⬭	⬭	⬭	⬭	⬭	⬭

29. GENERAL MASS AND SIZE FOR MOVEMENT OR TRANSPORTATION OF MEDIUM*

Mark only one oval per row.

	1	2	3	4	5
Instructional/ educator ICT medium is convenient for movement between classrooms as well as laboratories	⬭	⬭	⬭	⬭	⬭
Learner ICT medium is convenient to carry in a school bag during and after school	⬭	⬭	⬭	⬭	⬭

30. OPTICAL QUALITIES*

Mark only one oval per row.

	1	2	3	4	5
Screen backlight is not too bright/ dim and damaging to the eye	⬭	⬭	⬭	⬭	⬭
Font size and type are not limited but adjustable	⬭	⬭	⬭	⬭	⬭
The external cover of the ICT medium is of an acceptable colour (not too bright or dull) to match the learner's level of development	⬭	⬭	⬭	⬭	⬭

31. HEALTH, SAFETY AND SECURITY*

Mark only one oval per row.

	1	2	3	4	5
ICT-medium will possibly not cause injury to the users (e.g. due to sharpness of edges, exposed wires or poor quality plugs)	⬭	⬭	⬭	⬭	⬭
ICT- medium will possibly not cause health hazards to the users (e.g. poisonous manufacturers hard plastic material or fumes)	⬭	⬭	⬭	⬭	⬭
ICT medium is enabled with search and find features in case it is stolen	⬭	⬭	⬭	⬭	⬭
ICT medium is compatible to storage and security plans of the institution	⬭	⬭	⬭	⬭	⬭

32. KEYBOARD QUALITIES*

Mark only one oval per row.

	1	2	3	4	5
Keys are strong, firm, not too hard to press	⬭	⬭	⬭	⬭	⬭
The inscriptions on keys is bright, clear and durable	⬭	⬭	⬭	⬭	⬭
The keyboard complies with the standard QWERTY layout	⬭	⬭	⬭	⬭	⬭

33. SOUNDS*

Mark only one oval per row.

	1	2	3	4	5	Column 6
All the sounds of the ICT medium are adjustable and mutable not to disturb classes	⬭	⬭	⬭	⬭	⬭	⬭
The audio features produce a reasonably audible sound	⬭	⬭	⬭	⬭	⬭	⬭

34. LAYOUT AND PRESENTATION*

Mark only one oval per row.

	1	2	3	4	5
The external colour of the ICT Medium is appealing and relevant to development level of the user	⬭	⬭	⬭	⬭	⬭

35. PERFORMANCE CAPACITY*

Mark only one oval per row.

	1	2	3	4	5
The ICT media is quick to switch on and off	⬭	⬭	⬭	⬭	⬭
The memory space is sufficient	⬭	⬭	⬭	⬭	⬭
The Storage space is sufficient	⬭	⬭	⬭	⬭	⬭
The ICT medium's camera pixels are of a reasonable value for quality pictures	⬭	⬭	⬭	⬭	⬭
The camera has multifunctional options	⬭	⬭	⬭	⬭	⬭
The battery capacity is reasonably to last long	⬭	⬭	⬭	⬭	⬭
ICT medium performs its basic functions well especially its domain	⬭	⬭	⬭	⬭	⬭

36. COST EFFECTIVENESS*

Mark only one oval per row.

	1	2	3	4	5
The ICT medium retail price is at a reasonable market value (not over-priced)	⬭	⬭	⬭	⬭	⬭

37. USER-FRIENDLINESS*

Mark only one oval per row.

	1	2	3	4	5	Column 6
The ICT-media functions and buttons are clearly marked and visibly located for ease of access	⬭	⬭	⬭	⬭	⬭	⬭

38. COMPATIBILITY WITH OTHER ICT MEDIA OR NEW INNOVATIONS*

Mark only one oval per row.

	1	2	3	4	5
The ICT medium is compatible with other devices already in the market/ used by the school (e.g. Bluetooth, input and output ports, power cable, plugs etc.)	⬭	⬭	⬭	⬭	⬭

39. GUARANTEES AND WARRANTIES*

Mark only one oval per row.

	1	2	3	4	5
Guarantees and warrantees specified	⬭	⬭	⬭	⬭	⬭
Guarantees and warrantees are reasonable (e.g. return and repair conditions, period, measures. contact information, endorsements etc.)	⬭	⬭	⬭	⬭	⬭

40. BRAND QUALITIES*

Mark only one oval per row.

	1	2	3	4	5
The brand is known and popular for good reasons	⬭	⬭	⬭	⬭	⬭
It is a new or unknown brand with good online reviews or references	⬭	⬭	⬭	⬭	⬭

41. EVALUATOR'S NOTES OR COMMENTS

THIS MAY INCLUDE ASPECTS NOT LISTED ABOVE THAT YOU DEEM SIGNIFICANT

42. Final Decision *

Mark only one oval.

- Disapproved
- Conditionally approved
- Pended
- Recommended
- Approved