Implementation of project-based learning in pre-service Consumer Studies teacher preparation to promote self-directed learning

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In loving memory of Stephanus Andreas (André) du Toit

ABSTRACT

Consumer Studies is a valuable and multifaceted subject in South African schools, requiring that teachers in the subject are well prepared. Pre-service Consumer Studies teachers need to be prepared to become lifelong learners to cope with the dynamic nature of the subject, as well as to develop various 21st century skills to be able to deal with the demands of these times. Structured guidance, however, could not be uncovered for the preparation of pre-service Consumer Studies teachers to empower them with the requirements for Consumer Studies education. Self-directed learning is a process that supports the development of various 21st century skills, including lifelong learning, and could thus contribute to the development of pre-service Consumer Studies teachers, if included in their preparation. A suitable teaching-learning strategy that could be utilised in the preparation module for Consumer Studies teachers, as well as a vehicle to promote self-directed learning as part of such preparation, was identified in the form of project-based learning. A qualitative case study was employed to investigate how project-based learning as a teaching-learning strategy could promote self-directed learning in a pre-service Consumer Studies teacher preparation module. Project-based learning was found to foster the development of various skills as part of the process, including planning and collaboration skills. Subject content, consistent with what is required to be taught in Consumer Studies education on high school level, was developed and self-directed learning was promoted in participants using project-based learning. Recommendations were suggested for the preparation of pre-service Consumer Studies teachers, as well as for the effective structuring of projects and project-based learning in Consumer Studies.

KEY TERMS

Consumer Studies

21st century skills

Recommendations

Project-based learning

Self-directed learning

Teacher preparation

Teaching-learning

OPSOMMING

Verbruikerstudie is ’n waardevolle en multidimensionele vak in Suid-Afrikaanse skole wat vereis dat onderwysers in hierdie vak goed voorberei moet word. Voor-diens Verbruikerstudie onderwysers moet voorberei word om lewenslange leerders te word sodat hul kan tred hou met die dinamiese aard van hierdie vak, asook om verskeie 21ste eeu-vaardighede te ontwikkel om die uitdagings van die nuwe eeu te kan hanteer. Gestruktureerde leiding vir die voorbereiding van voor-diens Verbruikerstudie onderwysers om hul te bemagtig met die vereistes wat gestel word vir Verbruikerstudie onderrig, kon egter nie opgespoor word nie. Selfgerigte leer is ’n proses wat die ontwikkeling van verskillende 21ste eeu-vaardighede, insluitend lewenslange leer, ondersteun en kan dus bydra tot die ontwikkeling van voor-diens Verbruikerstudie onderwysers indien dit in hul opleiding ingesluit word. ’n Geskikte onderrig-leer strategie wat aangewend kan word in die voorbereidingsmodule vir Verbruikerstudie onderwysers en wat ook kan dien as kanaal om selfgerigte leer te bevorder as deel van sodanige opleiding, is geïdentifiseer in die vorm van projekgebaseerde leer. ’n Kwalitatiewe gevallestudie is gebruik om ondersoek in te stel oor hoe projekgebaseerde leer as onderrig-leer strategie aangewend kon word om selfgerigte leer te bevorder in ’n module wat voor-diens Verbruikerstudie onderwysers vir die professie voorberei. Daar is bevind dat projekgebaseerde leer die ontwikkeling van verskeie vaardighede, insluitend beplannings– en samewerkingsvaardighede, bevorder het as deel van die proses. Deur die gebruik van projekgebaseerde leer het vakinhoud in ooreenstemming met vereistes vir onderrig in Verbruikerstudies op hoërskoolvlak ontwikkel en selfgerigte leer is in deelnemers bevorder. Aanbevelings is gemaak ten opsigte van die opleiding van voor-diens Verbruikerstudie onderwysers, sowel as vir die effektiewe strukturering van projekte en projekgebaseerde leer in die vak Verbruikerstudies.

SLEUTELTERME

Verbruikerstudie

21ste eeu vaardighede

Aanbevelings

Projekgebaseerde leer

Selfgerigte leer

Onderwyser opleiding

Onderrig-leer

ACRONYMS AND ABBREVIATIONS

CAPS	Curriculum and Assessment Policy Statements
CELL	Centre of Excellence in Leadership of Learning
CS	Consumer Studies
DBE	Department of Basic Education
DoE	Department of Education
FCS	Family and Consumer Sciences
HEc	Home Economics
IAL	Institute of Adult Learning
PBL	Project-based Learning
PGCE	Post-graduate Certificate in Education
SAQA	South African Qualifications Authority
SDL	Self-directed Learning
WIL	Work Integrated Learning

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CHAPTER 1

BACKGROUND AND RATIONALE FOR THE RESEARCH

1.1 INTRODUCTION

Consumer Studies (CS) is a valued school subject (Umalusi, 2014:14, 35, 74, 175) in which knowledge and skills are taught to address real-life (and global) issues by solving problems creatively (Department of Basic Education (DBE), 2011:8). According to the Department of Education[1] (DoE) (2008:7), CS actively involves learners in linking content and skills to real-life situations through hands-on problem-solving. Teachers in CS have to be able to apply subject knowledge as part of the development of skills, but also have to be able to connect knowledge and skills to everyday situations in order to support the purpose of the subject (Umalusi, 2014:77, 96). This purpose is described as teaching "learners to make informed decisions and to make optimal use of resources to improve human well-being", and to empower learners with entrepreneurial knowledge and skills (DBE, 2011:8, 9). Learner numbers in this subject have been steadily growing in recent years (DBE, 2010:3), resulting in an increased need for more well trained teachers who are specialists in their subjects. Furthermore, CS content is not static and evolves continually (Fox & Klemme, 2010:3), and therefore teachers cannot persist in teaching only the knowledge and skills they have acquired during their pre-service teacher preparation.

The intricacies surrounding CS education (some of which are mentioned above) require that CS teachers are prepared in a manner that will enable them to function optimally in their chosen profession. Aligning preparation of CS teachers with the requirements for CS education would imply that those teachers would be better equipped to support teaching and learning of the subject. Literature, however, indicates that there is no clear guidance for CS teacher preparation in South Africa (Umalusi, 2014:111), signifying a gap in research. Therefore, the problem to solve was how pre-service CS teachers' subject knowledge could be expanded while simultaneously developing the skills they require in their profession in the 21st century.

[1] The former National Department of Education was split into the Department of Basic Education, and the Department of Higher Education and Training from 2009. Prior to that year, it was dealt with as only one Department of Education (DBE, 2014).

A number of studies have established self-directed learning (SDL) as an essential life skill that supports lifelong learning (Bell, 2010:39; Guglielmino, 2008:1; Mok & Lung, 2005:34). Yet, the fostering of SDL in educational modules has been slow, leading to suggestions that the deliberate inclusion of SDL in modules for teacher preparation might help to promote the use of SDL by teachers (Mok & Lung, 2005:19). Various teaching-learning strategies have been associated with the promotion of SDL, including collaborative learning, problem-based learning and project-based learning (Borich, 2011:330-361). Self-directed learning is an important skill, but can also be described as a process (Brockett & Hiemstra, 1991:25) that ought to be promoted in pre-service CS teachers to uphold lifelong learning of dynamic content to support relevant teaching and learning in the subject.

Project-based learning (PBL[2]) emerged from available literature as a teaching-learning strategy that is often used to promote SDL (Grant, 2009:2; Hixson, Ravitz & Whisman, 2012:3; Wurdinger & Rudolph, 2009:124; Zhou & Lee, 2009:37). Project-based learning helps learners[3] to construct meaning from their learning through involvement in real-life issues. It requires learners to accept responsibility for their own learning in the acquisition of new knowledge (Begay, Bender, Stemkoski, Raines & Walker, 2006:19; Boss & Krauss, 2007:65; Grant, 2009:9; Smith, 2007:10).

Several PBL elements parallel the aims specified for CS education in South African policy documentation (DBE, 2011:5, 8), including problem-solving, collaborative learning and real-life issues supporting learning. Consequently, it was decided to study PBL as a preferred teaching-learning strategy to explore whether SDL could be enhanced as part of pre-service CS teacher preparation.

The rationale for this study therefore emanates from the following issues:

(a) The need for pre-service Consumer Studies teachers to have broad (Umalusi, 2014:155) and deep subject-specific knowledge (National Qualifications Framework (NQF) Act, 2011:8);

(b) Subject content in Consumer Studies (the school subject) and Consumer Sciences (offered at tertiary level) is not particularly aligned, as Consumer Sciences prepares students for a range of professions (North-West University, 2014) and does not only focus on Consumer Studies content;

[2] See page 4 for clarification of the use of the acronym PBL for project-based learning.
[3] See page 3 for clarification of the term “learners”, as opposed to using the term “students”.

(c) A gap exists in research regarding pre-service CS teacher preparation in South Africa in terms of preferred skills for these teachers, as well as teaching-learning strategies, which could support the development of such skills (Umalusi, 2014:32); and

(d) PBL is a recognised teaching-learning strategy that might be used to promote SDL (Borich, 2011: 361).

This study aimed to explore how PBL could be implemented in pre-service CS teacher preparation to promote SDL — a crucial skill needed in CS education. The findings of this research might help to structure recommendations for CS teacher preparation in the South African context.

A preliminary review of the literature was undertaken to provide a conceptual-theoretical framework for the research and to situate the study within the context of existing research on the problem.

1.2 CONCEPTS UTILISED IN THIS STUDY

For this literature review, the key terms "project-based learning", "self-directed learning", "teacher preparation" and "Consumer Studies" were initially used to search online databases, including *EBSCO HOST*, *ERIC*, *Sabinet Online*, *AJOL*, *SA E-Publications* and *Google Scholar* for studies and sources which might relate to the planned research.

Concepts and terms used in this study have been defined and expanded upon in Table 1.1 to support accuracy and interpretation. Though generally accepted definitions have been included in Table 1.1, the following terms were used to further clarify specific vocabulary chosen in this study:

- The term "**field**" refers to various international subjects with different names, but with relatively consistent content, including subjects in this regard such as Consumer Studies, Consumer Science, Family and Consumer Sciences (FCS), Home Economics and Human Sciences. "**Home Economics**" (HEc) refers to the subject that was taught in South African schools up to the introduction of CS in 2003, as well as to the subject with the same designation still used internationally. "**Consumer Studies**" (CS) refers to the subject which replaced HEc in South African high schools as part of the implementation of *Curriculum 2005*[4].

[4] *Curriculum 2005* was introduced into the South African school system in 1998 to replace the system which was used up to that point. The new curriculum was intended to introduce a more learner-centered approach in schools, amongst other reasons (Alexander & November, 2010:101-102).

- When referring to "**learners**" in this study, the term applies to all persons acquiring information or skills or "someone who is learning something" (Collins Dictionary, 2013). These learners include school learners or university students, adult learners or even teachers-as-learners. In this study the participant group (i.e. "learners") consisted of university students.

Table 1.1: Clarification of concepts and definitions used in this study

Term/ concept	Definition/clarification	Reference
Consumer Studies	A school subject focused on consumer behaviour in respect of various disciplines. Learners are taught to make informed decisions and to make optimal use of resources to improve human wellbeing. In the practical component, learners produce marketable products to develop entrepreneurial skills and knowledge.	DBE (2011:8)
Field	A branch of knowledge, a discipline, a subject area, or a subject field. The "field" referred to in the study includes a range of related subjects with different names and some variations in content, but with the same main purpose of educating consumers and/or families.	Audio-English Dictionary (2012)
Home Economics	An applied science concerned with the well-being of individuals and families on various levels, through the application of knowledge and skills to satisfy various existential needs. Even though a large number of countries have renamed the subject, various others opted to keep the name of Home Economics, both on secondary and tertiary educational level.	Boshoff (1997:53), McGregor (2010:21)
Project-based learning	An extended process of inquiry in response to a complex question, problem or challenge, in which projects are carefully planned, managed and assessed to help learners learn key academic content, practice 21st century skills (e.g. collaboration, communication and critical thinking), and create high-quality, authentic products and presentations.	Buck Institute for Education (BIE) (2012b)
Self-directed learning	A teaching-learning process (or skill) in which learners take primary responsibility and control of their learning process, including setting goals, finding resources, determining strategies and evaluating outcomes.	Pilling-Cormick and Garrison (2007:14)
Transfer or transferability of learning	Transfer of learning occurs when learning can be transferred to and becomes useful in other (novel) contexts. Transfer is crucial in education, making the learning more meaningful and useful to the lives of the learners.	Perkins and Salomon (1992)

- In this study, "**project-based learning**" (PBL) was examined in detail as a teaching-learning strategy. Literature indicates a close relationship between problem-based learning and project-based learning (Barron, Schwartz, Vye, Moore, Petrosino, Zech, Bransford & The Cognition and Technology Group at Vanderbilt, 1998:277; Hmelo-Silver, 2004:236; Speckels, 2011:39), with some studies considering the two strategies to be so closely related that they are used interchangeably (Bradley-Levine, Berghoff, Seybold, Sever, Blackwell & Smiley, 2010:3). The Buck Institute for Education (BIE) (2012a:3) even refers to problem-based learning as "a forerunner of project-based learning". Both strategies share similar elements (Bradley-Levine et al., 2010:3) but the single distinguishing feature of project-based learning, which problem-based learning does not have, is the construction of a product at the culmination of the project (Helle, Tynjälä & Olkinuora, 2006:295). Researchers have used the acronym "PBL" for both project-based and problem-based learning. However, in this study the acronym PBL specifically refers to project-based learning.

Following Creswell's advice (2009:26), an exploratory review of literature was conducted to create a wider understanding of the topic, as well as to provide a framework that helped to orientate the study.

1.3 PHILOSOPHICAL POINT OF DEPARTURE

Constructivism is about the "*how*" or nature of the learning (Illeris, 2007:36) and focuses on an understanding of the cognitive processes involved in learning: the fundamental construction of knowledge and learning. Learning is seen as the result of mental construction, where new content is "built into" existing knowledge, skills and understanding (Pritchard, 2009:4; 17). Social constructivism is a branch of constructivism which shares many of these same underlying assumptions (Mascolol & Fisher, 2005; Pritchard & Woollard, 2010:8).

The study was mainly situated within the epistemological approach of social constructivism (§3.2)[5]. Social constructivism seeks to understand the world in which participants function and focuses on the subjective meanings of participants (Creswell, 2009:8). It is based on the idea that learning takes place between people (not only in an individual) and thus that it is social in nature. Collaborative learning in the form of group work or working in pairs would therefore support social constructivists' learning (Illeris, 2007:117; Jonassen, Cernusca & Ionas, 2007:7; Mascolol & Fisher, 2005; Pritchard & Woollard, 2010:45). In social constructivism, learning is

[5] References to other sections in this study will be indicated with the symbol §.

described as a process taking place among people and including elements outside the person that influences learning (Mascolol & Fisher, 2005).

1.4 THEORETICAL PERSPECTIVES

A review of existing literature provided the following insights into the preparation of CS teachers (§1.4.1), the importance of SDL (§1.4.2) and PBL as a teaching-learning strategy (§1.4.3).

1.4.1 Consumer Studies teacher preparation

Internationally, the closest comparable subjects to CS are HEc and FCS. The following aspects regarding preparation of pre-service teachers in these subjects were identified, namely: the practical application of information to solve real-life problems is seen as essential (Bull & Cummings, 2002:30; Smith, 2012:7), incorporating critical thinking skills in teaching and learning, as well as the development of self-reliant attitudes and abilities in learners and teachers (Smith & De Zwart, 2010:17, 20).

The following teaching-learning strategies (listed alphabetically) are associated with international subjects closely comparable to CS: action-orientated learning strategies (Hitch & Youatt, 2002:172), contextual teaching and learning (Shamsid-Deen & Smith, 2006:14; Smith, 2010:24), indirect instruction or "non-formal education" (Hitch & Youatt, 2002:14; Smith & De Zwart, 2010:29) and project-based learning (Byrne, 2001:328; Zhou & Lee, 2009:41). The development of National Educational Standards for FCS sets a benchmark in the USA for the designing of learning experiences for pre-service teachers (Klemme, 2008:62; Smith 2012:12). Additionally, a list of "expectation statements" was developed to further support FCS educators on all levels, including the preparation of pre-service FCS teachers (Smith, 2012:1).

No benchmark information and few clear guidelines are available regarding requirements for CS teacher preparation in South Africa. Other than limited module descriptions from a handful of tertiary institutions, little information on this issue could be found. A gap exists in literature regarding guidance for effective teaching-learning strategies that should be used by South African CS teachers and pre-service teachers. More research in this field of study is required. The dynamic quality of CS content adds to these shortcomings, requiring those teachers to keep on learning continuously in an effort to stay abreast of developments in the subject.

1.4.2 Self-directed learning

Self-directed learning is described as a process or life skill in which learners take responsibility for their own learning through controlling, monitoring and managing learning tasks and activities, while considering why and how the learning is taking place (Brockettt & Hiemstra, 1991:25; Knowles, 1975:61; Pilling-Cormick & Garrison, 2007:16).

Self-directed learning is an important skill for learners to have in the 21st century, attributed to reasons such as rapid technological development, the effects of globalisation, and new developments in the understanding of knowledge and learning (Bell, 2010:39; Mok & Lung, 2005:34). Confirming the importance of SDL, Guglielmino (2008:1, 7) states that it is essential for the continuous lifelong learning required globally, and that employees will have to increasingly be able to apply SDL in the modern workplace. Self-directed learning also facilitates the interaction between real-life and learned content for learners (Pilling-Cormick & Garrison, 2007:29).

Self-directed learners have several qualities (Carwile, 2009:25), such as a fondness of learning, openness to learning, independence in learning, and awareness regarding their own responsibility for learning. Guglielmino (2008:2) points out that the personal characteristics of the learner (including their attitudes, values and abilities), as well as the learning situation, contributes to SDL. It was also determined that competency for SDL could be developed and taught (Mok & Lung, 2005:35).

Teaching-learning strategies and skills associated with SDL include metacognition, teacher mediation, reciprocal teaching, scaffolded social dialogue, inner speech, problem-based learning and project-based learning (Borich, 2011:330-361). Zhou and Lee (2009:38-39) found that project-based learning (PBL) had greater impact than direct instructional strategies in developing learners' responsibility towards learning, the quality of their learning, and their application of learning to new situations or to solve problems. Additionally, PBL was described as being able to foster self-direction in a real-life environment (Zhou & Lee, 2009:39). For these reasons, the study explored the implementation of PBL as a teaching-learning strategy to promote SDL skills as part of the preparation of pre-service CS teachers.

1.4.3 Project-based learning

The Buck Institute for Education (2012b) defines PBL as an extended strategy of inquiry in response to a complex question, problem or challenge, in which projects are carefully planned, managed and assessed to help learners learn key academic content, practise 21st century skills

(such as collaboration, communication and critical thinking), and create high-quality, authentic products and presentations (§2.5.1).

Project-based learning is a teaching-learning strategy with specific characteristics. According to Begay *et al*. (2006:19), Bell (2010:39), Boss and Krauss (2007:65), Grant (2009:17), and Smith (2007:10), PBL is learner-centred, helps learners to construct meaning from their own learning, utilises self-directed learning which requires learners to accept responsibility for their own learning, is problem-based, and is scaffolded around a plan (§2.5.3). Project-based learning requires careful planning, structuring and implementation to support teaching and learning effectively (Bell, 2010:40). As part of PBL, a project is included through which curriculum concepts are facilitated. The project is guided by a question that drives the research and allows learners to apply their acquired knowledge in the process (Bell, 2010:41).

The use of PBL as a teaching-learning strategy has many advantages (Bell, 2010:42; Mitchell, Foulger, Wetzel & Rathkey, 2009:340; Yasin, Mustapha & Zaharim, 2009:253), including that it develops SDL in learners (Zhou & Lee, 2009:39) and cultivates collaborative learning. However, despite the numerous potential advantages of using PBL (§2.5.1.3), teachers are sometimes concerned about a lack of specific guidelines for the correct implementation of PBL (Mitchell et al., 2009:340). Therefore, preparing pre-service teachers in the use and application of PBL might be advantageous to provide them with guidance for the implementation of PBL.

Though the use and application of PBL have been described in various subject fields (Zhou & Lee, 2009:38), research has not been conducted regarding its implementation specifically in the preparation of pre-service Consumer Studies teachers.

From the literature overview, it became apparent that limited guidance exists regarding preferred subject-specific teaching-learning strategies that should be used for the preparation of pre-service teachers in CS. Self-directed learning became evident as an important life skill, which ought to be developed in pre-service teachers. Project-based learning emerged from the available literature as a recurrent and successful teaching-learning strategy used to promote SDL in other subjects.

After reviewing the literature, the following problem statement and research questions were formulated to guide this study.

1.5 THE PROBLEM STATEMENT, RESEARCH QUESTIONS, AND PURPOSE OF THE RESEARCH

Consumer Studies is a multifaceted subject that requires subject-specific knowledge, various skills, as well as lifelong self-directed learning from its teachers. However, little research has been conducted regarding the preparation of pre-service Consumer Studies teachers. Preferred teaching-learning strategies that ought to be used in Consumer Studies teacher preparation have not been studied in the South African context, nor how such strategies could be implemented to promote the skills that Consumer Studies teachers would need (including self-directed learning) as part of pre-service Consumer Studies teacher preparation. In the light of the problem statement, the following research questions have been formulated:

Main research question:

How can project-based learning be implemented in pre-service Consumer Studies teacher preparation to promote self-directed learning?

Subsidiary questions that were addressed are:

(1) How can the use of project-based learning in a pre-service Consumer Studies teacher preparation module support the learning of subject content?

(2) How can project-based learning foster the development of skills to plan, design, implement and assess projects as part of pre-service Consumer Studies teacher preparation?

(3) How does the use of project-based learning in pre-service Consumer Studies teacher preparation promote self-directed learning?

In accordance with the research problem, the main purpose of the study was to investigate how project-based learning in pre-service Consumer Studies teacher preparation can be implemented to promote self-directed learning. In order to do this, the following sub-aims directed the research in more depth:

(1) Explore how the use of project-based learning in a pre-service Consumer Studies teacher preparation module can support the learning of subject content;

(2) Investigate how project-based learning can foster the development of skills to plan, design, implement and assess projects as part of pre-service Consumer Studies teacher preparation; and

(3) Explore how the use of project-based learning in pre-service Consumer Studies teacher preparation can promote self-directed learning.

In an attempt to attain these aims, the following empirical research guided the proposed study.

1.6 EMPIRICAL RESEARCH

1.6.1 Research design and methodology

For the purpose of this study, a qualitative research design was used. In an effort to address the need to develop CS content knowledge (§1.1 (a)), together with the skills required of CS teachers in the 21st century (§1.1 (c)), the research explored how the implementation of PBL in the preparation module for pre-service CS teachers could develop SDL.

A pre-module questionnaire was employed to gather data regarding participants' prior knowledge on CS education content, teaching-learning strategies and self-directed learning. The module content was restructured to employ and implement PBL as a primary teaching-learning strategy. Specific tasks were set for participants to complete individually and in a group. Focus group sessions and individual interviews were held throughout the course of the module to gather data (§3.8.2). In addition, documentation (i.e. weekly project sheets, reflections, weekly journals) (§3.8.4) was required from participants at regular intervals to gain insight into several aspects that were investigated, such as the conceivable development of 21st century skills and CS knowledge. At the completion of the teacher preparation module, the completed tasks and a post-module questionnaire were used to gather additional data, and to explore whether certain skills and CS knowledge have developed because of the implementation of PBL as a teaching-learning strategy.

A flowchart summarising the research process has been included (see Figure 1.1) and details thereof will be discussed in the subsequent sections.

1.6.2 Research method

Case studies provide an opportunity to explore issues and events from both epistemological and ontological perspectives and are often used in education research (Morgan & Sklar, 2012:75). According to Fouché (2005:272), the "case" in a case study "may refer to a process, activity, event, programme or individual … or … even refer to a period of time rather than a particular group of people". Merriam (1998:27) stresses the delimitation of the case being studied as "the defining characteristic" of a case study. In this case study, the implementation of PBL in one specific academic module used for the preparation of pre-service CS teachers, was studied. The case was bounded by the CS didactics module.

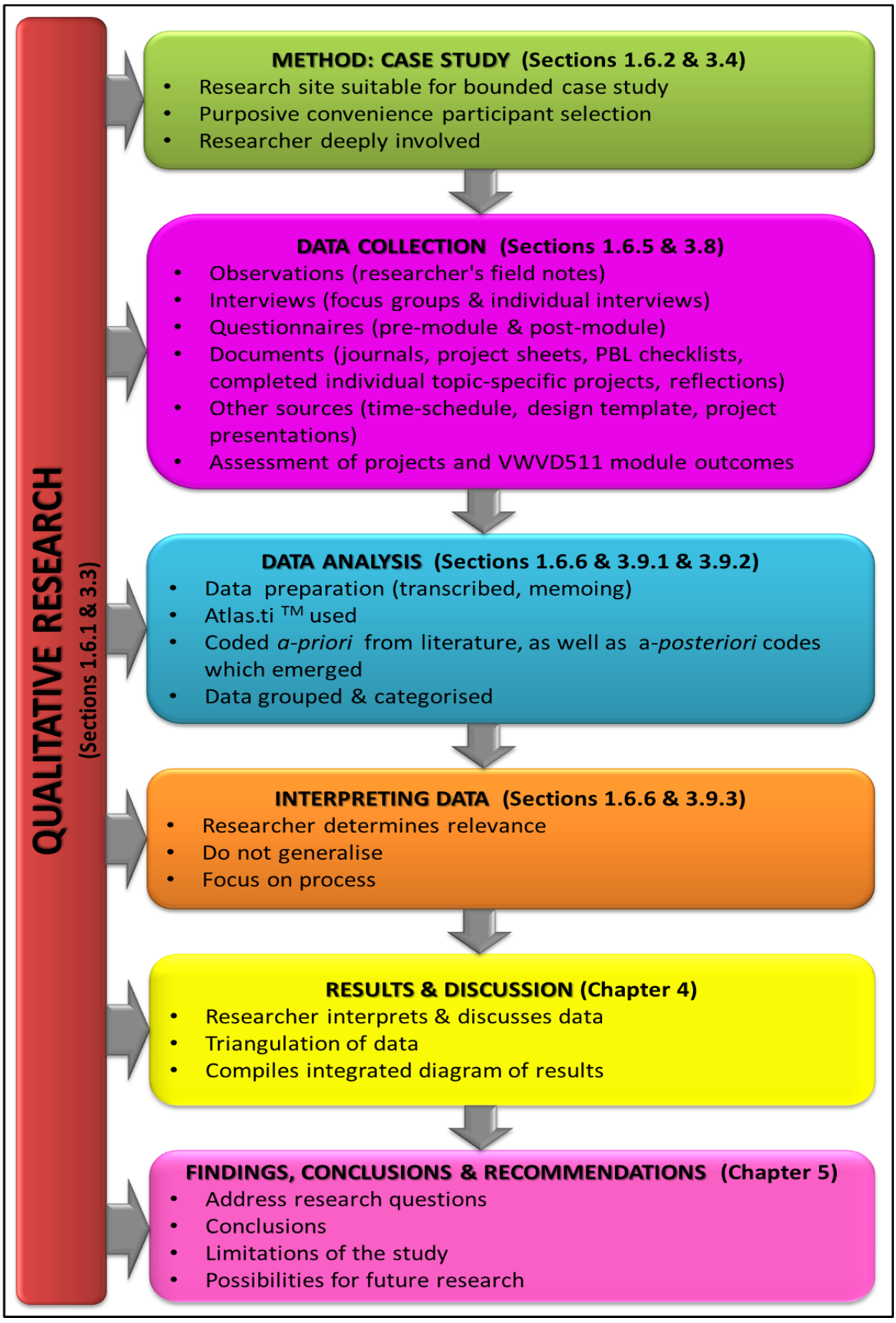

Figure 1.1: Flowchart illuminating the research process

The investigation took place within a real-life context (Nieuwenhuis, 2010b:75), as the module in which the research was performed is compulsory for pre-service CS teachers at the institution where the study was conducted. Fouché (2005:272) mentions that the researcher has to have regular contact with participants in case studies and that he/she has to gain their trust. The researcher is the lecturer of the module in which the case study was investigated.

The case being studied and the context in which it is being studied cannot be separated (Nieuwenhuis, 2010b:75; Merriam, 1998:29). Project-based learning as a strategy was wholly integrated into the teaching and learning in the pre-service CS preparation module. Qualitative methods and techniques were used to collect (§1.6.5 and §3.8), analyse and interpret data (§1.6.6 and §3.9) as part of case study research and were described in more detail in subsequent sections.

The researcher was deeply involved in the collection and interpretation of the data. The role of the researcher is discussed in detail in Section 3.5.

1.6.3 Research site selection

The university where this study was conducted is one of few higher education institutions in South Africa still offering Consumer Studies teacher preparation. At this institution, preparation for pre-service CS teachers is offered as a Post-graduate Certificate in Education (PGCE). The Faculty of Education Sciences at this university has been preparing pre-service teachers for a career in education since 1919. Qualifications obtained from this faculty have been registered with the South African Qualifications Authority (SAQA), are recognised internationally, and empower the teacher-students to teach at public or private institutions. The study was situated within an existing SDL Project in the Faculty of Education Sciences.

Permission was granted by the Ethics Committee of the university for the purpose of research in the "Teaching and Learning Strategies to Promote Self-Directed Learning" project, with ethical approval number NWU-00010-13-A2 (Addendum A). More details regarding ethical aspects of the study can be found in Section 3.12.

1.6.4 Participant selection

Purposive convenience selection was conducted of all students opting to do a PCGE with CS as one of their core teaching subjects. These students are required to complete a module called Consumer Studies Methodology (coded VWVD511), which involves teacher preparation specifically for the subject CS. The population consisted of all full-time VWVD511-students that

were registered for the module in 2013. The group was small and therefore no sampling was conducted, as the whole population was invited to participate. The five participants are all Afrikaans-speaking Caucasian females. They were all full-time students with a prior degree (e.g. B. or B.Sc. Consumer Sciences, or B.A. Fashion Design) which permitted them to continue with the PGCE-programme as part of their preparation as CS teachers.

1.6.5 Methods of data collection

Qualitative data collection methods and techniques were employed to help ensure rich, deep data and to support the prospect of triangulation.

Questionnaires with open-ended questions were used to collect data about the pre-service teachers' knowledge regarding CS education, PBL and SDL at the beginning and end of the study (Addendum D and CD doc. 10). Using open-ended questions allowed for the gathering of data with the intent of eliciting the views and opinions of participants (Creswell, 2009:181; Seabi, 2012:90). Semi-structured open-ended questions were also used to guide focus group sessions and individual interviews (see CD doc. 2 for examples of some of these questions).

Focus group sessions and individual interviews were conducted to gather deeper exploratory data and background information from participants, and to gain a wider range of responses regarding particular topics (Nieuwenhuis, 2010b:90; Seabi, 2012:90). Focus groups included discussions on the experiences, expectations and perceptions of participants during the study regarding PBL, SDL and projects in CS. Interviews and focus group discussions were recorded digitally.

Participants were expected to keep reflective journals (Grant, 2009:6; Hmelo-Silver, 2004:246) to document their own experiences of the PBL project as individuals and as part of the group. The keeping of reflective journals supports metacognitive development and journal writing was expected to be structured to include metacognitive elements (Moon, 2003:8).

Project sheets (Havenga & De Beer, 2013) had to be completed individually on a weekly basis to keep a record of participants' progress. Reflective journals and project sheets were submitted electronically and analysed continuously. The researcher also kept a research journal containing field notes and comments (§3.8.1).

Project-based learning facilitates the development of learners' social and collaborative skills through group work, but PBL also supports individual and autonomous learning (Bagheri, Ali, Abdullah & Daud, 2013:18). To facilitate collaborative learning, the group of five participants

was expected to work jointly in creating a suitable template for use in projects in CS. Each participant was subsequently expected to master one CS topic using PBL through designing and presenting a comprehensive project based on that specific topic. Topic-specific projects were individually constructed using the template designed by the group. Two class tests were administered to assess students' subject and module content knowledge. Topic-specific projects were presented to the group for formal formative assessment and peer comments to provide feedback to participants. The template, topic-specific (individual) projects, as well as class tests and other forms of assessment, were additionally utilised as data collection methods.

All electronic data was stored on an external hard drive, with back-up copies in a separate location. Hard copies of the data were filed systematically, with scans of all originals kept with back-ups of electronic data.

1.6.6 Methods of data analysis and interpretation

Data was transcribed verbatim with as much detail as possible, analysed, coded and categorised into main themes using Atlas.ti™ software. Data was organised electronically according to categories identified from literature and through coding. *A priori coding* (identified from literature) was used as a starting point; however, codes which were initially not anticipated, emerged (*a posteriori*) from the data as well (Creswell, 2009:187).

Insight, discovery and interpretation of data, as opposed to testing a hypothesis, are central in case studies (Merriam, 1998:28). Interpretation of data by the researcher therefore played an important role in this case study. The analysis allowed data to be viewed from different angles, adding insight into similarities and differences.

1.6.6.1 Validity, trustworthiness and generalisability

In an effort to ensure data validity, all questionnaires and open-ended questions planned for focus groups and interviews were reviewed by the supervisors of the study (both experts in their fields), as well as members of the Ethics Committee. Rich, deep descriptions of participants and the context and boundaries of the case study were also used (Maree & Van Der Westhuizen, 2010:37). A major advantage of case study research is the opportunity to use triangulation when multiple sources of data and data collection techniques are used (Di Fabio & Maree, 2012:141; Nieuwenhuis, 2010b:76; Gill, 2011:133). Triangulation of data helped to ensure trustworthiness in the study (Table 4.15).

Aside from using multiple sources of data and data collection techniques (§3.8), the study also employed the following strategies to improve trustworthiness, as suggested by Nieuwenhuis (2010c:113-114): raw data was verified by participants after transcription; a research journal was kept by the researcher to include and describe all research decisions that were taken; regular stakeholder checking was conducted by participants on interpretations; and findings and the limitations of the study were stated upfront.

Though concerns exist about the generalisability of case study findings (Creswell, 2009:193; De Vos, 2005a:346), Nieuwenhuis (2010b:76) points out that case studies aim to explain or understand a specific situation or phenomenon, and therefore generalisability should not be a concern. In an opposing view, Brown (2008:6) addresses the generalisability of case study findings by quoting Stake (2000) who noted that case studies are a "preferred method of research because they may be epistemologically in harmony with the reader's experience and thus to that person a natural basis for generalization". Gill (2011:119), however, maintains that issues regarding generalisability in case studies could be overcome by using additional evidence or abundant deep data within the boundaries and context of the case being studied.

1.6.7 Anticipated research problems

A few difficulties were anticipated in the study. Equipment used for digital recording had to be checked and tested regularly to ensure that it was working efficiently when needed for data collection. Theron and Malindi (2012:106) recommend that participants should be "desensitised" to prevent unnatural reactions and responses while they are being recorded. Having trail recordings to help them adjust before actual data collecting sessions helped to overcome this problem. The researcher also had to cautiously plan the incorporation of all content of the module VWVD511 as part of the research study to ensure that the module outcomes were being achieved.

1.6.8 Ethical aspects of the research

The following issues were considered when the proposed study was planned:

A problem that would benefit not just the researcher, but also a wider audience (i.e. the participants) was utilised to orientate the study. Approval was sought from the university's Ethics Committee for the study to take place as part of the SDL Research Project. Participants were required to sign informed consent forms prior to the onset of the research (Addendum B). The informed consent included participation in the study, as well as permission to be recorded as part of data collection. These forms identified and clarified aspects of the study, noted

possible risks to participants and guaranteed confidentiality. Participation was on a voluntary basis and participants could withdraw from the research at any time. However, none of the participants withdrew from the study — possibly because they realised the value the research could contribute to their preparation as teachers.

The researcher guarded against situations in which students could feel intimidated. Participants were reminded of their value as part of the study and did not have to be concerned about their module marks being negatively influenced by the study. Details of data and findings were handled in an ethical manner and were not discussed in a derogatory manner with anyone. While writing up the research findings and results, the researcher did not use language that shows bias against any group or individual. No results were falsified or manufactured to suit the ideas of the researcher.

1.7 CONTRIBUTION OF THE STUDY

It was anticipated that this research would contribute to the field of CS through the identification of a preferred teaching-learning strategy for use in CS education in the South African context in both teacher preparation and the learning of subject content. In addition, it was anticipated that participants might develop certain skills associated with PBL and SDL, which are also crucial in CS education.

This study would contribute to the self-directed learning (SDL) Project (Teaching and Learning Strategies to Promote Self-Directed Learning) within the “Education as Praxis” Research Focus Area of the Faculty of Education Sciences. Though both PBL and SDL have been researched before, scant specific research could be found regarding its use and application in CS as subject and even less research regarding the use of these learning strategies in the preparation of pre-service CS teachers. The research was expected to bridge this gap in research, as well as to expand the knowledge base for PBL and SDL by describing its usefulness and application possibilities in CS in the South African context, specifically for preparing pre-service teachers.

CHAPTER 2

CONCEPTUAL-THEORETICAL FRAMEWORK

2.1 INTRODUCTION

A review of literature has various purposes, including sharing and comparing results of related research, identifying gaps in prior research, and relating and positioning the proposed study to the wider field of research (Creswell, 2009:25). In qualitative research, the review of literature is exploratory (Delport & Fouché, 2005:265), is utilised to build a wider understanding of the research topic, and to compile a framework with which to orientate the study (Creswell, 2009:26).

2.2 FRAMEWORK FOR THIS STUDY

The framework that was used to orientate this study is presented in Figure 2.1, indicating how the researcher intended to gain a wider understanding regarding the preparation of pre-service Consumer Studies (CS) teachers.

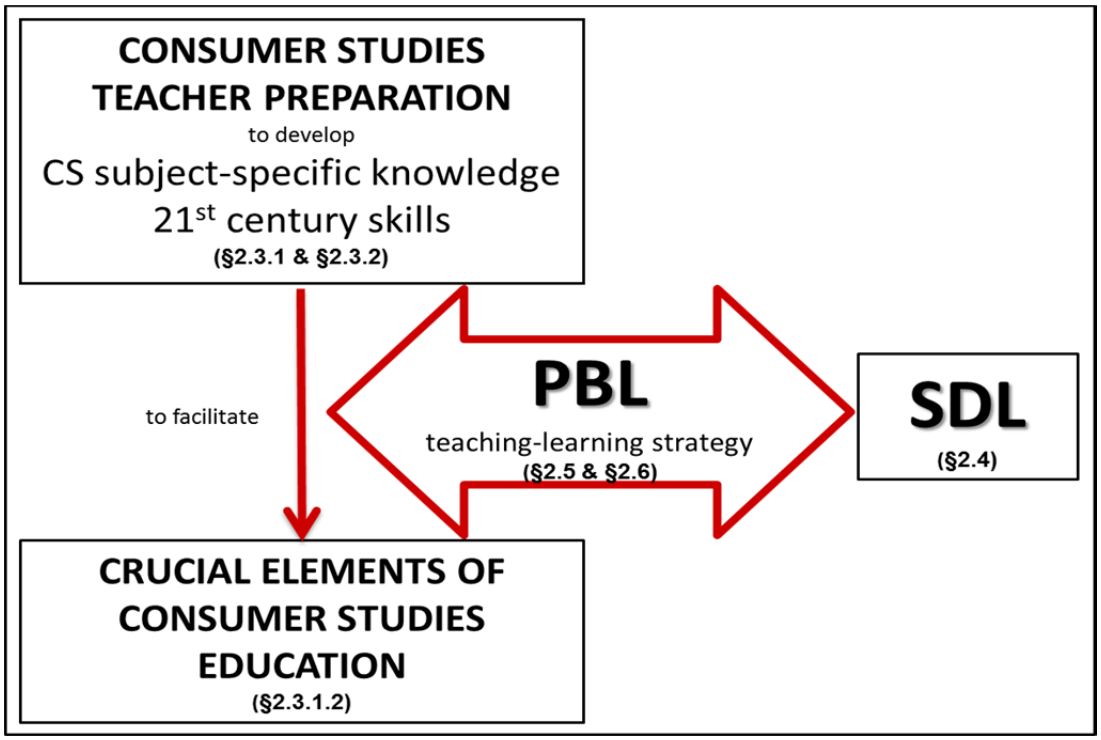

Figure 2.1: Framework compiled for this study to orientate the literature review

To streamline the interpretation of Figure 2.1, references were not included in this initial section, but have been included in the comprehensive description that follows in the literature review (§2.3 to §2.6).

As the initial point of departure, the ***preparation of pre-service CS teachers*** (specifically in South Africa) was investigated. Consumer Studies pre-service teacher preparation should include teaching-learning strategies to assist effective learning of knowledge and skills in the subject, as well as to promote preferred qualities or 21st century skills, such as problem-solving skills, critical and creative thinking, collaboration and assessment skills (§2.3.2). Preparation of CS teachers should also facilitate the ***crucial elements of CS education***, which form the foundation of the subject. These include the integrated nature of CS subject content and practical skills, the dynamic quality of the subject (which evolves and is constantly modified), the expectation of lifelong and life-relevant learning of its teachers, and the transfer of learning to real-life contexts (§2.3.1.2). Teaching-learning strategies to prepare pre-service CS teachers with the skills and knowledge required of them were sought in an effort to bridge the gap between the preparation of CS teachers and the crucial elements of CS education.

Lifelong, life-relevant learning is incorporated in and supported by ***self-directed learning*** (SDL) — a vital life skill that enables individuals to cope in the 21st century. Various 21st century skills are associated with SDL, such as planning, problem-solving and collaboration (§2.4.1.4). Promoting SDL as part of CS pre-service teacher preparation seemed advantageous to support the development of lifelong learning and 21st century skills required in CS education. The literature was then explored to discover how SDL might be promoted, including an investigation into suitable teaching-learning strategies that could contribute to the promoting of SDL.

Project-based learning (PBL) was identified as a teaching-learning strategy, which supports and promotes the development of various 21st century skills, including self-directed learning (§2.5.1.3). The scaffolding of projects within PBL was explored in detail to determine how projects in CS should preferably be designed to facilitate the crucial elements, knowledge and skills in the subject (§2.5.3).

The arrow bridging the gap between the crucial elements of CS education and the expected preparation of CS teachers in Figure 2.1 therefore signifies the main research question, which asks:

How can project-based learning be implemented in pre-service Consumer Studies teacher preparation to promote self-directed learning?

To support and address the main question, three subsidiary questions (§1.5) were developed that focus respectively on the developing of CS content, the development of skills, and the promoting of SDL as part of the implementation of PBL.

In line with this framework, the first section of the literature will locate preparation of pre-service CS teachers within the international field of research as well as in the South African context, and will describe the crucial elements of CS education that should underpin CS pre-service teacher preparation. Secondly, SDL as a process was explored, as well as its association with elements found in CS education. Thirdly, PBL was examined in detail and application possibilities for its use as a teaching-learning strategy in CS teacher preparation was investigated. Finally, the main research question regarding the potential contribution of PBL to promote SDL in pre-service CS teacher preparation was researched.

2.3 CONSUMER STUDIES

To introduce the subject and situate the research in context, a brief history of CS education in South Africa has been included. Consumer Studies replaced Home Economics (HEc) as subject in South African high schools in 2003 as part of the implementation of *Curriculum 2005*. Consumer Studies is therefore considered a relatively new subject. Major differences exist between CS and HEc, including divergent subject content and a new subject format (Umalusi, 2014:34). In contrast to the structure of HEc, which was compulsory for all grade 8 and 9 learners and an elective for grade 10 to 12 learners, CS is only offered as an elective subject from grade 10 onwards with no prior exposure to the subject. Whereas HEc focused on the family and the needs of the family, CS subject content focuses on 'the consumer' as central concept (DBE, 2010; DBE, 2011:8).

The "new" subject CS is therefore quite different from its predecessor and requires detailed and specialised training of its educators (Umalusi, 2014:89, 102) — both new and existing — to enable the attainment of its subject-specific aims (DBE, 2011:8).

2.3.1 Requirements for Consumer Studies teacher preparation

The *Policy on the Minimum Requirements for Teacher Education Qualifications* (NQF Act, 2011:8) demands that preparation of all South African teachers should include (amongst other elements) specialised subject-specific knowledge, as well as specialised pedagogical knowledge. This is also true for the preparation of CS teachers.

Consumer Studies teachers need to be prepared to be competent in a wide field of topics and need to be skilled in at least one of the five practical options (§2.3.1.1). It is therefore imperative that the preparation of pre-service CS teachers should empower them with subject-specific content knowledge, as it is essential in the field. Subject teachers should constantly learn and explore to be able to offer learners high-quality education (Smith & De Zwart, 2011:24) due to the dynamic nature of CS (§2.3.1.2).

In addition, CS teachers should have various skills to support teaching and learning, and to enable them to transfer the subject content in a meaningful way (Reitsma & Koekemoer, 2012:14, 41). Teaching-learning strategies utilised in their preparation, should incorporate 21st century skills, such as collaboration, problem-solving and critical thinking, which they will need to thrive in the 21st century (Bell, 2010:39), as well as to support optimal learning in CS (§2.3.1.2). Higher education should employ instructional methods and educational practices, which will help students to develop such 21st century skills, for example self-direction (Bagheri et al., 2013:15).

2.3.1.1 Consumer Studies subject content

To contextualise the extent of knowledge and skills that CS pre-service teachers need to be prepared for, an overview of the subject content has been included.

Knowledge content in the curriculum document for CS has been structured around seven topics, specifically ‘The consumer’, ‘Food and nutrition’, ‘Design elements and principles’, ‘Clothing’, ‘Housing and interiors’, ‘Textiles and fabrics’ and ‘Entrepreneurship’ (DBE, 2011:8). Developing informed and responsible consumer behaviour and especially the development of entrepreneurial knowledge and skills are important objectives in CS (DBE, 2011:9). All content topics develop, strengthen and support these two central objectives in CS (Umalusi, 2014:116, 117).

The subject content in the CS curriculum was found to be broad (covering an assortment of topics and sub-topics) and moderately deep (referring to the depth of coverage required of each topic and sub-topic) (Umalusi, 2014:155), and covers more topics than comparable subjects internationally (Umalusi, 2014:158).

The practical component in CS is aimed at skills development to support small-scale production and entrepreneurship. Schools may choose one of five different practical options, specifically production of food, clothing, soft furnishings, knitted and crocheted products, or hand quilting and appliqué items (DBE, 2011:8).

Consumer Studies is therefore perceived to be a multifaceted subject covering a broad selection of content knowledge and practical skills. Consequently, the three domains in Bloom's taxonomy are recognised in CS, since knowledge, skills and values contribute to learning in the curriculum (DBE, 2011:4).

2.3.1.2 Crucial elements in Consumer Studies education

As is the case with comparable subjects in the field, CS education is continually modified and adapted according to global and national trends regarding consumer issues (McGregor, 2010:20). This dynamic character of CS necessitates that teachers cannot persist in teaching the subject with only the knowledge and skills they acquire during their pre-service teacher preparation. Pre-service CS teachers should be prepared for the notion that teaching is a lifelong process of learning for the teacher (Kunkwenzu, 2007:178). Teachers will have to find ways to intentionally continue learning and renew their subject knowledge in order to stay relevant and be able to teach up-to-date content. Since lifelong, life-relevant learning is required of CS teachers, it should be a competency facilitated as part of their pre-service preparation.

The relevance of learning to the real lives of learners is one of the general aims of the national curriculum and promotes learning in the local context (DBE, 2011:4). Active, contextual learning helps to connect learning content to real-life situations (Smith, 2007:14) with the solving of real-life problems as a core requirement in the field of CS (Smith & De Zwart, 2011:24). The skill to transfer or convey subject content knowledge, as well as skills (like critical thinking or problem-solving) to real-life situations relevant to the South African context, is therefore imperative in CS.

Information and technology is changing at an ever-increasing pace, requiring that learners be exposed to other and higher levels of knowledge and skills than what they were previously used to (DoE, 2008:1). Teachers are also required to be able to succeed and thrive in such a knowledge-dependent world, which implies that the preparation of teachers should be structured to align with this requirement (Hökkä & Eteläpelto, 2014:40, 48; Mok & Lung, 2005:18). McGregor and MacCleave (2007:6) claim that capability in certain skills could be used to help prepare pre-service teachers to develop 21st century skills. A review of literature (DBE, 2011; Erickson, Fox & Stewart, 2010; McGregor & MacCleave, 2007; Umalusi, 2014) led to the identification of the following skills required of pre-service CS teachers in the next century, as they were deemed relevant to this specific research:

- collaboration and communication (elements strongly featuring in PBL);
- continued lifelong and life-relevant learning/research (important elements in both CS education and SDL);
- critical and creative thinking skills to facilitate problem-solving (important elements in PBL) and entrepreneurship;
- skills to transfer learned knowledge and skills to real-life situations; and
- subject-specific pedagogical approaches and methods.

In addition to the mentioned skills, assessment in CS should aim to support the main objectives of the subject (DBE, 2011:60-64), which is the development of entrepreneurship (Umalusi, 2014:16, 175) and developing informed and responsible consumer behaviour (DBE, 2011:8). Appropriate subject-specific teaching-learning strategies are needed to enable and empower pre-service teachers to be able to accomplish the main objectives and effective assessment in CS, as stated above.

2.3.2 Preparation of pre-service Consumer Studies teachers

Preparation for teachers in comparable subjects internationally[6] is actively overseen and often supported by a process of certification to ensure that only quality professionals enter the field (McGregor, 2008:26). This underlines the gap that exists in structured guidance regarding preparation of pre-service CS teachers in South Africa where no such regulation could be uncovered. Preparation of pre-service teachers should offer opportunities for transference of learning to real-life situations, which will help to bridge the gap between what is learned at university level and what is expected of them after graduation (Bagheri et al*.,* 2013:17).

2.3.2.1 Preparation of pre-service Consumer Studies teachers in South Africa

Excluding course materials of the five universities offering CS teacher preparation in South Africa in 2013, few other sources could be uncovered containing information regarding South African CS teacher preparation. A single direct reference to teacher preparation was found in the curriculum document for CS, dealing only with inclusivity and how teachers should be prepared to plan for diversity in teaching (DBE, 2011:5). Documented guidance for the preparation of teachers who will be teaching CS in South Africa is thus inadequate.

[6] Subjects closely comparable to CS internationally, include Family and Consumer Sciences (USA) and Home Economics (Canada and Australia), due to their similar scope and closely related content.

In CS in South Africa, the subject centres on the consumer, with little reference to the family as central concept (DBE, 2011:8). Though a great deal of guidance for pre-service teacher preparation exists in related subjects internationally, the emphasis in HEc and FCS is on the needs of the family and family members — rendering transferability of international information to the local context problematic.

2.3.2.2 Preparation of pre-service teachers in comparable subjects internationally

National Educational Standards have been developed in the USA for FCS[7] with the intent that these Standards form the scaffold for comprehensive programmes in the subject (Hitch & Youatt, 2002:11) and set a benchmark for designing learning experiences for pre-service subject teachers (Klemme, 2008:62; Smith 2012:12).

In international HEc teacher preparation, practical and critical thinking skills are focused on equipping pre-service teachers to handle the increasing complexities of daily life (Smith & De Zwart, 2011:24). Problem-solving skills, the practical application of information to issues in daily life (transfer of learning), as well as opportunities to analyse, evaluate and solve life-relevant problems, are provided in HEc (and HEc teacher preparation) (Smith & De Zwart, 2011:24). Subject-specific knowledge, constant learning and research are important aspects in HEc education and the preparation of HEc teachers (Smith & De Zwart, 2011:17-25). Though these aspects could be relevant to CS teacher preparation in the South African context, HEc focuses on 'the family', whereas CS centres on 'the consumer', hampering transferability of this information to the local context.

Despite the implementation of the *National Educational Standards* (developed for FCS) and other schemes (for HEc), there is no globally accepted conceptual framework for professional competency of FCS teachers (McGregor & MacCleave, 2007:2), nor does such guidance exist for South African CS teachers. Subsequent to the lack of guidance and regulation found for pre-service CS teacher preparation in South Africa, the researcher then turned to literature regarding preferred teaching-learning strategies utilised in the subject that should be employed in the preparation of CS teachers.

[7] The National Standards for Teachers of FCS were developed by the National Association of State Administrators of Family and Consumer Sciences (NASAFACS) to reflect the changes in the FCS subject field and society, as well as to describe specific content and skills that were expected to be taught, assessed and learned in the subject.

2.3.2.3 Teaching-learning strategies for preparing pre-service Consumer Studies teachers

Excluding some suggestions in CS learner textbooks and their paired teacher guides, no references could be uncovered about teaching-learning strategies preferred for use in CS education specifically in South Africa. Likewise, no literature could be obtained regarding preferred teaching-learning strategies employed in the preparation of pre-service CS teachers in South Africa.

Literature, however, indicated that strategies selected for comparable subjects internationally should aim to be learner-centred, should focus on the concept being taught, and should engage students to learn in meaningful ways (Hitch & Youatt, 2002:171; Smith & De Zwart, 2011:25; Thompson & Wheeler, 2010:239). Strategies identified from international literature that reflect the requirements for CS education listed here (§2.3.2.2), were the following: problem-based learning, project-based learning, inquiry-based learning and collaborative learning are mentioned as subject-suitable contextual teaching-learning strategies (Smith, 2007:14; Smith, 2010:24, 27). It was found that learners connected learning content to real-life situations better, achievement in the subject improved, subject matter was mastered to a better degree, and problem-solving and higher-order thinking skills were promoted when using these strategies (Smith, 2007:6). Project-based learning was also identified as a preferred strategy for students doing a CS degree in the United Kingdom (Byrne, 2001:326). This strategy afforded students independence, collaboration and research opportunities. Project-based learning is learner-centred, utilises collaboration and co-operation, and renders value to learning (Byrne, 2001:326).

The substantial practical component of CS (§2.3.1.1) dictates that action (active) learning must take place in the subject (Umalusi, 2014:88). Hitch and Youatt (2002:172) suggest action-orientated learning strategies, such as role-play and simulation of life experiences, for FCS education. Advantages of using such strategies include increased learner involvement, more focused, deeper learning and understanding, and increased learner responsibility for own learning. Creative thinking, problem-solving, increased learner motivation, collaboration and learning-through-doing, are also associated with such strategies. Debriefing or reflecting at the end of such action-orientated strategies is important to support learning (Helle et al., 2006:30; Hitch & Youatt, 2002:200). Reflection on learning helps to make the learning more meaningful and therefore ought to form part of teaching-learning strategies in CS.

The same teaching-learning strategies suggested for use in CS education, should be employed in the preparation of teachers who will be teaching the subject. The preparation of pre-service

CS teachers should therefore include active, problem– and/or project-based teaching-learning strategies that promote the development of 21st century skills (§2.3.1.2). Additionally, opportunities for reflection should be included in such preparation to make the learning (and preparation) of pre-service teachers more meaningful.

2.3.2.4 The gap in pre-service Consumer Studies teacher preparation

Guidance for preferred teaching-learning strategies that should be used in CS teacher preparation in South Africa is inadequate (§2.3.2.1). This gap in research needs to be addressed. Suitable teaching-learning strategies that could be used to support the development of subject knowledge, dynamic lifelong learning, 21st century skills required of pre-service CS teachers, and enabling the transference of learning to real-life contexts (§2.3.1.2) need to be identified. The active construction of knowledge as part of teaching-learning necessitates self-directed learning (Mok & Lung, 2005:19). One process that therefore holds great promise to contribute to teaching-learning in CS education and pre-service CS teacher preparation with a possibility of partially bridging the gap identified above, is self-directed learning.

2.4 SELF-DIRECTED LEARNING

Self-directed learning is defined as a process in which responsibility and control of learning tasks is accepted by the learner, including the learning behind the process (metacognition and motivation) (Knowles, 1975:15; Pilling-Cormick & Garrison, 2007:16). Self-directed learning (SDL) (as opposed to instructor-directed learning) is a basic human capability: individuals should be able to learn on their own (Guglielmino, 2008:4). Self-directed learning allows learners to decide “what, how, where and when to learn” (O’Shea, 2003:63). In this research, SDL is thus seen as a process being more than a mere learning skill.

2.4.1 Features of self-directed learning

In SDL, learners and facilitators have prescribed roles to fulfil. Although self-directed learning has various advantages, it should be implemented with care to overcome challenges associated with the process, as well as to ensure that desired outcomes, such as effective metacognition, are achieved. Each of these features has been described in the following sections.

2.4.1.1 Self-directed learning as a process

A clear distinction is made between SDL (as an instructional process) and learner self-direction, which deals with the personal characteristics of such learners (Bagheri et al., 2013:15; Brockett

& Hiemstra, 1991:25; Oliveira, Silva, Guglielmino & Guglielmino, 2009:46; Pilling-Cormick & Garrison, 2007:16; Reio & Davis, 2005:40). The former (SDL) focuses on external factors (outside the learner) such as planning, implementing and reflecting on learning, whereas the latter (learner self-direction) focuses on internal (personal) characteristics, such as satisfaction with learning (Brockett & Hiemstra, 1991:22-23). Personal characteristics of highly self-directed learners, determined through a Delphi survey of experts (Guglielmino, 1978:73) include: learner initiative, independence and persistence in learning; accepting responsibility for own learning; approaching problems as challenges; applying self-discipline; having a strong desire to learn; an ability to use study skills, manage time, and plan; as well as being someone who enjoys learning (Guglielmino, 2013:3).

Though Guglielmino (2008:2; 2013:3) points out that the personal characteristics of the learner also contribute to SDL, this study specifically aims to explore the impact of a teaching-learning strategy on the promoting of SDL as an instructional process and therefore only some of the personal characteristics of highly self-directed learners mentioned, would be studied in more detail. In the SDL process, learners assume primary responsibility for planning, implementing and evaluating the learning process (Brockett & Hiemstra, 1991:24), which includes setting learning goals and selecting resources and strategies (Knowles, 1975:18).

2.4.1.2 Roles of learners and facilitators in self-directed learning

In an SDL environment, learners are expected to take control of and responsibility for their own learning. They are expected to define learning goals, identify and select resources, choose strategies for learning, and reflect on and evaluate learning results (Pilling-Cormick & Garrison, 2007:14; Thornton, 2010b:161). Learners assume the role of “thinker and creator of knowledge” and actively control their learning, whereas teachers or lecturers only act as facilitators and mentors in the learning process (Guglielmino, 2008:3).

Implementing SDL does, however, not imply that teachers become redundant in the construction of learning, but that teachers (as facilitators) are essential in helping learners to develop SDL skills (Thornton, 2010b:160). Facilitators also play a vital role in shaping learners’ thinking skills and providing scaffolding for metacognitive processes (Hmelo-Silver, 2004:246). Facilitators support the promoting of SDL through helping to secure resources, planning the instructional process to allow development of SDL skills together with learning, collaborating with learners, and assessing the process and outcomes of the learning (Brockett & Hiemstra, 1991:105).

If teachers are to implement SDL successfully, they should be knowledgeable about these altered roles and be prepared to fulfil such roles efficiently.

2.4.1.3 Metacognition as part of self-directed learning

Self-directed learning and metacognition is closely linked (Carwile, 2009:35; Institute of Adult Learning (IAL), 2012:2). Metacognition refers to learners' ability to understand how prior learning, learning goals, learning strategies, personal views regarding learning, planning, control of and evaluating the learning and learning environment, might influence their learning of new material (Brockett & Hiemstra, 1991:118-119; IAL, 2012:1-2; Mok & Lung, 2005:21). The metacognitive skills applied in SDL, in turn supports long-lasting (lifelong) learning (Bagheri et al., 2013:18). Learners, who think about, reflect upon and understand their own learning, should learn better. Feedback is also considered an essential element in developing learners' metacognition (Mok & Lung, 2005:21). Learners utilising the SDL process might, however, need additional support to be able to develop metacognitive skills (Mergendoller, Markham, Ravitz & Larmer, 2006:38), which implies that teachers have to be equipped to strengthen learners' capability to nurture such skills.

The onus rests on tertiary institutions to provide opportunities for promoting SDL in students, since this will empower them to be able to transfer skills (such as metacognition) from the learning environment into their everyday lives (Francom, 2010:29; Mok & Lung, 2005:37).

2.4.1.4 Benefits of self-directed learning

The following beneficial elements of SDL, relevant to this study, were identified from literature (Bagheri et al., 2013:18; Brockett & Hiemstra, 1991:24; O'Shea, 2003:63, 69; Pilling-Cormick & Garrison, 2007:16-19, 29; Zhou & Lee, 2009:38): learners assume primary responsibility for planning, implementing and evaluating their learning process. Self-directed learning was found to facilitate the interaction between real-life and learned content for learners. Transfer of content knowledge and learning skills to other situations increase when SDL is implemented. Evaluating learning outcomes is an integral part of the teaching-learning process in SDL that provides valuable feedback about own learning. Critical thinking and construction of (deep) meaning, as well as thinking about how and why learning takes place, is fostered as part of the SDL process. Increased confidence regarding own learning ability (Brockett & Hiemstra, 1991:142), developing lifelong, life-relevant learning skills (Francom, 2010:30) and intrinsic motivation (Guglielmino, 2013:6) are other benefits associated with SDL. Additionally, Piskurich (1993:31) notes that self-directed learning is useful in dynamic environments in which material (and content) is constantly changing and being updated. The benefits of SDL are, however, not

limited to individuals only, but could also be expanded to teams, groups, schools and society as a whole (Boucouvalas, 2009:2).

2.4.1.5 Challenges in self-directed learning

O'Shea (2003:67-68) and Thornton (2010b:164) identified the following challenges for the implementation of SDL: the impact of learners taking control of and responsibility for their own learning should not be disregarded, as it probably entails a significant amount of adaptation for those learners. Facilitators and learners sometimes have opposing views of what SDL entails and clarification is necessary to avoid difficulties.

O'Shea (2003:67) found that learners sometimes initially view SDL with negative feelings (such as frustration, confusion or dissatisfaction), but that suitable guidance and support from facilitators can transform the feelings of those learners into confidence and empowerment with SDL skills. Certain facilitators also believe that SDL is more time-consuming than other learning processes (O'Shea, 2003:68). Various strategies could, however, be employed to successfully overcome these challenges. If teachers were prepared in the application of SDL, they would be aware of these challenges and might apply suitable strategies to deal with such problems.

The next segment delves into research conducted on the promoting of SDL skills to address the issue of *how* SDL could be promoted.

2.4.2 Promoting self-directed learning

Since diverse SDL studies have been referring to terms such as "learning", "fostering" and "promoting" almost interchangeably, it was deemed necessary to clarify and differentiate these concepts for the sake of this study. The Collins Dictionary (2013) defines "learning" as the act of gaining knowledge through study, instruction or scholarship; "fostering" as the promoting of the growth/development of something; and "promoting" as the encouragement or furthering of progress or existence of certain aspects, or raising aspects to a higher degree. "Fostering" and "promoting" may therefore be used interchangeably, but for the sake of this study, the term "promoting" was used as the preferred term. Self-directed learning is a process that can be learned (gaining knowledge through understanding), but it can also be promoted (if some level of prior use or knowledge of it already exists) (Reio & Davis, 2005:41).

In this study, two assumptions were embraced regarding the promoting of SDL, namely:

- Self-directed learning may be viewed not only as a personal characteristic, but also as a process (Brockett & Hiemstra, 1991:20-21; Francom, 2010:31; Pilling-Cormick &

Garrison, 2007:16; Reio & Davis, 2005:40) centring on the teaching-learning that fosters its development (Brockett & Hiemstra, 1991:30); and

- Self-directed learning could be promoted in participants through the utilisation of suitable teaching-learning strategies, such as PBL (Bagheri et al., 2013:18, 25) and appropriate learning tools, resources, experiences and guidance (Brockett & Hiemstra, 1991:105).

It was expected that participants might have some existing concept or experience regarding SDL, since they have all completed a degree (§1.6.4 and §3.7). The study aimed to investigate how SDL could be promoted and therefore the literature review focused specifically on research relating to promoting SDL, as opposed to the learning of SDL skills as if learners had no prior SDL experience.

Mok and Lung (2005:21) discuss three factors that promote and contribute to SDL in pre-service teachers specifically, namely cognitive factors, control factors and affective factors. Metacognition, as well as participants' beliefs about their own learning and their understanding and awareness of the learning task and context, are cognitive factors contributing to SDL (Mok & Lung, 2005:22; Pilling-Cormick & Garrison, 2007:17). Control factors refer to learners' self-directed efforts to take responsibility for their learning process, being in command of themselves (the learners), the task, as well as their learning environment (Mok & Lung, 2005:21; Pilling-Cormick & Garrison, 2007:18). Affective factors, such as the learners' motivation to learn, their attitudes towards learning, as well as the value they place on their learning also contribute to SDL and is especially important in adult learners (Mok & Lung, 2005:22; Pilling-Cormick & Garrison, 2007:17).

Teaching-learning strategies should be well-structured to facilitate the promotion of SDL skills (Francom, 2010:32; Thornton, 2010b:158). Strategies that promote SDL will increase skills to transfer learning and amplify the perceived value of the learning (Francom, 2010:37). Practical learning strategies (such as PBL) are mentioned in particular for their capacity to support the fostering of SDL skills (Francom, 2010:38; Zhou & Lee, 2009:37). Using learner-centred strategies allows the practice of SDL by combining subject content with the application thereof in learning activities (Francom, 2010:36).

The implementation of project-based learning (PBL) as a learner-centred teaching-learning strategy has been positively linked to the development of SDL in several studies (Grant, 2009:2; Hixson et al., 2012:3; Wurdinger & Rudolph, 2009:124; Zhou & Lee, 2009:37). Specifically, PBL offers opportunities for promoting SDL in a real-life environment (Zhou & Lee, 2009:38). Project-based learning has additionally been identified as an ideal teaching-learning strategy in

CS specifically (Byrne, 2001:326) and contains elements, such as learner-independence, problem-solving, critical thinking and practical applications that link well with the requirements identified for CS teacher preparation (§2.3.1). Project-based learning therefore has great potential to be applied as a teaching-learning strategy to promote SDL in the preparation of pre-service CS teachers and is consequently discussed in more detail.

2.5 PROJECT-BASED LEARNING

Project-based learning is described as an essential strategy to empower learners with the skills (such as collaborative work, problem-solving and communication skills), which they will need to prosper in the 21st century (Bell, 2010:39). Some studies have found that both teachers and learners prefer PBL to traditional teaching-learning strategies (Byrne, 2001:326; Thomas, 2000:34; Zhou & Lee, 2009:39).

2.5.1 Features of project-based learning

Project-based learning is constructed around a complex question, problem, or challenge, in which projects are carefully planned, managed and assessed (Mergendoller et al., 2006:587). It supports learners in the learning of key subject content, practising of 21st century skills and creating of high-quality, authentic products and presentations (BIE, 2012a:8).

Teaching-learning activities revolve around the execution and completion of a project within which teaching and learning occurs (Savery, 2006:15). Project-based learning motivates learners to learn deeper and to understand content better, while increasing the level of reading, as well as emphasising the linking of learning content to real-life contexts (Bell, 2010:39). Another significant aspect of PBL as a teaching-learning strategy, is its support of knowledge transfer to real-life contexts, which is considered as vital in CS education (§2.3.1.2).

2.5.1.1 Roles of learners and facilitators in project-based learning

The responsibilities of teachers and learners in PBL shift from their traditional roles: learners become more responsible for their own learning and teachers act mainly as facilitators in the learning process (Bell, 2010:39; Savery, 2006:15). Learner-centred learning is utilised for the acquisition of new information (Begay et al., 2006:19; Zhou & Lee, 2009:38), promoting active learning and higher-order cognitive skills (Savery, 2006:15). Though collaboration between learners is an essential part of PBL, the strategy also supports individualistic and independent learning (Bagheri et al., 2013:18).

Instead of 'teaching' learners, PBL facilitators guide and support learners in their learning. Teachers have to plan and prepare well in advance if PBL is going to be used and learners also need to be equipped to be able to deal with the atypical learning that PBL offers (BIE, 2012a:7-8). This might be problematic, as research found that teachers have limited preparation or experience in this strategy (David, 2008:80). Scaffolding effective projects as part of PBL is another skill that facilitators in this strategy need to master (Thomas, 2000:3). It might therefore be useful to include content on the planning and implementation of PBL in the preparation of pre-service teachers.

2.5.1.2 Project-based learning includes metacognition

Embedding opportunities for learners' self-assessment and reflection throughout the PBL process is essential (Begay et al., 2006:19). Reflection offers learners opportunities to develop metacognitive skills, which in turn supports knowledge retention and transferability of learning (Mergendoller et al., 2006:607). Metacognition in PBL includes being perceptive about *why* the learning is taking place, self-assessing how that goal is being achieved, considering revision and adaptation as an expected part of learning, recognising the importance of carefully selecting resources, and structuring learning well (Barron et al., 1998:273). Reflection as an essential characteristic of PBL should therefore form part of the intended learning in projects.

Additionally, the metacognitive and reflection skills acquired in PBL encourage learners to "learn how to learn" (Cartledge, Baldwin & Holloway, 2006:22). However, not all learners are equally adept at reflection and metacognition. Thornton (2010a:419) therefore recommends offering additional support to learners regarding metacognitive and reflective processes as part of PBL. This in turn implies that teachers need to be able to provide such support, indicating a need to prepare pre-service teachers for this purpose.

In addition to supporting the development of metacognition, PBL offers several other benefits.

2.5.1.3 Benefits of project-based learning

Numerous advantages associated with the use of PBL were found in literature. Some of the most prominent benefits include that real-life problems are addressed — allowing learners to "give something back" to the communities in which they live, as well as connecting learning to global issues (Bell, 2010:42; Swafford & Dainty, 2010:214). Learners become more adept at transferring knowledge from one context to another and learn to value or consider others' perspectives (Mitchell et al. 2009:340). Important skills, such as communication and planning, are developed in learners as part of PBL (BIE, 2012a:6).

Learners who use PBL are better prepared for the world of work and develop skills such as higher-order thinking, collaboration, planning and critical thinking skills (Bell, 2010:42, 43), creative thinking and self-directed learning skills (Yasin et al., 2009:253). Project-based learning supports learners with varying learning styles or levels of skill, while lifelong learning and civic responsibility is also purported to increase through the use of PBL (BIE, 2012a:6). Learners (and specifically pre-service teachers) employing PBL, performed better on assessments than learners not exposed to PBL, and were able to transfer knowledge and apply it to different situations (Bradley-Levine et al., 2010:3).

The benefits of PBL extend far beyond supporting the learning of subject content, but appear to support the development of skilled learners into socially responsible and constructive citizens (BIE, 2012a:6). Despite the abundant advantages, PBL presents some challenges as well.

2.5.1.4 Challenges in project-based learning

Adjusting to the changing roles of learners and teachers, the management of collaborative learning in order to reap the full benefits thereof as part of PBL, and assessment of projects, have been experienced as challenges in PBL (Grant, 2002:3). Project-based learning is at times perceived as being more time-consuming than lecture-based teaching-learning, which makes it difficult for learners to attain the required depth and breadth desired in most projects (David, 2008:84). Mitchell *et al*. (2009:340) additionally report that teachers sometimes felt concern about a lack of specific guidelines, such as a teacher's manual or objectives-driven lesson plans for PBL. Therefore, teachers need to be skilled and prepared for the effective implementation of PBL as a strategy. David (2008:82) states that in order for PBL to be successful, teachers need to be trained in the strategy. Project-based learning tasks have to be carefully structured and learning environments have to be prepared to fully support this teaching-learning strategy. If all these elements are not in place, PBL could easily devolve into aimless activities with little learning taking place.

Barron *et al.* (1998:271) found that adjustments to curriculum, instructional strategies and assessment are needed to implement PBL, and that both learners and facilitators occasionally find it difficult to adjust to all these changes. Learners might need additional support to be able to develop skills like critical thinking and metacognition, which will require supplementary assistance from facilitators (Mergendoller et al., 2006:38).

Clearly various factors should be considered and included in order for this strategy to be implemented successfully. The next sections will therefore focus on the requirements for and planning of PBL.

2.5.2 Requirements for project-based learning

For PBL to be effective as a teaching-learning strategy, it has to be well scaffolded and adhere to certain requirements. These requirements include that the project has to be structured around a central question or problem, that learning has to be linked to real-life experiences of learners, and that additional (21st century) skills have to be intentionally embedded in the planning of the project (Bell, 2010:41). Project-based learning concludes with a product and presentation (Thomas, 2000:7, 17, 36). Assessment should be well planned and integrated as part of the PBL strategy. These requirements for effective PBL are discussed in more detail in the subsequent sections.

2.5.2.1 Learning is structured around a project

Project-based learning centres on the completion of a project during which knowledge, skills and learning is integrated. Developers of PBL projects should purposefully include and structure the specific concepts, skills and knowledge that they want learners to learn as part of the project requirements (Thomas, 2000:3). Learners should preferably contribute to some aspects of the project, such as the selection of resources and/or time-management (Larmer & Mergendoller, 2012:2). This will allow a greater scope for creative and critical thinking than if the facilitator is being highly prescriptive and will offer an opportunity for learners to learn from their mistakes (Francom, 2010:32).

2.5.2.2 A central question or problem guides the project

Project-based learning should be constructed around a central problem or interesting question, posing a challenge to learners, as well as directing the structuring of the project within PBL (Larmer & Mergendoller, 2012:2). The question or problem should be relevant to the lives of the learners and should create opportunities for learners to apply their acquired knowledge as part of the process (Bell, 2010:41; David, 2008:80; Savery, 2006:15). The central problem or question is solved through structuring teaching and learning events around the project aims (Smith, 2007:10; Speckels, 2011:89).

The formulation of the central question or problem serves to help contextualise the problem-solving required of the learners (Thomas, 2000:7), and thereby strengthening the potential for learning. Problem-solving skills are considered life skills and learners should be encouraged to

apply these skills to real-life problems (Speckels, 2011:43). Collaborative learning, critical and creative thinking, responsibility for own learning, as well as constructing knowledge, are all considered to be important factors embedded in problem-solving (Speckels, 2011:58).

Careful selection of driving questions or problems should thus ensure that the learning in the PBL project is more meaningful and relevant to their lives of the learners (David, 2008:80). In subjects such as CS, which aim to address everyday social problems, several conundrums can be found to structure PBL around, such as 'Food-related consumer issues', 'Application of design elements and principles when planning a wardrobe', or 'Daily meal planning for specific consumer groups' (DBE, 2011:14).

2.5.2.3 Linking learning and 21st century skills to real-life contexts

For PBL projects to be meaningful, learners have to appreciate its learning-value and it has to have an educational purpose (intended learning) (Larmer & Mergendoller, 2012:2). Project-based learning as a strategy is founded in reality, as projects are **based on real-life** problems or situations (Bagheri et al., 2013:25). This characteristic of PBL motivates learners through making the learning meaningful and relevant to their lives (Larmer & Mergendoller, 2012:1). Involvement in real-life issues help learners to better understand learning content and to construct meaning from their learning (Begay et al., 2006:19; Grant, 2002; Mergendoller et al., 2006:586; Rossingh & Chambers, 2011:63; Smith, 2007:10). Real-life contexts are more interesting to learners and allow them to apply acquired knowledge and concepts to such situations in order to solve the problem (David, 2008:80).

Transferability of learned content and skills or knowledge to the everyday lives of learners is crucial in subjects like Consumer Studies (Smith & De Zwart, 2010:14). Since CS education constantly revolves around real-life issues that consumers (and therefore learners) are confronted with, linking learning to such contexts in PBL should not be difficult. This would mean the learning becomes more useful to the learner and could possibly be applied in novel contexts. It is claimed that self-directed learning facilitates the interaction between what has been learned and real life (Pilling-Cormick & Garrison, 2007:29).

21st Century skills, such as critical– and creative thinking skills and collaborative learning, should be intentionally built into projects as part of the objectives of PBL (Begay et al., 2006:17; Grant, 2009:1; Larmer & Mergendoller, 2012:2; Markham, 2013; Mergendoller et al., 2006:587; Thomas, 2000:3). PBL learners also have the opportunity to develop other important skills, such as increased higher-order thinking, research, self-directed learning, time-management,

responsibility for own learning, as well as “learning how to learn” (Begay et al., 2006:19; Speckels, 2011:89; Wurdinger & Rudolph, 2009:118, 124).

2.5.2.4 Team work and collaboration

The ability to work collaboratively with others is a prominent 21st century skill (Bell, 2010:39). Collaboration skills are developed when learners work together in teams or groups toward a common goal, such as when solving problems with the understanding that each member shares responsibility and contributes to the product or solving of the PBL problem (Hixson et al., 2012:8). Project-based learning necessitates improved listening skills, communication, shaping own opinions, and collaboration and negotiation, which are all considered to be critical social skills needed to be developed in learners for the future (Bell, 2010:40-41).

In instances where learners are inexperienced in working collaboratively, additional support in this aspect should be provided by the facilitator to promote the development of collaborative skills (Yam & Rossini, 2010:6).

2.5.2.5 A product and presentation as part of the problem solution

The end result of PBL is normally a useful, authentic product, article or service (Grant, 2009:1; Hmelo-Silver, 2004:238; Mergendoller et al., 2006:587; Smith, 2007:10). The product or service typically addresses or relates to the question or problem that guided the project as part of PBL. Learners should have an opportunity to present their projects to their peers or to other audiences, which would add more meaning to their learning, as well as possibly improving the quality of their work (Larmer & Mergendoller, 2012:3) through providing motivation to perform well.

In the practical component of CS education (§2.3.1.1), learners are required to produce products with entrepreneurial value. Presenting results to peers might strengthen learners’ communication and evaluation skills, and might improve the subsequent learning when they are educated to learn from their (or others’) mistakes.

2.5.2.6 Assessment in project-based learning

Assessment should be integrated throughout PBL projects to provide formative feedback to learners and should relate to “real world” assessment, such as the type of assessment found in the workplace (Larmer & Mergendoller, 2012:2; Mergendoller et al., 2006:587). Team efforts and individual work should be assessed in PBL. Learning content, as well as aspects surrounding learning, such as collaboration, time-management and planning, should also be

included in the assessment of projects (Bell, 2010:43; Grant, 2009:17; Hixson et al., 2012:31; Mergendoller & Thomas, 2000:34) to help prepare learners for real-world situations (Zimmerman, 2010:10). Diverse assessment strategies and instruments should be used with the aim to improve learning of all aspects included in PBL (Bagheri et al., 2013:21; Mergendoller & Thomas, 2000:30). Various instruments are available to support different aspects of project assessment, such as the "critical friends group", which provides peer assessment and feedback or several rubrics focusing on aspects of (amongst others) time-management, teamwork, project design or self-reflection (BIE, 2011c; Markham, 2013).

Formative assessment should be incorporated with the learning activities of the project (and not just summatively assess the product of the project) to provide feedback to learners regarding their progress and performance (Barron et al., 1998:284; Grant, 2009:2; Krajcik, McNeill & Reiser, 2008:9). Self, peer and facilitator assessment and feedback (as well as reflection) should be implemented during the different project phases to assess various aspects and elements of the project, as well as the associated learning that took place (Bell, 2010:43). Pre-service teachers should be prepared to fulfil their role as facilitator and be able to effectively integrate assessment as part of PBL.

The next section explores literature regarding the planning and optimal structuring of PBL projects.

2.5.3 Scaffolding project-based learning to foster learning

Scaffolding of projects in PBL should aim to support all aspects of learning, including content, skills, assessment and metacognition (Hmelo-Silver, 2004:260). Various plans, frameworks and processes for structuring and implementing PBL were found in the literature, of which a number were discussed in this section. Table 2.1 contains a summary of suggestions regarding the structuring of PBL to indicate similarities and discrepancies between the various scholars' views. As PBL is a multifaceted strategy, it is also important to endeavour to avoid certain pitfalls associated with the planning of projects as part of the strategy. A preferred framework for planning and scaffolding PBL emerged as a result of this review and has been included in Section 2.5.3.3, Figure 2.2 and Table 2.2.

2.5.3.1 Existing suggestions for scaffolding project-based learning

Stix and Hrbek (2006:166) (see Table 2.1) describe PBL in nine simple steps in order to support teachers who wish to implement the strategy. Some of these steps may be combined into slightly more complicated tasks (such as preparing the presentation and presenting the project)

Table 2.1: Suggestions for structuring project-based learning

	Stix & Hrbek (2006:166)	Barron *et al*. (1998:273)	Begay *et al*. (2006:19)	Grant (2002:3)	Mergendoller *et al*. (2006:588-609)
1	Setting the stage using real-life examples	Setting of learning appropriate goals	Outlining the purpose and objectives of the project	Introduction to "set the stage"	Launching the project – engage learners' interest, share and set high expectations and orientate learners by clarifying details
2	Design project	Scaffolding which supports both teaching and learning	Focussed research and developing a plan for carrying out the project	Challenging task including guiding question or problem; collaborative group work such as brainstorming sessions [8]	Guided inquiry and product creation – instruction is merged with carrying out the project through facilitating resource usage defining and managing progress scaffolding work and learning cultivation of communication (and presentation) skills
	Discuss and gather background information				
	Resolve evaluation criteria			Guidance and scaffolding is provided to support learners	
3	Constructing projects	Participative behaviour	Problem-solving through collaborative work	Identifying and using resources	Project conclusion – presentation of the project and summative assessment; learners reflect on the process and learning which took place
	Preparing project presentations			Process of solving problem including critical thinking and higher-order thinking skills	
	Presenting projects				
4	Reflect on process; evaluate projects	Self-assessment, reflection, revision	Artefact produced. Reflection and evaluation of work	Reflection or debriefing on what was learned	
5			Connecting learning to real-life situations. Critical and creative thinking skills applied		

[8] In Grant's article, the framework for PBL has "elements" and not "steps". The researcher therefore took the liberty of rearranging the elements in Grant's framework to better indicate alignment with other frameworks.

than what was found in this structure for PBL. Possible deficiencies in this PBL plan include the failure to mention a structure for the execution of the project and not emphasising the use of collaborative groups.

Barron *et al*. (1998:273) focus on four basic design principles, which might support learners' understanding of their own learning in PBL. These principles are (1) the setting of learning appropriate goals, (2) scaffolding projects to support both teaching and learning, (3) regular opportunities for self-assessment, reflection and revision, and (4) participative behaviour. Though connection to real-life contexts are not emphasised in this design, its principles correspond well with the general requirements for PBL (§2.5.2).

Begay *et al.* (2006:16-17) list five steps that form part of the "production model" of PBL. Learners start by outlining the purpose and objectives of the project, followed by focused research and the development of a plan for the execution of the project. Learners then work collaboratively on solving the problem central to the project. In the fourth step, the product or artefact (result of the project) is produced and learners have opportunities to evaluate and reflect on their work. The fifth step involves collaboration in real-life situations and allows learners a measure of freedom to apply creative and critical thinking skills. This framework accentuates the central role that learners are supposed to fulfil in PBL. The first four steps of this framework (Begay et al., 2006) clearly reflect the requirements for PBL (§2.5.2) and indicate suitable utilisation of a structure to orientate the project. In other frameworks, the aspects of life-relevant learning and critical thinking skills have been included as part of previous steps in the implementation of PBL.

Grant's (2002:3) framework for structuring PBL lists seven detailed elements as part of the process. An introduction starts the project with the aim to motivate learners and orientate their learning. The subsequent five elements do not necessarily have to be in order (or in "steps"), as they deal with the execution of the project to solve the guiding problem, specifically: the task, resources, process, guidance and scaffolding, as well as collaborative learning. A seventh element concludes this framework, dealing with reflection on the learning that took place in the project. This framework fails to indicate the importance of connecting projects to real-life situations, but otherwise reflects all the requirements for successful projects in PBL described in Section 2.5.2.

The most detailed description found for planning PBL was that of Mergendoller *et al.* (2006), who extensively describe how PBL should be scaffolded and managed optimally. Their PBL implementation structure is labelled "Pervasive Learning Management Activities in Project

Based Learning" and involves three comprehensive stages preceded by a stage "0". Stage 0 details the facilitator's planning that needs to take place prior to the onset of a project, such as the formulation of the driving question or details surrounding the assessment of the project. More detailed elements that are incorporated in stage 0 have been captured in Table 2.2.

Table 2.2: Elements included in stage 0 of "Pervasive learning management activities in project based learning"

Stage 0	The facilitator plans the project by • deciding on the scope and central notion of the project; • developing a definite project problem or question; • deciding on standards and integrating essential characteristics for learning and life skills; • structuring assessment to give feedback and to gain insight into how learners think; • categorising resources to support the execution of the project; • planning how collaboration will take place by deciding how groups will be structured.

Source: Adapted from Mergendoller et al. (2006:588-597)

The first stage of the pervasive management activities (Mergendoller et al., 2006), centres around the launch of the project, which should stimulate learner interest, clarify details and set high expectations for them. The second stage revolves around the execution of the project, including aspects such as scaffolding of the process, utilising resources and supporting learners in the refinement of the different facets of the project. Formative assessment is conducted throughout the project to give feedback to learners regarding their performance and progress. The third and final stage comprises the conclusion of the project and incorporates elements such as assessment and reflection (Mergendoller et al., 2006:606).

2.5.3.2 Pitfalls to avoid when scaffolding project-based learning

Boss and Krauss (2007:60) mention some common pitfalls that teachers should guard against when choosing or planning a PBL project. These difficulties include focusing too much on the activities, but not enough on the objectives or learning aims of the project, and the over-use of technology at the expense of using and learning other research and presentation skills. Likewise, sticking too close to narrow themes might hinder interactive and interconnected learning, as does choosing highly descriptive projects, which do not allow for or demand enough critical and creative thinking skills from learners. Balancing learner independence with structuring learning, time-demands and designing accurate assessment strategies might also prove difficult to some teachers (Bradley-Levine et al., 2010:5). The majority of these pitfalls can easily be avoided if teachers are aware of their existence. Proper preparation of teachers

to effectively plan, scaffold and implement PBL as a strategy, is required if all the potential learning gains associated with the strategy are to be achieved.

Considering these difficulties in conjunction with the various frameworks for structuring PBL reviewed in the literature (§2.5.3.1), the following *emerged* as guiding principles for the planning and scaffolding of PBL projects to support effective teaching and learning. These principles have been summarised in Figure 2.2.

2.5.3.3 Preferred planning and scaffolding of project-based learning

The review of literature indicated that a large amount of planning should precede the commencement of PBL as a teaching-learning strategy (see Figure 2.2). The depth and breadth (scope) of the project, a clear real-life problem (or question) to orientate the project, resources made available for use in the project, assessment of the project, and the structure of collaborative groups, should all be planned in advance by the facilitator (BIE, 2012b:4). In addition to these aspects, it is also imperative that the life skills associated with PBL (§2.5.1.3) should be planned and intentionally incorporated simultaneously to support those aspects of the learners' learning as part of PBL. After the facilitator's initial planning and preparation, it is suggested that the actual implementation of PBL involves four phases (§2.5.3.1 and Figure 2.2). Figure 2.2 illustrates the preferred framework, which was developed from the preceding literature, indicating a planning phase, followed by the four implementation phases.

In the ***planning phase*** (Phase 0), the facilitator identifies a problem which will guide the project and determines the scope of the project (including elements such as the learning of content and skills to be included, and the extent of the project). The facilitator identifies and selects certain resources, which will be made available to learners, as well as the assessment strategies that will be employed in the project.

The ***first phase*** introduces the project to learners through a real-life problem or question, which should be structured in a manner that will peak learners' interest. At this point, details and objectives of the project should be made available to learners. Objectives should not only include subject-specific learning content, but should also address anticipated skills or processes.

The ***second phase*** involves the structuring of the project to scaffold the different parts of the project as well as the teaching and learning intended as part of the project. Collaborative work between learners should be encouraged and embedded in the structure of the project.

The ***third phase*** encompasses the finding and using of resources by learners to solve the initial problem or answer the question. Critical and creative, higher-order thinking and problem-solving skills should be required of learners in the completion of their projects throughout the project. This stage is structured to design and select a possible approach to solve the problem.

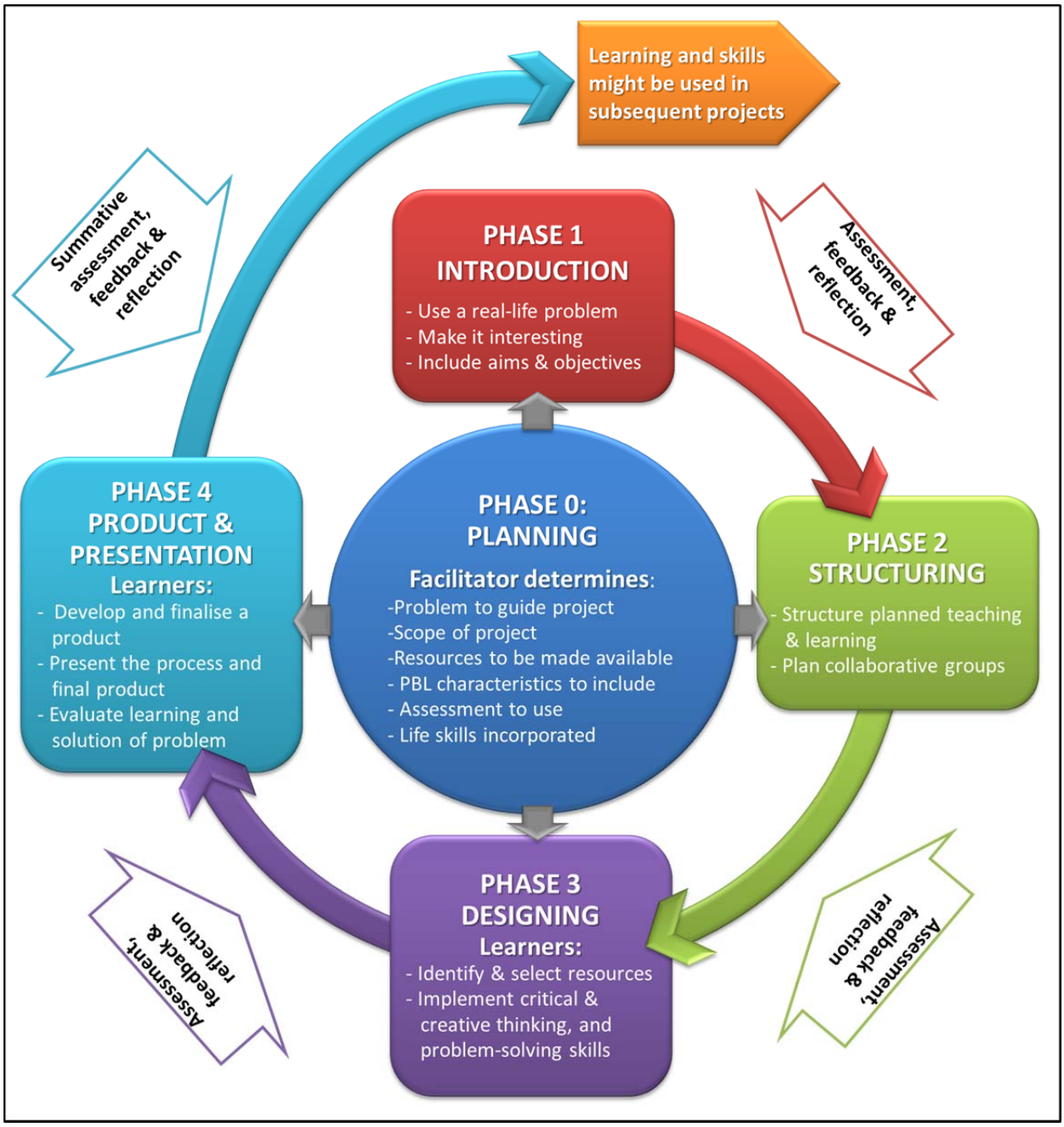

Figure 2.2: Preferred framework for planning and scaffolding project-based learning

The ***fourth phase*** concludes the project. A product, service or artefact is produced and presented by learners to an audience or peers. Learners should self-assess and reflect on their

projects, but also on their own learning during the project. Formal, summative assessment takes place at this stage.

After careful and detailed planning, using these four phases as guidelines for the process of implementing PBL could support the success of this strategy for teaching and learning. The quality of the planning and implementation of the project, together with the level of learners' commitment, should enhance academic achievement and the quality of learning (BIE, 2012a:6).

Assessment is planned and scaffolded as part of PBL to ensure that all aspects of learning are supported. Formative assessment plays an important part throughout PBL, but summative assessment should be used to assess the product and presentation at the end of the project. Feedback is supplied during all phases to support learning and development of learners. Learners reflect on their learning, their progress in the project and their goal attainment regularly, and make adjustments where necessary. Effective assessment of PBL might be challenging and ought to be included as part of teacher preparation to ensure that the full potential scope of learning in PBL is assessed (Grant, 2002:3).

The next section explores the suitability of PBL as a strategy to specifically promote SDL.

2.5.3.4 Common features between project-based learning and self-directed learning

The foremost common features between PBL and SDL (as is evident from Table 2.3 are: independent learning, the relevance of real-life situations to learning, setting of aims or objectives, identifying and selecting appropriate resources, using critical thinking skills, as well as the evaluation of results and reflection on what was learned. To streamline text, references were not included in Table 2.3, but are evident in §2.4.1 (SDL features) and §2.5.1 (PBL features).

Metacognition strongly features in both PBL and SDL and is considered an important part of the learning outcomes. Both PBL and SDL advocates learner-centred learning and lecturers or mentors only facilitate or guide learning (as opposed to lecturing). The development of 21st century skills is also associated with both PBL and SDL (Table 2.3, §2.5.2.3 and §2.4.1.4). The numerous common features found in PBL and SDL support the notion that PBL can serve as a teaching-learning strategy to promote SDL.

Table 2.3: Common features in project-based learning and self-directed learning

Project-based learning features	Self-directed learning features
Introduction to the project through a real-life problem or question Details and aims of the project are determined Learners identify each team members' responsibility regarding the project development	Interaction between real-life and learned content Responsibility for recognising own learning needs and setting learning objectives accordingly
Structuring of the project using a framework to scaffold its completion Planning and carrying out the project collaboratively Independent learning	Suitable guidance and support from facilitators Choosing strategies for learning Collaborative effort (in some cases) Independent learning
Finding and using resources to solve the initial problem or answer the question Transferring knowledge from one context to another Learners use critical and creative, higher-order thinking skills in the completion of their projects Formative assessment used to provide feedback to learners regarding their progress and performance	Identifying and selecting suitable resources Transferability of knowledge and learning skills to other situations Critical thinking (including reflection) Thinking about how and why learning takes place Feedback given regarding progress
A product or artefact is produced and presented Learners self-assess and reflect on their projects, but also on their own learning Metacognition an important part of learning skills developed	Reflecting on and evaluating results and learning that took place Metacognition essential to support successful self-direction

Main sources: Adapted from Knowles (1975:18), Mergendoller et al. (2006:588-609), and Pilling-Cormick and Garrison (2007:14, 16, 23)

2.6 CODES DEVELOPED FROM THE LITERATURE

The literature review focused on CS (specifically the preparation of teachers for the teaching of the subject on school level), SDL as a process with several advantages (including that it supports lifelong learning), and on PBL as a possible vehicle (in the form of a teaching-learning strategy) to promote the development of SDL. The review of the literature gave rise to the development of several thematic codes, which have been illustrated in Figure 2.3.

Two broad themes were distinguished from the literature and used in the data analysis, namely (1) teacher preparation for CS education (§2.3.2) and (2) factors which contribute to SDL (§2.4.2). The two sets of thematic codes each contained predetermined sub-categories (Figure 2.3). Though the main focus of the study was to investigate how SDL could be promoted, it was situated within the context of CS teacher preparation, which includes specific aspects

considered to be important in the teaching-learning of that subject. Detailed explanations for the development and selection of each of the thematic codes have been included in CD doc. 8. (See §3.9.2 for details regarding data analysis and §3.9.3 for details regarding data interpretation).

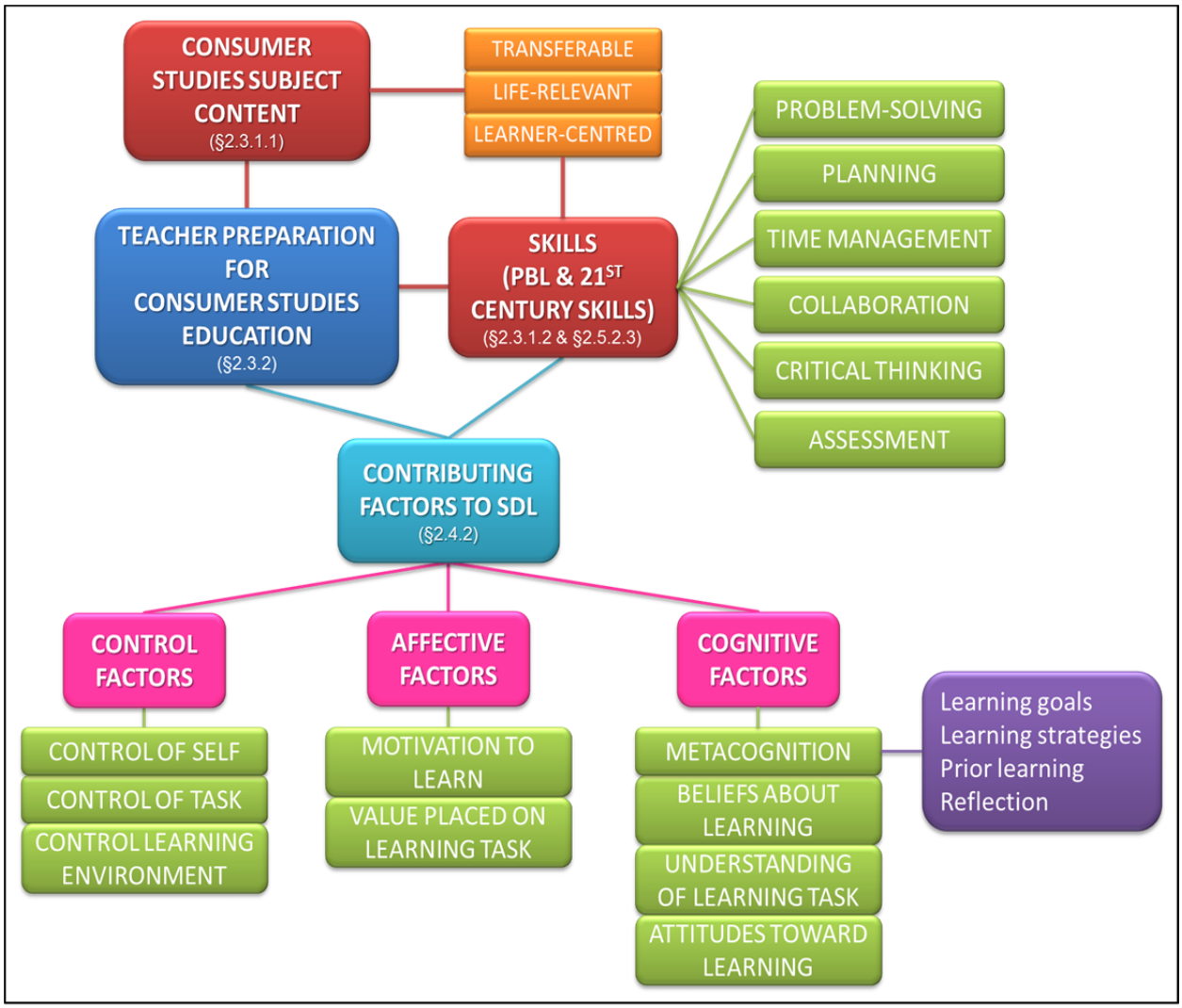

Figure 2.3: Thematic codes developed for this study from the literature review

2.7 SUMMARY

A contextual weakness identified from the literature (§2.3.2.4) is that preferred skills or pedagogical strategies to be used in the preparation of pre-service CS teachers, have not been specified within the South African context. SDL is an instructional process (as well as an essential life skill) that has many benefits, including the transferability of content knowledge and learning skills to other (real-life) situations, and developing lifelong, life-relevant learning skills. It is imperative that CS teachers are able to use SDL to stay relevant in their profession (§2.3.1.2). Various studies have shown a significant connection between the implementation of PBL as a strategy and the promoting of SDL skills (§2.4.2). Project-based learning emerged from literature as a practical, learner-centred teaching-learning strategy preferred by learners and facilitators (§2.5.1). Project-based learning has many benefits and its characteristics align well with crucial elements of CS education, which pre-service CS teachers should preferably develop as part of their preparation. Though several studies have been conducted on PBL and SDL, insufficient research exists regarding the implementation of PBL to promote SDL in the subject CS and specifically in pre-service preparation of CS teachers. The implementation of PBL as a teaching-learning strategy in the preparation of CS pre-service teachers, and how it could promote SDL in those teachers, was explored and is discussed in subsequent chapters.

CHAPTER 3

EMPIRICAL DESIGN

3.1 INTRODUCTION

This chapter illuminates the philosophical point of departure, which the researcher used to frame the research with, and also describes the empirical design. Descriptions of the research method, the researcher's role, the selection of the research site and participants, methods of data collection, analysis and interpretation, the quality assurance employed in this study, as well as considered ethical aspects, have been included.

3.2 PHILOSOPHICAL POINT OF DEPARTURE

The study was conducted within a philosophical framework with social constructivism as foundation (§1.3). Vygotsky is acknowledged as the founding father of social constructivism (Powell & Kalina, 2010:243; Van Merriënboer & De Bruin, 2014:27).

Social constructivism, a branch of constructivism (Mascolol & Fisher, 2005; Pritchard & Woollard, 2010:8), seeks to understand the world in which participants function and focuses on the subjective meanings of participants (Creswell, 2009:8). It is based on the idea that learning takes place between people (not only in an individual) and thus that it is social in nature. Social constructivists advocate that a person's interaction with his or her surroundings (and society) shapes ("constructs") his or her learning and perception of new content and contexts (Illeris, 2007:19, 117; Van Merriënboer & De Bruin, 2014:27).

Social constructivism describes learning as a process, involving more than mere attainment of new knowledge, which takes place among people (Mascolol & Fisher, 2005). Collaborative learning in the form of group work would therefore provide opportunities for social constructivist learning (Illeris, 2007:117; Jonassen et al., 2007:7; Mascolol & Fisher, 2005). From a social constructivist viewpoint, the discussions taking place between individuals in a group situation support deeper understanding of learning, add to student motivation, and create opportunities for self-regulation of learning through such interactions (Van Merriënboer & De Bruin, 2014:27). The role of peers is therefore significant when viewing the learning process from a social constructivist point of view (Mascolol & Fisher, 2005).

The pedagogy associated with constructivist and social constructivist approaches utilises the structuring of knowledge (Pritchard & Woollard, 2010:50) to support learning. Such pedagogy promotes teaching-learning strategies which build upon learners' prior learning (Pritchard & Woollard, 2010:47). In this study the prior learning of the participants, which was gained in their undergraduate studies, was essential to support the development of their further (and new) knowledge as part of their preparation as teachers. Learning taking place in authentic situations is important in social constructivism (Pritchard & Woollard, 2010:17), as well as in project-based learning (Mergendoller et al., 2006:9). Additionally, constructivist learning occurs in an "environmentally rich, problem-solving context that encourages the learner's investigation" (Pritchard & Woollard, 2010:47), such as that provided when project-based learning is utilised.

Social constructivist teaching-learning includes learners' willingness and ability to learn and the contexts and experiences which contribute thereto (Pritchard & Woollard, 2010:41). These elements are also deeply relevant in SDL (Knowles, 1975:15; Pilling-Cormick & Garrison, 2007:16). Teaching and learning experiences should be structured to support learner understanding and to facilitate deeper learning (Pritchard & Woollard, 2010:42).

The study aimed to understand how meaning is constructed within teacher preparation for CS education. The idea that reality (or multiple realities) is shaped by social interaction, was central to the research. Human perceptions, opinions and experiences play an important role in how people understand the world around them. Other aspects of social constructivism associated with SDL and PBL, such as reflection (Mascolol & Fisher, 2005), critical thinking, motivation, learner independence, real-world problem solving, peer-interaction (Pritchard & Woollard, 2010:45) and the inclusion of problem-based teaching-learning strategies (Van Merriënboer & De Bruin, 2014:27), also make this approach suitable for use in the current study.

3.3 RESEARCH DESIGN

For the purpose of this research, a qualitative case study was used (§1.6.1). Case study research aims to present a detailed account of a small number of occurrences or cases (Harling, 2002:2). Details regarding the design of the research used in this study were included and discussed in the subsequent sections.

Qualitative research aims to explore and understand the contexts and processes that influence human behaviour. In qualitative studies, emphasis is placed on the depth and quality of information (Nieuwenhuis, 2010a:51). It takes place in natural settings or contexts and utilises participants' views, experiences and opinions as essential data (Theron & Malindi, 2012:96).

The use of small samples to obtain rich, deep data on the phenomenon is acceptable in qualitative research (Morgan & Sklar, 2012:73) and therefore the small group of students selected as participants were considered to be adequate as long as sufficient detailed data was going to be collected. This study aimed to understand a human experience (the implementation of PBL as a teaching-learning strategy in the preparation of pre-service Consumer Studies teachers) by interpreting the viewpoints and opinions of the people who have experienced it.

Various other characteristics associated with qualitative research designs (Creswell, 2009:175-176; Morgan & Sklar, 2012:72-73), make it suitable for this study and have been tabulated in Table 3.1.

Table 3.1: Characteristics of qualitative research and implementation in this study

Qualitative research characteristics	Implementation of qualitative research characteristics into the design of this study
Data is collected in participants' natural setting or context	Data was collected at the university where participants studied and the research was embedded into their course module. The situation was uncontrived and allowed observation of participants and collecting of data without interference in their real-life context (§3.6).
Researcher is highly involved in data collection, analysis and interpretation	The researcher was directly involved in the research and was aware that she had to be cautious not to influence the research. Reflexivity was employed to recognise and address the potential influence that the researcher might have had on the research and the participants (§3.5).
Multiple sources are used to allow rich, deep descriptions	A variety of data sources were used, including interviews, questionnaires, project sheets, research journals, project designs, rubrics, observation sheets and more (§3.8). The perceptions, experiences and opinions of the participants were central in this study (§3.8.2 – §3.8.5).
Inductive analysis of data	Categories and themes emerged from analysing and working with the data, which were coded both *a priori* (from literature) as well as *a posteriori* (emerging from data analysis) (§3.9.2).
Interpretation is used to make meaning of data	Understanding and meaning was derived from collected data through interpretation thereof. Multiple views emerged from participants, but also from the observations of the researcher (§3.9.3). The study resulted in an expansive description of the phenomenon of Consumer Studies teacher preparation, and included various perspectives and elements that influenced the research (Chapter 4).

Source: Adapted from Creswell (2009:66)

Data that was collected in the actual context, in which the participants studied, was used. A wide variety of data collection methods was employed and the researcher played a central role

in data collection. The perceptions and experiences of the participants were fundamental in the study. A holistic description of real-life events (Merriam, 1998:29; Yin, 2008:4) was included as part of the research in the form of the phenomenon of Consumer Studies teacher preparation and the role of project-based learning therein to promote self-directed learning. In the next section, the selection of a case study as research method for this qualitative study is described.

3.4 RESEARCH METHOD

Case study research is considered a qualitative research method (Creswell, 2009:13; Morgan & Sklar, 2012:75; Nieuwenhuis, 2010b:75; Shen, 2009:22). Case studies are often used in educational research (Morgan & Sklar, 2012:75; Yin, 2008:4) and in complex environments (Gill, 2011:47). The next sections address case study as a research method in more detail.

3.4.1 Case studies as research method and its use in educational research

Qualitative case study research has been used in and linked to educational research in many ways, such as studies regarding programs, learners, policies and educators (Brown, 2008:8; Merriam, 1998:26; Shen, 2009:22). Instrumental or delimited case studies are most often used in educational research (Hamilton, 2011:2), though other types such as exploratory or descriptive case studies, have also been employed.

Yin (2008:18) defines a "research case study" as a method utilised to investigate a modern-day phenomenon in detail and within its real-life context. It is also often used where the boundaries between the phenomenon and its context are not clear. Further delineating and describing case study as a research method, Gill (2011:16-17) describes five key features of case study research. He explains that (1) such research is exploratory (§3.4.4), that (2) case studies rely greatly on the triangulation of the data (§3.10.3), and that (3) the researcher is actively involved in the research (§3.5). He stipulates that (4) conclusions are formed by the researcher interpreting the findings (§3.9.3) and that (5) a better understanding of the *process* (§3.4.4), rather than the generalisability of the findings regarding the phenomenon, should be the overall purpose of case study research. Gill's (2011) five features of case study research were adhered to as part of this study's research design and have been mentioned in more detail in the subsequent sections.

3.4.2 Boundaries for this case study research

Case study research focuses on key elements of a phenomenon (or phenomena) within a bounded unit (Hamilton, 2011:2; Merriam, 1998:27). Morgan and Sklar (2012:75) refer to

boundaries as the “defining feature” of case studies. The case that was investigated in this study was bounded by module specification. This study specifically researched the implementation of project-based learning for the preparation module of pre-service Consumer Studies teachers. Though the case in this study was bounded by module specification, aspects of teaching and learning involved in the teacher preparation module, such as time-management and planning, and how self-directed learning could be promoted as part thereof, shaped the research.

3.4.3 Benefits and difficulties associated with case studies

Shen (2009:24-26) points out some of the benefits associated with using case studies in research: the specificity of case studies often make them a preferable method to use in research with a very explicit focus. Case study research provides links to the *real world*, making it relevant to readers. Insights gained from case study research might be implemented to affect change or to generate action to address issues. Additionally, using different viewpoints to interpret data might open up new possibilities for research and allow others’ reinterpretation of the data.

Despite the various advantages, the following difficulties associated with case study research emerged from studying the works of Creswell (2009:193), De Vos (2005a:346), Nieuwenhuis (2010b:76), Shen (2009:25-27) and Yin (2008:14-15): case study findings are not generalisable and the lack of rigour is sometimes a concern. Additionally, researchers have to be careful not to aim to ascertain (only) chance connections between concepts. This last aspect might be especially relevant since few researchers are trained specifically in the skills (such as observing) required in case study research (Gill, 2011:21).

Though case studies sometimes lack rigour and are not generalisable, these difficulties are not insurmountable. Gill (2011:114) suggests that the impact of researcher bias or subjectivity could be lessened by focusing on the process of the research or concentrating on reporting the findings, rather than interpreting them. Lack of rigour might be countered by using a variety of methods to collect rich, deep data and by viewing and interpreting the data from various angles to create a better understanding of the phenomenon.

3.4.4 Suitability of case study method for this research study

Clarification of research aims is vital when designing research case studies (Gill, 2011:107) — in other words, stating what the researcher hopes to accomplish by doing the research. This case study served an exploratory purpose: the aim was to determine how project-based

learning could be implemented as a teaching-learning strategy in Consumer Studies teacher preparation to promote self-directed learning.

"How" research questions deal with exploring and explaining the connectedness or links between concepts (Yin, 2008:9), which directed the researcher to select an exploratory case study as research method. This research fits well within a case study method, as the research question was a *how* question, behaviour was not controlled, and the study focused on contemporary events. Direct observations and interviewing of participants were some of a variety of methods used to gather rich, deep data in this case study.

According to Gill (2011:17), the overall result of case study research should be a better understanding of the *process*, rather than generalisability of the findings regarding the phenomenon studied (§3.4.1). This suggestion from Gill was considered pertinent in this study, since the research question was focused on *how* project-based learning could be implemented in the pre-service Consumer Studies teacher preparation module, rather than just doing a clear-cut cause-and-effect case study. The sub-questions used to direct this study clearly indicated the importance of the *process* of the research, as it explored how skills developed, how project-based learning could be implemented, and how self-directed learning might have been promoted in the participants (§1.5).

A small number of participants were available to participate in the study and therefore other research methods were not considered to be suitable. Though the exploratory nature of this study reduces its generalisability, the findings and conclusions might be useful in further studies regarding Consumer Studies teacher preparation or in other settings offering the same type of teacher preparation qualification (§3.4.3 and §3.4.4).

The deep involvement of the researcher, as well as the context in which the research took place (embedded in the teacher preparation module), made the use of case study research an ideal method for this study.

3.4.5 The design used in this case study research

Various authors describe different types of case studies in both single and multiple form. To name a few: Baxter and Jack (2008:549-550) discuss single case studies, single case studies with embedded units and multiple case studies. Merriam (1998:34-37) further defines single case studies according to the study's disciplinary orientation (such as ethnographic, historical or psychological case studies) or the study's overall intent (e.g. being descriptive, interpretive or evaluative). In instances where one case is used to gain insights into a particular phenomenon,

Harling (2002:2) refers to it as an instrumental case study. In such cases, a question or a set of predetermined criteria is explored or investigated through the case study. Yin (2008:10) mentions the explorative value of case study research specifically in answering "how" research questions. The descriptions of Harling (2002:2) regarding instrumental case studies and Yin (2008:10) regarding exploratory case studies were most suited for this research design and were consequently utilised in three phases.

The three phases used in the study's design have been set out in Figure 3.1. The first phase involved the evaluation of the combined prior knowledge of the participants. PBL was introduced to the group during this phase and the group collectively developed a template for projects in CS. A "toolkit" containing articles and resources regarding the elements, structure requirements and qualities of PBL was made available to the pre-service teachers, and they were expected to identify and select additional sources of information regarding PBL and CS content.

During the second phase, each of the five participants utilised the template developed in the initial phase to design and develop their own topic-specific CS projects**.** To facilitate skills to implement and assess projects, as well as to broaden students' exposure to CS subject content (as described in the curriculum documents), five topic-specific projects were developed by participants individually. Participants implemented PBL knowledge and skills, as well as CS subject content and VWVD511-content (teacher preparation module) into their projects.

The third and final phase in the design of this study incorporated data and findings from both the first and second phases. During this final phase participants reflected on PBL as process and their subsequent CS subject content knowledge and SDL were deliberated. The group of participants collectively assessed their projects and presentations of their projects. The subsequent section of the report delves into the roles the researcher fulfilled in this study.

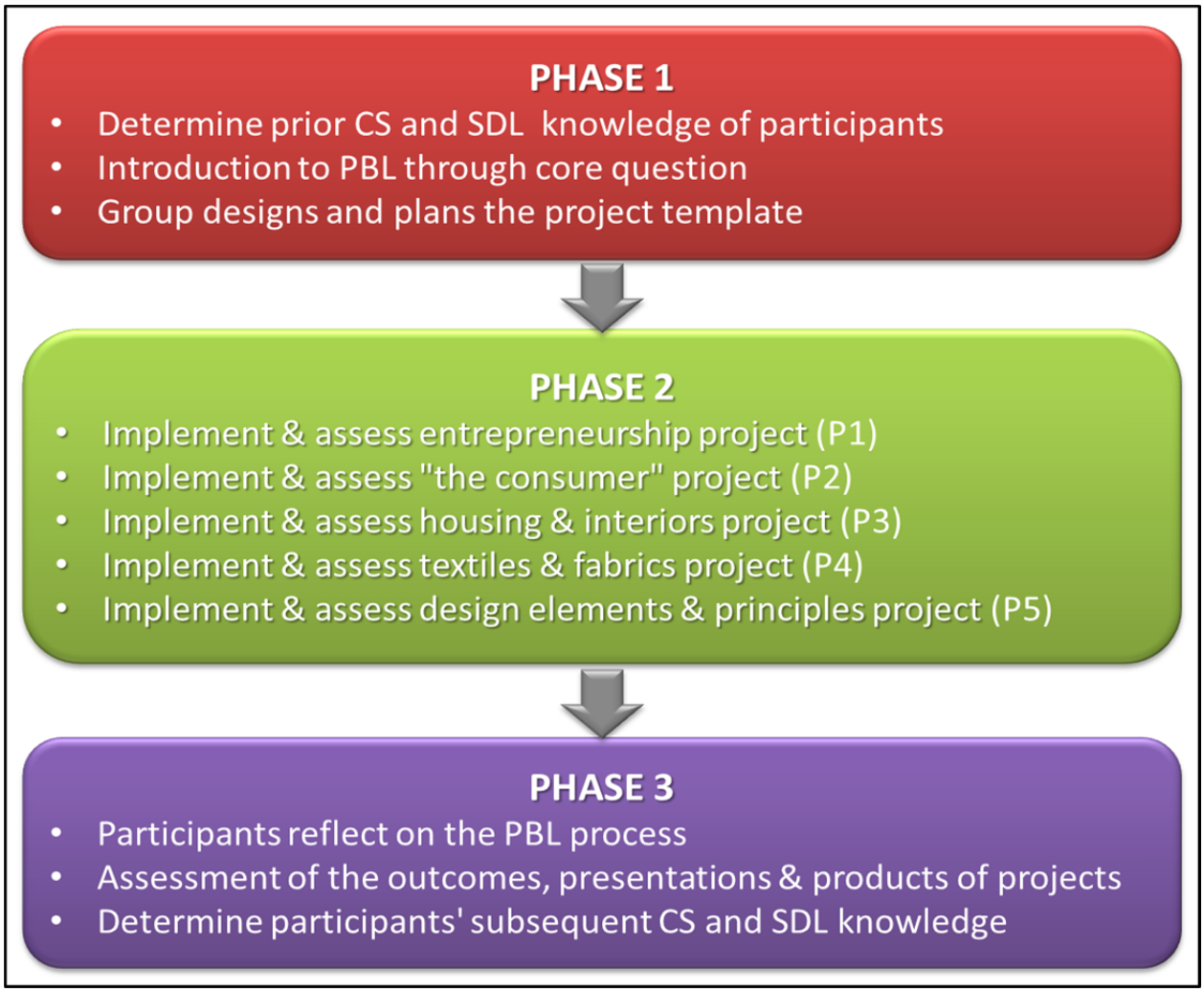

Figure 3.1: The three-phased design used for this case study research

3.5 RESEARCHER'S ROLE

The interpretative nature of qualitative research results in the researcher typically being closely involved with participants, which can give rise to various concerns, therefore requiring the researcher to be explicit about personal traits that might influence the research (Creswell, 2009:177). In case study research, the researcher is actively involved in the research process, but the importance of access to data overrules the issues of objectivity in such cases (Gill, 2011:16-17). Nieuwenhuis (2010b:79) emphasises the importance of the researcher as the "research instrument", as well as the researcher's role in recording data within the context that it happens. De Vos (2005b:363) labels this concept "reflexivity", which refers to the researcher's own understanding of his/her influence and perceptions or ideas regarding the research.

The researcher in this study is female, has broad experience in the field of CS education, and keenly believes in the potential opportunities CS holds for South African students and learners. The researcher acted as both observer (getting involved in the research, focus groups and data collection, but focusing on her role as observer in those situations) and facilitator (when interviewing participants and conducting focus group sessions). At the same time, she was searching for patterns of behaviours and comments, but attempted to not influence the interaction of participants (Nieuwenhuis, 2010c:85) — except when she had to keep them focused on the task, time-management and administrative aspects. She acted as facilitator (not as teacher) in the PBL process.

The context in which the research took place is closely related to the research site, which will be discussed in the next section.

3.6 RESEARCH SITE SELECTION

The university where this study was conducted is one of only five institutions in South Africa still preparing pre-service teachers for teaching the subject CS (§2.3.2.1). The site was selected for its contribution to CS teacher preparation and for its long tradition of training quality teachers (since 1919) (§1.6.3). The module (coded VWVD511), which serves as subject-specific preparation for CS teachers, is part of a program in the Faculty of Education Sciences offering a PGCE. The VWVD511-module is the only module offered in the faculty (and the university) that specifically focuses on the preparation of pre-service CS teachers.

Additionally, the Faculty of Education Sciences where the research was conducted has a strong research focus area in self-directed learning, making it an ideal setting for conducting this specific study with the aim to promote self-directed learning in participants.

3.7 PARTICIPANT SELECTION

All participants taking part in the study had to be pre-service CS teachers, since the case study was bounded by module specification (§3.4.2). Purposive convenience selection was conducted to include all PGCE-students with CS as one of their teaching subjects for 2013 (§1.6.4). Only full-time students could be accepted as participants, as frequent face-to-face interaction between the researcher and participants was required for the study. Only five full-time students registered for the module VWVD511 in 2013. This number of students is lower than was recorded for the same module in the past five years. Since the group was so small, no sampling was conducted and the population was invited to participate in the research.

All the participants were Afrikaans-speaking Caucasian females, between the ages of 23 and 26 years, and had a prior degree in an area related to CS subject content. Participants obtained their preceding qualifications (degrees) at four different universities and therefore had varied prior experiences regarding teaching-learning associated with tertiary education. Participants' prior qualifications and their school-based experience related to CS have been tabulated in Table 3.2. None of the participants had prior experience in teacher training for CS.

Table 3.2: Prior experiences of participants related to Consumer Studies

	School-based experiences related to Consumer Studies	Previously completed qualification related to Consumer Studies
P1	Consumer Studies	B. Consumer Sciences (Graphic Design)
P2	Hospitality Studies	B.Sc. Consumer Sciences
P3	Home Economics	B.Sc. Consumer Sciences
P4	Consumer Studies	B.Sc. Consumer Sciences (Economic Management)
P5	Hospitality Studies	B.A. Fashion Design

As such a small group of participants was available to work with, the decision was made to increase the frequency of data collection and to utilise a wider variety of data collection methods to ensure rich, deep data for the research. The next section explains the methods and techniques employed in this study to gather data.

3.8 METHODS OF DATA COLLECTION

The module VWVD511 is only offered during the first semester of the academic year — it is presented from February to the end of June. Careful planning had to be done to gain maximum data in the limited time available. Observations, interviews (individually and in focus groups) and documents (such as project sheets and reflective journals) were the main techniques and sources used for gathering data. Data sources and techniques used to collect data, have been grouped in Table 3.3 according to those supplied by individual participants, those supplied by the group of participants (collectively), and data generated by the researcher as part of the study.

In addition to the classification according to source, data was also grouped according to the phase of the project during which it was collected — namely the introduction phase, structuring phase, designing phase, presentation phase and reflection (Table 3.3). This was specifically done to indicate the alignment of the research process with the proposed steps of project-based learning identified from the literature (§2.5.3 and Table 2.1). References have also been included in the table to the specific addenda where the data sources can be located, for example, the "Self-reflection sheet on project work" is indicated as "CD doc. 5.11" and can be found on the CD accompanying this dissertation.

These techniques and sources (listed in Table 3.3) were intended to address each of the three specific research sub-questions. The research sub-questions are (§1.5):

(1) How can the use of project-based learning in a pre-service Consumer Studies teacher preparation module support the learning of subject content?

(2) How can project-based learning foster the development of skills to plan, design, implement and assess projects as part of pre-service Consumer Studies teacher preparation?

(3) How does the use of project-based learning in pre-service Consumer Studies teacher preparation promote self-directed learning?

The intended purpose for using each technique in this study (as summarised in Table 3.3) has been discussed in more detail in subsequent sections.

The collection of the data was checked and monitored at regular intervals to ensure that all data was received and catalogued and to follow up with participants on outstanding sections of data. All digital recordings were transcribed with a master set, and copies of the recordings and transcriptions (originals and two back-up copies) were stored in three separate locations. Hard copies of the collected data were filed systematically and scans of originals were kept with other back-ups of electronic data.

3.8.1 Observations

Advantages associated with observations as a data collection method include that the researcher has direct, personal experiences with the participants, observations can be noted as they occur (in context) and unusual or interesting aspects can be noted as part of the observation (Creswell, 2009:179). The researcher contributed to data collection by keeping **research field notes** pertaining to observations made, changes made to planned research questions, or adaptations made to the research schedule (Table 3.3). Both anecdotal (brief

Table 3.3: Sources and techniques used for gathering data

OBTAINED FROM	PHASE IN RESEARCH	MAIN SOURCES AND TECHNIQUES USED FOR GATHERING DATA	
INDIVIDUAL PARTICIPANTS	**Introduction**	Pre-module questionnaire with open-ended questions *(Add. D and CD doc. 3)*	(§3.8.3)
		Orientating letter to participants *(Add. C)*	(§4.3.1.1)
	Structuring	Time frame designed for execution of topic-specific project	(§3.8.5)
		Digitally recorded individual interview (1)	(§3.8.2)
		Project-design template completed for execution of own project	(§3.8.5)
		Weekly project sheets *(CD doc. 4)*	(§3.8.4)
	Designing	PBL essential elements checklist *(CD doc. 5.2)*	(§3.8.4)
		Digitally recorded individual interview (2)	(§3.8.2)
		Weekly project sheets *(CD doc. 4)*	(§3.8.4)
	Product & Presentation	Executed topic-specific project	(§3.8.4)
		Assessment strategy designed for own project	(§3.8.4)
		Own project presentation	(§3.8.5)
		Project-presentation audience feedback *(CD doc. 5.6)*	(§3.8.4)
		Post-module questionnaire with open-ended questions *(CD doc. 7)*	(§3.8.3)
	Reflection	Weekly personal reflective journal entries	(§3.8.4)
		Comprehensive individual reflective report regarding the whole project	(§3.8.4)
		Self-reflection sheet on project work *(CD doc. 5.11)*	(§3.8.4)
PARTICIPANTS AS A GROUP	**Structuring & Designing**	Timeframe designed for designing of project template *(Add. E)*	(§3.8.5)
		Project-design template developed by group *(CD doc. 6 and Add. G)*	(§3.8.5)
		Focus group sessions (x6)	(§3.8.2)
RESEARCHER	**Observation**	Research journal	(§3.8.1)
		Field notes regarding observations made during research	(§3.8.1)
	Formative assessment	Feedback and comments regarding the planned time frame developed by the group	(§3.8.6)
		Feedback and comments regarding the project-template developed by the group	(§3.8.6)
	Summative assessment	Results of two written tests	(§3.8.6)
		Assessment of completed projects *(CD doc. 5.1)*, presentations *(CD doc. 5.10)*, and assessment instruments used for their projects	(§3.8.6)

descriptions using key words) and running records (slightly more detailed notes describing the context as part of the observations) (Nieuwenhuis, 2010b:85) were kept.

3.8.2 Interviews

Interviews were conducted face-to-face during **individual sessions** and **focus group sessions**. A notable advantage of using interviews in this study was that the researcher could guide the direction of questioning, though allowances were made to include additional information resulting from alterations during the course of the interviews. Two disadvantages associated with interviews as data collection method are that the researcher's presence may influence participants' responses and that all participants are not equally adept at expressing themselves verbally (Creswell, 2009:179). Both these difficulties were faced in this study since interviews often had to be conducted in the office of the researcher, which could have been an intimidating setting to the participants. As the study progressed, it also became apparent that not all participants were able to verbalise their perceptions or opinions equally well.

Open-ended questions were used for individual interviews and focus group sessions with the intention of exploring the views, perceptions and experiences of participants. Six focus group sessions were conducted at regular intervals throughout the study (Table 3.3). The focus group sessions were planned around specific aspects relevant to the research questions, such as planning, time-management and securing resources. Individual interviews were conducted with each participant twice during the course of the study. Individual interviews were held with the intention to gain deeper insight into individual participants' experiences and perceptions without the influence of other participants, which might have happened during focus group sessions.

3.8.3 Questionnaires

Biographical data was gathered from participants as part of the "pre-module" questionnaire and was applied before the onset of the study. Mouton (2012:105) classifies self-administered structured questionnaires as an interview-type data collection method. A take-home **pre-module and post-module questionnaire** (Addendum D) with open-ended questions was completed by individual participants (CD docs 10.1 and 10.2 — summaries of completed questionnaires) (Table 3.3). The questionnaires were intended to gather data regarding participants' perceptions and knowledge of CS subject content, the preparation of CS teachers, learning strategies used in CS, as well as self-directed learning at the start of the module and after the completion thereof. It was envisioned that the content of the two questionnaires could be compared to investigate possible (if any) learning and insight gains.

Since a standardised instrument was not available to support the collection of the data required in this study, the researcher developed her own sets of open-ended questions for the questionnaires and the interviews (Addendum D and CD doc. 2).

3.8.4 Documents

Participants were required to complete several **documentation sheets** during the course of the study. Each participant was expected to complete and submit both a *Weekly project* sheet (Havenga & De Beer, 2013) (Addendum F), as well as a **personal reflective journal** entry on a weekly basis. Both these documents intended to collect data regarding participants' progress, perceptions and experiences during the development of their projects. The *Weekly project* sheets additionally collected specific data regarding the goal-setting, planning, resource management, organisational experiences and skills of participants, as well as details regarding difficulties they might have experienced as part of the project (CD doc. 4 — summary of completed sheets).

Each participant had to complete and submit a **PBL essential elements checklist** sheet (BIE, 2011a) (CD doc. 5.2) to evaluate the group's project template for alignment with essential elements required of project-based learning. The intended data gained from the completed checklists would give a reflection on how well participants understood and could judge the application of these PBL elements. Additionally, participants could use the checklist to self-assess their own projects before submission.

The **completed projects** of individual participants, in the form of electronic documents, served to gain insight into the implementation of CS subject content, as well as their implementation and application of project-based learning in their projects (Table 3.3 and Figure 3.1). Additionally, participants had to produce the **assessment strategy** they planned to use for their project. Both these requirements were included to gain data and insight into how participants understood and implemented VWVD511-module content knowledge into the production of the project assignments, as well as how they implemented knowledge of PBL into the designing of their own projects. Completed projects and assessment strategies were assessed using purposely designed rubrics (CD docs 5.1, 5.2 and 5.10), which were made available to participants in advance.

Each participant attending the project presentations completed a **Project presentation audience feedback** sheet (BIE, 2011b) (CD doc. 5.6), which is a form of peer assessment. Data collected from these sheets gave insight into participants' perceptions and opinions regarding each other's presentations and their understanding of what is expected in a

respectable presentation. Participants also used these feedback sheets to add detail to their individual project reflection reports.

The final individual **reflections** of participants provided insight into their opinions, feelings and perceptions regarding the PBL process, and their own learning and skills development during the process. Each participant had to compile a comprehensive reflection report as part of the assignment and had to complete a *Self-reflection sheet on project work* (BIE, 2011c) (CD doc. 5.11), which asked specific details as part of their reflections. These details pertained to the project's construction and to the participant's experience as part thereof.

3.8.5 Other data sources

During the planning phase of the project, participants **designed a time frame** (Addendum E) for the implementation of the PBL process as a group and thereafter each participant designed her own time frame for the execution of her topic-specific project (Table 3.3). The intention was to gain insight into participants' time management and planning skills as individuals and also collaboratively as a group. The group was required to **design a template** (CD doc. 6 and Addendum G) that could be used to plan, design and implement projects in CS education (Table 3.3). Data gained from this would be used to obtain insight into how participants understood, applied and implemented (new) knowledge regarding PBL and designing projects for project-based learning into their CS projects.

Participants' **project presentations** were used to collect data regarding their presentation skills, to get an overview of their project from their personal perspectives, how they structured content and their experiences of PBL as learning process. Field notes were kept of observations and perceptions made during the participants' presentations. The digital files (*Power Point*-presentations) which participants designed for their presentations were also kept as possible data sources.

3.8.6 Assessments

Records of all **assessments** of assignments, tests and work completed by participants were kept. Assessments included observations, evaluations, judgements and interpretations of produced work, and comparison thereof to expectations (rubrics) (CD docs 5.1, 5.4, 5.8 and 5.8). Data from these assessments were used to discern patterns or make meaning of participants' perceptions, learning and implementation of skills. Formative assessment was used at various stages in the project to give feedback to participants regarding their progress and development in the project. Summative assessment was employed to give a reflection of

participants' goal attainment in relation to the expected outcomes for both the research and the module.

3.9 DATA ANALYSIS AND INTERPRETATION

Data analysis refers to the segmentation of collected data into (smaller) sections, patterns, themes, or categories to make it more manageable (Mouton, 2012:108) — especially in the case of qualitative data that is usually rich in (multiple) meaning. De Vos (2005a:333) refers to data analysis as a process that brings order, structure and meaning to collected data, thereby making the data more useful. Careful planning of the data analysis process is therefore required to support the interpretation of the data.

Data analysis in qualitative research is iterative (Nieuwenhuis, 2010c:99), indicating that the processes of collecting, analysing and interpreting data does not have to be done in strict succession, but that it occurs intermingled and recurring. Noticing significant detail (or lack thereof), collecting data in relation to those details and reflecting upon it, are three elements that appear repeatedly during the iterative process of data analysis (Nieuwenhuis, 2010c:100).

In order to assist data analysis and interpretation, the data had to be prepared in a manner to support interpretation.

3.9.1 Preparation of data

Data collection had been scaffolded around the phases of the research in line with the phases distinguished from literature for scaffolding PBL (Figure 2.2 and §2.5.3), that is the planning phase, introduction phase, structuring phase, designing phase and presentation phase (Table 3.3). Additionally, some data collection took place continuously throughout the project with the intention that it might result in data that could be analysed and interpreted to reflect progression and development of aspects such as skills or learning.

All digital recordings were transcribed verbatim, and were checked by the researcher and a co-analyst to ensure accuracy. Collected data was clearly labelled according to the participant number (or group), the date it was gathered and the type of data collection method used (e.g. questionnaire or project sheet template).

A protracted process of memoing was embarked upon while getting to know the data (i.e. reading, re-reading and listening to data) and forming general impressions. These memos were kept together as part of the researcher's reflective journal to keep record of notions gained from

working through the data again. Any regularities or irregularities, general perceptions and ideas in the form of brief notes and short sentences, were noted in a structured manner while working through the data.

Since the researcher intended to use the ATLAS.ti™ software as a tool to support the analysis, data had to be prepared for use in this programme. This involved ensuring that all PDF-files were uploaded with text recognition included. Data was then considered to be ready to start with the analysis process.

3.9.2 Analysing data

This study was exploratory (§3.4.1 and §3.4.4) and emphasised the process of the research — therefore deductive analyses processes were employed by including some thematic codes which were developed (*a priori*) from the literature (Figure 2.3) as well as from the data itself (*a posteriori*). Content analysis was used to derive meaning from transcripts of interviews and focus group sessions, as well as from reflective journals, reflective reports of participants and other data collected using open-ended questions. Through deconstructing and analysing participants' perceptions, experiences, knowledge and other data collected as part of the research, the researcher attempted to understand how participants shaped or constructed their ideas regarding certain phenomena, such as time-management or metacognition.

ATLAS.ti™ software was used to support the analysis of data and the development of codes and themes. Using the ATLAS.ti™ software supported the systematic analyses of the data, saved time and probably increased the data validity (Friese, 2012:1). The NCT model described by Friese (2012:92) for developing codes through noticing things (N), collecting things (C) and thinking about things (T) found in the data was useful in this study.

The research questions in this study centred on three aspects, which led to the three major themes emerging from the coding. These were (1) Elaborating CS content by using PBL; (2) PBL experiences relevant to CS teacher preparation, and (3) factors contributing to the development of SDL in pre-service CS teachers. Figure 2.3 summarises the topics which were derived from the literature and from which *a priori* codes were developed (§2.6).

Additional concepts and content, which were deemed relevant to this study, emerged during data analysis and were allocated *a posteriori* codes. A list of these *a posteriori* codes and their explanations has been included on CD doc. 9, together with their alignment to the three main themes used in the data analysis (§3.9.2).

Not all data was coded with the Atlas.ti™ software, since tabulated data is sometimes problematic to process in some versions of the software. In instances where data was in tabulated form or where data was in the form of completed questionnaires or checklists, detailed memos and research notes were made. Data from the **Presentation Audience Feedback** sheets (CD doc. 5.6), **Self-reflection sheets** (per participant) on project work (CD doc. 5.11), as well as the PBL essential elements sheets completed by participants for the framework they developed (CD doc. 5.2), were tabulated and detailed memos were made thereof to gain insight into participants' experiences.

Once the initial rounds of coding were completed, ATLAS.ti™ software was used to systematically sort codes, helping to identify additional themes from the data. The process of coding and analysis with ATLAS.ti™ was repeated a few times to augment the process.

3.9.3 Interpreting data

In case studies the researcher decides which evidence is relevant and which is not, therefore conclusions in such studies are shaped by the researcher (Gill, 2011:17). Researchers should be careful to not generalise findings, but should rather focus on the understanding and insights gained from the *process* of the research (Gill, 2011:17) (Figure 1.1, §1.6.6, §3.4.1 and §3.4.4). Care was taken to not just interpret or summarise the data, emergent codes and themes, but to seek deeper meaning from it in an effort to understand why certain information was included in a specific way, as suggested by Nieuwenhuis (2010c:111), as well as how participants constructed their opinions and perceptions in relation to these themes.

3.10 TRUSTWORTHINESS AND VALIDITY

When doing qualitative research, the researcher should aim to collect data within the natural context of the participants without manipulating any component thereof (Nieuwenhuis, 2010b:78). Validity and trustworthiness were considered while a variety of data-gathering methods was applied. Techniques such as triangulation (Table 4.15) were also considered to address validity and trustworthiness of qualitative data.

3.10.1 Trustworthiness

Trustworthiness is frequently used as a term to describe the reliability of research (Kunkwenzu, 2007:56; Maree & Van Der Westhuizen, 2010:38). It implies that readers and other researchers can trust the findings of the research and that they have been assured of the quality of the methods and strategies employed in the research to give trustworthy results.

Data verification (Maree & Van Der Westhuizen, 2010:37) is especially important in qualitative research, where replication is mostly not a possibility, since qualitative studies often deal with human nature and interpretations. Though various data sources and collection methods were implemented to support methodological rigour, as recommended by De Vos (2005c:391) and Hamilton (2011:2), that alone might be insufficient. For this reason, Yin (2008:24) suggests critical conditions to support quality assurance in case study research, including internal and external validity.

3.10.2 Validity

Validity refers to the extent to which something measures what it is supposed to measure (Di Fabio & Maree, 2012:139; Pietersen & Maree, 2010:216), or more simply, to check the accuracy of the findings (Creswell, 2009:190). Additionally, validity in qualitative research denotes how much agreement exists between the interpretations and ideas of the researcher and those of the participants (Maree & Van Der Westhuizen, 2010:38). Analysed data and findings of this study were presented to participants for their feedback in order to validate the interpretation of concepts found in the data (i.e. member-checking).

The balancing of objective and subjective meanings and interpretations in case studies makes internal validity difficult in such research (Gill, 2011:154). The researcher endeavoured not to let her subjectivity impede on the research and requested input from her supervisors to support this goal. Open-ended questions used for interviews and focus group sessions were carefully screened and appraised by both study supervisors in an effort to support their validity for use in this study (§3.8.2 and §3.8.3).

Maree and Van Der Westhuizen (2010:37) suggest employing rich descriptions of participants, as well as the context in which the research was completed to support external validity in qualitative research. Gill (2011:154) notes that the external validity in case study research tends to be high, due to the observations and data collection taking place in the natural setting of the participants. The strategies suggested here were used in this research to support external validity (§3.6 and §3.7).

3.10.3 Other mechanisms employed to ensure quality assurance

Other strategies employed in this study to support the trustworthiness and validity of the findings included triangulation (§1.6.6.1) — described by Hamilton (2011:2) as the use of two or more forms of data collection and/or the use of two or more perspectives. The emphasis on triangulation of data to support the conclusions is perceived as a key feature of case study

research (Gill, 2011:16). A variety of different data sources and methods were used in this study to establish themes through confluence of data from different perspectives and to gain deeper understanding of phenomena. After multiple analyses by different co-analysts, triangulation techniques were employed to clarify the emerging meanings that participants constructed about the phenomena in the study (e.g. Table 4.15).

Additionally, reflexivity was used to describe possible bias (which the researcher brought to the study) to participants and supervisors before the start of the study (§3.5). Rich, thick descriptions were used to describe various aspects of the study to give a broad/holistic perspective. A variety of findings was included in the report to reflect various perspectives on the findings from and interpretation of the data. Participants were not "coached" in any way, but the researcher allowed participants' own views, perceptions and opinions to emerge from the data.

3.10.4 Generalisability issues in case studies

In case study research, rigour is especially important, as concerns may exist about the generalisability of the findings in such studies (Creswell, 2009:193; De Vos, 2005a:346; Nieuwenhuis, 2010b:76). Creswell (2009:193), however, emphasises the intent of qualitative studies as being particular to a specific context or site and that such studies are not meant to be generalised. Shen (2009:22) conforms to this idea when he maintains that the purpose of case studies should be representing the case and not the world. The study focused on the unit of the bounded case with emphasis on the significance of *process* of the research (§1.6.6, §3.4.1 and §3.4.3). Generalisability of results was therefore not considered a major issue in this study.

3.11 ANTICIPATED RESEARCH PROBLEMS

Fitting the research into the relatively full PGCE-program of the participants, without interfering with their other work, was a challenge. Fortunately, with such a small group it was relatively simple to reschedule meetings or to schedule additional contact sessions when required. A downward adjustment had to be made to the number of reports submitted by each participant to allow for the limited time they had available during the holidays and off-campus Work-Integrated Learning (WIL)[9] interval.

[9] Work Integrated Learning is a compulsory module as part of the preparation of pre-service teachers in South Africa (JET, 2012:20). Teacher-students gain experience at schools during specified times through the course of their training.

The researcher was initially concerned about the "research expectancy effect" (Mouton, 2012:106), since the number of participants was small and might have been susceptible to influence from her expectancies. However, the participants turned out to be highly independent with strong personal opinions and established convictions.

As the study progressed, the frequent non-response of a particular participant to requests for data documentation surfaced as a problem. This difficulty was addressed through constant, friendly reminders and providing the participant with a checklist to determine which documents was still outstanding. This last intervention was highly effective in encouraging a response and resulted in the particular participant submitting all outstanding documentation promptly. This intervention was approached with sensitivity in order to maintain high ethical standards as part of the study.

Section 3.12 explores in detail the ethical considerations that were applicable to this study.

3.12 ETHICAL ASPECTS OF THE RESEARCH

Permission was granted by the university's Ethics Committee to conduct this research under the umbrella of ethical approval granted for the project "Teaching and Learning Strategies to Promote Self-Directed Learning" with ethical approval number NWU-00010-13-A2 (Addendum A).

This study was conducted while bearing the four general ethical principles of the Human Sciences Research Council (HSRC, 2013) of South Africa in mind. These broad principles are (a) *respect and protection* of participants' privacy and welfare; (b) *transparency* and honesty in all aspects of the research process; (c) *scientific and academic professionalism* of the researcher at all times; and (d) *accountability* toward sponsors (where applicable), participants, other researchers and the greater community. These four general ethical principles, together with Creswell's (2009:88) five areas for ethical consideration, resulted in the contemplation of the several ethical issues during the planning and execution of this study.

In addition to the ethical issues described in §1.6.8, such as ethical clearance and consent forms completed by participants, the following were attended to:

Both the researcher and participants ought to benefit from the research. In a lecturer-student position, power could easily have been abused, which could have left students feeling intimidated. The researcher had to clearly and transparently describe the purpose of this study

to the participants. Contact with participants were kept informal, they were regularly informed about the valuable contributions they were making to the study and they had easy, direct access to the researcher (via *WhatsApp*, open office hours, *eFundi*[10] and email) if they experienced any problems. Issues surrounding assessment and module marks were addressed up front with the students in order to dispose of misconceptions. Pseudonyms were used to protect the identity of participants in all parts of the research report, including data analysis, interpretation, findings and conclusions.

3.13 SUMMARY

A qualitative case study design, viewed from a social constructivist position, was used in this research. The case study was exploratory and bounded by module specification (Consumer Studies teacher preparation module). The researcher was deeply involved in collecting, analysing and interpreting the data in an effort to address the research questions guiding this study. In line with the rich, deep descriptions required in qualitative research, the participants and research site, the various methods of data collection, and analysis and interpretation were described. The researcher was mindful of issues regarding the quality assurance typically associated with case study research, such as trustworthiness and validity. Generalisability of results in this study was not a concern as the primary focus was on the process of the research rather than only the findings. Ethical aspects of relevance to the study were considered to be fundamental and were adhered to through all phases of the research.

The next chapter addresses details regarding the results from the research and the discussion thereof.

[10] *eFundi* is the learning management server utilised by the university where the study was conducted.

CHAPTER 4

RESULTS AND DISCUSSION

4.1 INTRODUCTION

The purpose of this chapter is to present and discuss the results of this investigation. The main research question that guided this study was the following:

How can project-based learning be implemented in pre-service Consumer Studies teacher preparation to promote self-directed learning?

Participant narratives and examples from data have been included in the subsequent sections to highlight and support results and have been referenced as follows: (e.g.) AP**4:17**. Such references refer to the Atlas.ti^{TM} Primary [AP] document number (in the example it is AP document number **4**), and the specific paragraph number in the document (in this example paragraph **17**). A complete Atlas.ti^{TM} document bundle from the study has been included on the CD accompanying this report and is labelled CD doc. 1. When reference is made to P1, P2, P3, P4 or P5, these five references refer to Participants number one to five — the pseudonyms given to participants in the study. In cases where participant narrative is in the Afrikaans language, verbatim English translation follows such quotations.

Three themes emerged and were used to structure the discussion of results in this chapter. These three themes are (1) Elaborating CS content by using PBL; (2) PBL experiences relevant to CS teacher preparation, and (3) factors contributing to the development of SDL in pre-service CS teachers. Thematic codes emerged from the literature review (§2.6, Figure 2.3), and were utilised to develop *a priori codes* used in the data analyses. In addition, *a posteriori codes* also emerged from the data itself. Details about *a priori* codes have been tabulated in CD doc. 8 and details regarding *a posteriori codes* have been tabulated in CD doc. 9.

To facilitate the discussion of the results, the sections used in this discussion were delineated in Table 4.1, which specifies that three broad themes emerged. A discussion relating these results to the research questions that guided the study (§1.5), has been included in Chapter 5.

Table 4.1: The delineation of sections used for the results and discussion

THEME 1: Elaborating CS content by using PBL (§4.2)		
Sub-theme 1.1: Understanding the scope of CS subject content (§4.2.1)		
Sub-theme 1.2: Developing CS content knowledge (§4.2.2)	4.2.2.1	Developing knowledge regarding CS topics from projects
	4.2.2.2	Resources utilised for developing CS content
	4.2.2.3	Collaboration to develop CS subject content
THEME 2: PBL experiences relevant to CS teacher preparation (§4.3)		
Sub-theme 2.1: Participants' experiences regarding PBL in the preparation of pre-service CS teachers (§4.3.1)	4.3.1.1	Participants needed guidance in PBL
	4.3.1.2	Feedback provided by the facilitator and peers
	4.3.1.3	Participants' experiences regarding PBL
Sub-theme 2.2: Skills participants developed as part of PBL (§4.3.2)	4.3.2.1	Planning skills
	4.3.2.2	Time-management skills
	4.3.2.3	Collaboration skills
	4.3.2.4	Problem-solving and critical thinking skills
	4.3.2.5	Assessment skills
Sub-theme 2.3: Scaffolding and developing CS projects by applying PBL (§4.3.3)		
THEME 3: Factors contributing to the development of SDL in pre-service CS teachers (§4.4)		
Sub-theme 3.1: Cognitive factors contributing to SDL (§4.4.1)	4.4.1.1	Participants' understanding of the learning tasks
	4.4.1.2	Participants' metacognition
	4.4.1.3	Participants' beliefs about their own learning
Sub-theme 3.2: Affective factors contributing to SDL (§4.4.2)	4.4.2.1	Participants' attitudes toward their own learning
	4.4.2.2	Participants' motivation to learn
	4.4.2.3	The value participants placed on the learning task
Sub-theme 3.3: Control factors contributing to SDL (§4.4.3)	4.4.3.1	Control of self
	4.4.3.2	Control of the task
	4.4.3.3	Control of the learning environment

The next section presents and discusses results regarding 'Elaborating CS content by using PBL', which was the first broad theme that emerged.

4.2 THEME 1: ELABORATING CONSUMER STUDIES SUBJECT CONTENT BY USING PROJECT-BASED LEARNING

Consumer Studies subject content is an essential element in the preparation of pre-service CS teachers, as specialised subject-specific knowledge (§2.3.1) is indicated as one of the minimum requirements for teacher education qualifications in South Africa (NQF Act, 2011:8). Findings regarding CS subject content include participants' realisation that CS school content *differs* from their undergraduate learning content (§4.2.1), the scope of participants' knowledge of CS subject content (topics) (§4.2.1), as well as the development of participants' CS content knowledge (§4.2.2), and will be discussed in subsequent sections. Subject content prescribed in the curriculum documents for CS education is structured according to seven main topics (DBE, 2011:8). Though the direct translation for "topic" is "onderwerp" in this study (as is often found in practice), the word "tema" ("theme") was used instead by participants to delineate topics.

To facilitate the discussion of the results regarding Theme 1: 'Elaborating CS content by using PBL', the sub-themes used in this discussion were delineated in Table 4.2 (a duplication of a segment of Table 4.1).

Table 4.2: The delineation used for the results and discussion of Theme 1

THEME 1: Elaborating CS content by using PBL (§4.2)		
Sub-theme 1.1: Understanding the scope of CS subject content (§4.2.1)		
Sub-theme 1.2: Developing CS content knowledge (§4.2.2)	4.2.2.1	Developing knowledge regarding CS topics from projects
	4.2.2.2	Resources utilised for developing CS content
	4.2.2.3	Collaboration to develop CS subject content

4.2.1 Sub-theme 1.1: Understanding the scope of Consumer Studies subject content

Early in the study it became apparent that participants realised that there is a difference between CS subject content (as required by the CS curriculum for school learners) and undergraduate content studied as part of a Consumer Sciences (or related) degree. As is the case internationally, various names exist for tertiary courses related to the field in which Consumer Studies is situated in South Africa (see Table 1.1: "field"). Some institutions refer to it as *Consumer Sciences*, while others call it *Family and Consumer Sciences*. Consumer Sciences degrees prepare students for a wide range of professions, such as consumer consultants, clothing merchandisers, product developers, or quality managers (North-West University, 2014). Table 4.3 includes examples of quotes from participants indicating their realisation and understanding of this aspect. This finding might indicate that participants had expected CS school curriculum content to be more aligned with

what they learned in their undergraduate studies. It was thought that this awareness might prepare participants to approach teaching-learning in CS education from this (new) perspective, and in doing so, motivating them to increase their CS content knowledge in the teacher preparation module.

Table 4.3: Comments reflecting participants' realisation that CS school curriculum content differs from their undergraduate studies' content

Participant	Participants' comments about the difference between CS school content and undergraduate content
P5	*"… my goed wat ek gestudeer het ... dis eintlik heeltemal anders as wat die Verbruikersinhoud is ..." - [... the things I studied … is actually totally different from the content of Consumer Studies ...]* AP46:19
P2	*"… maar om vir skool Verbruikerswetenskappe, is heeltemal anders … so ek dink dit is nogals 'n groot verskil tussen my graad Verbruikerswetenskappe en dit wat jy leer om vir die kinders te leer en wat hulle self leer, is op 'n ander vlak wat ons dit geleer het." – […but to teach Consumer Studies on school level, is totally different … so I think there is a vast difference between my Consumer Sciences degree and that which you have to teach learners, as well as what they learn themselves – it is on a different level.]* AP54:13

In addition to dissimilarities between CS high school and undergraduate content, P2 also mentioned that teaching-learning for school learners is on a different level than teaching-learning at university (AP54:13).

This was deemed an important insight, especially for a student in a pre-service teacher course, as the National Qualifications Framework (NQF) of South Africa explicitly specifies levels on which teaching-learning should occur within the different teaching phases. The NQF provides a national framework of levels and standards for all qualifications and training to ensure comparable quality (Alexander & November, 2010:102). Consumer Studies is only offered in the Further Education and Training (FET) phase (aimed at learners of approximately 16-18 years of age), thus demanding that teaching-learning be pitched at NQF levels 2 to 4 (SAQA, 2000:20). Pre-service teachers should be enabled to structure teaching-learning experiences for learners within this framework and therefore at the correct level.

For teachers to be able to teach at the correct level they would however require a solid knowledge of subject-specific content. Participants' grasp of the scope of topics included in CS subject content, was limited at the start of the teacher preparation module, as indicated in their "pre-module" questionnaire (§3.8.3) answers. The "scope" in this discussion refers to participants' understanding of the complexity of the topics in CS education. All participants mentioned

"Clothing" as a key topic to be taught in CS, followed by "Food" (P1, P2, P3, and P4) and "Interiors" (P1, P3, P4). Only P4 mentioned "Textiles" and "Housing" as additional topics in CS education (CD doc. 3: Question 7). Of the seven teaching-learning topics specified as minimum content in the CS curriculum (DBE, 2011:8) (§2.3.1.1), participants did not mention the topic "Entrepreneurship", and "The consumer" only in connection to other topics. For example, P2 wrote (verbatim):

"Voedsel = wat die verbruiker se behoeftes is en hoe dit die heeltyd verander …" – [Food = what the needs of consumers are and how it changes all the time …] (CD doc. 3: Question 7)

This example illustrates that "Food" as topic is linked to "The consumer" as topic, but neither of these two topics were expanded upon much.

Though "Entrepreneurship" and "The consumer" are stand-alone topics, these topics also form the focus of CS education (§ 2.3.1.1). The consumer is the central concept that links all other content and topics in CS, underpinning curriculum cohesion and progression in the subject content (Umalusi, 2014:10, 13). The development of entrepreneurship is integral to small-scale production and marketing of quality products as part of the practical component of CS (DBE, 2011:9), and is also embedded in sub-topics within other topics. In addition, the development of entrepreneurial skills in CS is particularly relevant in the South African context, where unemployment is a significant problem (DBE, 2011:22; Umalusi, 2014:175). Participants' limited mention of these two topics is a cause for concern, since both are core to CS education and teachers in the subject need to grasp that (Koekemoer & Booyse, 2013:517). One possible reason for participants not mentioning these topics as separate units might be that the topics were not dealt with in isolation or were termed differently in their undergraduate Consumer Sciences courses.

Reponses in the "pre-module" questionnaire (CD doc. 3: Question 7) suggested that the scope of participants' CS content knowledge at the start of the teacher preparation module was inadequate for them to teach all CS content topics with confidence[11] and that additional content needed to be obtained by these students as part of the teacher preparation module. Despite this initial concern, the findings in the study nonetheless indicated that participants' knowledge about the scope of CS subject content improved (§4.2.2.1) during the course of the research, as was evident from their responses in the "post-module" questionnaires (CD doc. 7).

[11] A Consumer Sciences degree prepares students for a wide range of professions and is not specifically aimed at providing CS education knowledge as specified by the CAPS.

4.2.2 Sub-theme 1.2: Developing Consumer Studies content knowledge

The following sections describe findings related to the development and expansion of participants' CS subject content knowledge. Subsequent sections deal specifically with findings that participants believed that their knowledge of CS subject content (topics) increased (§4.2.2.1), the resources participants utilised to develop their CS content knowledge (§4.2.2.2), as well as collaborative efforts utilised by participants to develop their CS content knowledge (§4.2.2.3).

4.2.2.1 Developing knowledge regarding Consumer Studies topics from projects

All participants believed their knowledge regarding specific CS topics increased and this was particularly attributed to the projects they had to develop [P1; P2; P5 and Table 4.4 (P3; P4)]. Table 4.4 contains some quotes reflecting P3's and P4's beliefs that their learning of subject content knowledge developed (or increased) as a consequence of the PBL projects.

Table 4.4: Examples of quotes reflecting participants' beliefs about subject knowledge gained from their topic-specific projects

Participant	Participants' beliefs about subject knowledge gained from their own topic-specific projects
P3	*"… ek moes nou meer in diepte gaan lees oor wat presies dit behels … maar nou weet ek spesifiek wat moet jy in ag neem …" – […I needed to read in depth to determine what it entails … but now I know precisely what one needs to take into consideration …]* AP24:25
	"… ek het omtrent alles rondom behuising geleer… maar ek beskou myself nou as 'n deskundige op die gebied van behuising." – […I learned almost everything about housing ... I now consider myself an expert on housing.] AP27:3
P4	*"… definitief weer bietjie my geheue verfris, … dit wat ons geleer het voorheen in die graad wat ek gedoen het, was baie in diepte gewees, maar mens kom nie agter wat jy vergeet het …" – […definitely refreshed my memory again, because my undergraduate studies were in depth, but one does do not realise what one has forgotten…]* AP35:19
	"Ek weet verseker baie meer oor my spesifieke tema …" – [I definitely know much more regarding my specific topic …] AP41:2
	"Dit het my gehelp om die tema se vakinhoud beter te verstaan. Ek kan met eerlikheid sê dat die projek beslis 'n verskil gemaak het in die kennis wat ek gedra het oor die tema tekstielvesel en tekstielstowwe." – [It helped me to better understand the topic's subject content. I can honestly say that the project definitely made a difference in the knowledge I had regarding textile fibres and fabrics.] AP57:2

These participants felt that they had a deeper understanding regarding the content of their particular CS topic and its scope, which is in line with Bell's (2010:39) comment that learners learn deeper and understand learning content better when applying PBL. Participants 3 and 4 felt that the learning in the project refreshed their memories and that they even considered themselves as

'experts' on their topics after the completion of their topic-specific CS projects (Table 4.4). This increase in CS knowledge was seen as positive, especially as the content which CS teachers have to be able to teach, was found to be broad and moderately deep (§2.3.1.2), requiring significant subject-specific knowledge from its subject teachers.

Participant 3 felt that the summaries prepared by each participant on their own topics helped her to brush up on her CS subject content knowledge. In addition, P5 stated explicitly that she had learned content knowledge about topics that she did not know before:

"... wat ek glad nie van weet nie, weet ek nou ... baie meer as wat ek geweet het." – [… now I know ... much more than I did before.] (AP46:17)

Apart from developing and learning CS subject content, participants additionally mentioned other notable elements related to the development of their CS content knowledge. Results indicated that most participants were well aware of the dynamic nature of CS subject content (§2.3.1.2), as reflected in this quote from P1:

"… en dit is nie net 'n ding wat ek vir hulle kan wys nie en daarso, en dit verander en daar is heeltyd soos ander goeters wat 'n rol speel …" – […and it isn't just a thing which I can show them and there it is, and it changes and there are constantly other things which influence it …] P1 (AP2:79)

In an effort to address the dynamic aspect of CS content, some participants (P1, P2 and P3) mentioned that continued learning would be required of them if they wanted to keep up-to-date with such changes in CS content. This relates to Kunkwenzu's (2007:178) opinion that pre-service CS teachers should be prepared for the notion that **teaching is a lifelong process of learning for the teacher**. Table 4.5 includes examples of quotes that reflect participants' realisation that lifelong, continued learning would be required of CS teachers.

Table 4.5: Examples indicating participants' realisation of the need for lifelong learning for CS teachers

Participant	Participants' comments indicating a need for lifelong learning
P1	*"... dit moet nie die eerste keer wees wat ons daarna kyk nie en ook nie die laaste keer nie ..." – [it should not be the first nor the last time we review it …]* AP3:78
P4	"*... nooit regtig ophou leer nie, om elke dag, ... refresh in jou brein ..." – [never really stop learning, to every day … refresh your brain …]* AP2:64
P5	*"... ek dink ook om al hierdie goed heeltyd te herhaal en weer daarna te gaan kyk en jy gaan dit gebruik wanneer jy skoolgee ..." – […I think to keep on repeating these things and to review it again and you will use it when teaching …]* AP3:79

The realisation by participants of the need for continued, lifelong learning in a dynamic subject such as CS, was perceived as significant and it was anticipated that this realisation might further motivate the participants to learn in the teacher preparation module (§4.4.2.2). This links with the requirements stated for CS teacher preparation (§2.3.1) that CS teachers should constantly learn and explore to be able to offer learners high-quality education and that lifelong learning would be required of them (§2.3.1.2).

4.2.2.2 Resources utilised for developing Consumer Studies content

A prominent trend was identified in the data about the resources participants utilised to develop their CS subject content knowledge. It was found that all participants consulted the CAPS (§2.3.1.1) as primary document to delineate the specific topics for their projects, after which they all used the Internet (i.e. *Google*) as preferred resource to gain information on their topics, as reflected in this quote from P3:

"… ek het na die CAPS gaan kyk … en van daar af het ek ge-Google en dan … van my universiteitshandboeke begin gebruik …" – [… I consulted the CAPS … and from there I googled and then … I started using my university textbooks…] (AP1:38)

All the participants mentioned utilising prior knowledge (gained during their undergraduate studies) as a source of content topic information (P1, P2, P3, P4 and P5). Textbooks, newspaper articles, *Pinterest*® and "other books" were also consulted for information regarding the specific topics (CD doc. 4).

The finding that participants utilised the CS curriculum documents (CAPS) to orientate their research for their projects was considered positive, since it implied participants' grasp of the teacher preparation module (VWVD511) content. The module underscores the importance of teachers using the CAPS document to scaffold learning experiences for learners (Reitsma & Koekemoer, 2012:5, 31). Participants' use of *Google* to initiate their search for information on topics reflect an international trend where most students use *Google* as their starting point for finding information (Rowlands, Nicholas, Williams, Huntington, Fieldhouse, Gunter, Withey, Jamali, Dobrowolski & Tenopir, 2008:292).

It was conceivable that participants would realise that their undergraduate learning content might be a relevant source of information. This result should, however, not be considered in isolation, but should be explored in conjunction with participants' earlier realisation that CS school education differs from their undergraduate content (§4.2.1).

4.2.2.3 Collaboration to develop Consumer Studies subject content

Participants' collaboration in the acquiring and utilisation of sources to develop their subject content was also significant. Participant 3, for example, mentioned how she and P5 swopped sources, which they found on *Prezi.com*:

"… byvoorbeeld vertel van Prezi en uhm, toe het ons ook so met mekaar inligting uitgeruil van Prezi …" – […for example told me about Prezi and uhm, then we also traded information from Prezi …] (AP2:42).

Other examples of collaboration, which emerged, include that participants asked each other for direction, ran ideas past each other, and discussed implementation strategies with each other. Exchanging ideas during focus group sessions were also mentioned repeatedly as being useful to participants for gaining insight into how they should progress or how they could utilise resources in the implementation of topic-specific projects, as shown in this quote from P2:

"… nou dat ek gehoor het wat almal gedoen het, nou het my kop ook begin werk …" – […now that I have heard what everybody has done, now I have also started thinking …] (AP1:68)

Collaboration skills are vital in PBL (Hixson et al., 2012:8) (§2.5.2.4) and is an important 21st century skill (Bell, 2010:39) required of CS teachers (Swafford & Dainty, 2010:209) (§2.3.1.2). The emergent collaboration between participants to develop their CS subject content knowledge in the PBL project was therefore deemed meaningful.

Within Theme 1 ('Elaborating CS content by using PBL') results show that participants realised that CS subject content on school level differs from Consumer Science undergraduate learning content, which led to their recognition of the need to continually update their subject content knowledge — supporting literature referring to the dynamic characteristic of CS. It also emerged that though participants had a limited understanding of the scope of content topics covered in the curriculum for CS at the start of the teacher preparation module, the scope of their subject content knowledge developed particularly as part of projects completed in PBL. Project-based learning supported participants' identification and selection of own resources, as well as collaboration with other group members.

Note that research sub-question (1) concerning the role of PBL to support the learning of CS subject content, which relates to the findings of the theme 'Elaborating CS content by using PBL', has been addressed in Section 5.3.1. The next section describes and discusses results about 'PBL experiences relevant to CS teacher preparation', which was the second broad theme, which emerged from the data.

4.3 THEME 2: PROJECT-BASED LEARNING EXPERIENCES RELEVANT TO CONSUMER STUDIES TEACHER PREPARATION

A number of PBL aspects, which are considered to be relevant to CS teacher preparation, emerged from the data analysis and were subsequently grouped into three sub-themes, namely participants' experiences regarding PBL, the skills participants developed as part of PBL, and the scaffolding of CS projects for PBL. The perceptions of participants regarding PBL as a teaching-learning strategy used in their pre-service teacher preparation is noteworthy if the strategy is to be utilised in such modules in the future. Fostering skills as part of PBL was one of the main aims of this study (§1.5, sub-question (1)). The appropriate scaffolding of projects is beneficial for CS teachers to comprehend if they are going to use PBL as a teaching-learning strategy.

To facilitate the discussion of the results regarding Theme 2: ('PBL experiences relevant to CS teacher preparation'), the three sub-themes used in this discussion were delineated in Table 4.6 (a repetition of a segment from Table 4.1).

Table 4.6: The delineation used for the results and discussion of Theme 2

THEME 2: PBL experiences relevant to CS teacher preparation (§4.3)		
Sub-theme 2.1: Participants' experiences regarding PBL in the preparation of pre-service CS teachers (§4.3.1)	4.3.1.1	Participants needed guidance in PBL
	4.3.1.2	Feedback provided by the facilitator and peers
	4.3.1.3	Participants' experiences regarding PBL
Sub-theme 2.2: Skills participants developed as part of PBL (§4.3.2)	4.3.2.1	Planning skills
	4.3.2.2	Time-management skills
	4.3.2.3	Collaboration skills
	4.3.2.4	Problem-solving and critical thinking skills
	4.3.2.5	Assessment skills
Sub-theme 2.3: Scaffolding and developing CS projects by applying PBL (§4.3.3)		

4.3.1 Sub-theme 2.1: Participants' experiences regarding project-based learning in the preparation of pre-service Consumer Studies teachers

It was necessary to consider how participants in this study experienced PBL as a teaching-learning strategy. Their perceptions and experiences could be utilised to identify possible areas of improvement or excellence for PBL in the teacher preparation module.

4.3.1.1 Participants needed guidance in project-based learning

Initially, most of the participants expressed a need for further guidance and clarification of the PBL approach to the module, especially regarding the scope of the work and how to decide what to do. This might be attributed to the novelty of the student-centred, self-directed learning approach utilised in the PBL process and participants not being used to having so much control over their own learning.

To provide guidance regarding the scope of their projects and to support the development of their knowledge and understanding of PBL, participants were given access to a PBL "Toolkit" on the VWVD-module's learning management system (*eFundi*), which contained research articles and documents regarding the elements, structure, requirements and qualities of PBL. The toolkit amongst others included a rough excerpt from the literature review of this study, which provided participants with guidance regarding the preferred structuring of projects in CS. The original *Power Point*-presentation, which was used to introduce the module structure to the students at the start of their PGCE, was also included in the toolkit and this provided guidance to the participants as they could refer back to the presentation to help orientate them in the novel approach to teaching and learning. The CD that is part of this report provides a summary and examples of the documents (excluding research articles) that were eventually included in the toolkit, as well as a brief explanation of the guidance intended by each (CD docs 5.1 to 5.11).

To provide additional guidance, a detailed discussion including a question-and-answer session, was held with the participants as a group regarding expectations in the module (researcher's field notes, dated 21/02/2013). A sheet with written details, as well as assessment weighting for the PBL project (Addendum C), was also distributed to participants. The additional guidance seemed to address their need for clarification, as is evident from this quote from P4:

"die papier wat aan ons gegee is waar die punte aangedui word voel ek meer gerus oor wat verwag word van my" – [the page given to us with the mark allocations indicated made me feel more reassured about what was expected of me] (AP42:2)

These results are in line with findings in literature, which indicate that students require additional guidance when PBL is introduced for the first time (Bradley-Levine et al., 2010:5; Grant, 2002:2), especially when aiming to offset a more self-directed learning approach with guided instruction. Such support could be provided in the form of providing resources, helping learners to develop a positive attitude toward learning and SDL, or offering continuous feedback to support learning and development of skills (Brockett & Hiemstra, 1991:109).

4.3.1.2 Feedback provided by facilitator and peers

Four participants relied on feedback from the module facilitator to foster reassurance regarding the project (P1, P3, P4 and P5), as reflected in the following quote from P5:

"… nadat ek met Mev. gepraat het Maandag voel ek baie beter ... ek het sommer baie meer en beter idees …" – […after I spoke to you on Monday I felt much better … I have many more and better ideas …] (AP48:3)

The need for feedback implies that participants understood and wanted to regulate or control their own thinking processes (metacognition) and that they realised that feedback would result in reassurance. Feedback from the facilitator adds to learners' metacognition, supports the development of SDL, and contributes to motivation and achievement in learning (Mok & Lung, 2005:21). This links to Brockett's and Hiemstra's (1991:117) description of facilitator support providing reassurance in learners and thereby developing SDL.

Participants also received feedback from their peers, specifically through the use of the Project Presentation Audience Feedback sheet (BIE, 2011b, CD doc. 5.6). This is a simple sheet with four questions, which audience members (i.e. peers) completed during/after each participant presented her project. The completed sheets were given to the presenting participant to give them feedback regarding their presentation, as well as to enable them to possibly add some of these details in their final reflection report.

These results relate to literature, which suggests the inclusion of formative feedback from both facilitators and peers to make learning more meaningful in PBL (Larmer & Mergendoller, 2012:3). Feedback provides learners with opportunities to learn from their experiences and to implement suggestions and changes into their future tasks (BIE, 2012a:5; Zimmerman, 2010:60). Furthermore, literature states that feedback from peers contribute to motivation of learners to learn and do well, as they do not want to disappoint their friends (Bell, 2010:40).

4.3.1.3 Participants' experiences regarding project-based learning

It emerged from the data that almost all the participants held a positive view towards PBL, especially towards the end of the process. To simplify text, quotes have been paraphrased and abbreviated in Table 4.7 to indicate participants' views regarding PBL as a teaching-learning strategy.

Four of the five participants (P1, P3, P4 and P5) experienced PBL as positive with several advantages. Positive attributes included that the goal of the PBL process was clear, that learning was directly linked to the application thereof in real-life examples, that the content was organised in

a useful structure, and that participants thought abundant learning was included in the teaching-learning strategy (Table 4.7). Project-based learning was perceived as more enjoyable than other modes of delivery in the PGCE-programme, with participants experiencing PBL as interesting, challenging and exciting. Both P1 and P4 remarked that PBL resulted in their own personal growth. This was a substantial claim and worth mentioning as part of the results.

Table 4.7: Participants' views regarding project-based learning

Participant	Views and perceptions regarding PBL
P1, P3, P4	*"…wat lekker in hierdie vak is, is dat daar 'n doel is …" […what was nice in this subject, is that there is a goal …]* (AP4:19)
P1, P3, P4, P5	*"… maar met die projek moet ek presies gaan dink hoe moet ek ook my projek aan een sit …" – […but with the project I have to think precisely how I have to compile my project …]* (AP4:27)
P3	*"… dis net vir my meer georden ..." – […I just find it to be more organised …]* (AP23:31)
P4	*"Ek het al tot dusver baie uit die projek geleer." [I have thus far learned a lot from the project.]* (AP39:3)
P3	*"… dis die enigste ... aspek in NGOS wat ek geniet nog sover …" – […it is the only … aspect in PGCE that I am enjoying thus far …]* (AP23:29)
P1, P3	*"… ek vind dit interessant, dit is 'n uitdaging vir my om hierdie projek te kan doen …" - […I find it interesting, it is a challenge for me to be able to do this project …]* (AP4:3)
P3, P4	*"… ek is veral opgewonde om 'n projek te ontwerp wat van so aard is …" – […I am especially excited to design a project of this nature …]* (AP27:3)

These results are aligned with findings from literature that students prefer PBL to other types of teaching-learning strategies (Byrne, 2001:326; Thomas, 2000:34; Zhou & Lee, 2009:39). Also, it resonates with literature which states that PBL should present a challenge to participants, making their learning interesting and linking their learning to real-life situations (Larmer & Mergendoller, 2012:2). The participants' experience of PBL as having clear goals, being well-structured and offering learning opportunities, additionally relate well to the preferred scaffolding for PBL identified in this study (§2.5.3.1 and Table 2.1).

A single participant conversely viewed PBL as complex and difficult to get started on:

"… in hierdie vak voel dit vir my alles is 'n mengelmoes, so ek weet nie waar om te vat en waar om te los nie." – […in this module everything feels mixed up, and therefore I don't know where to start or where to carry on.] (AP4:12)

This same participant experienced difficulties with time-management and personal organisational skills (§4.3.2.2 and §4.4.3.1) during the PBL process, which might partially explain her adverse perception regarding PBL. The importance of providing structured guidance to students in a PBL environment (§4.3.1.1) is therefore highlighted. This result also indicates the need to identify students who are not achieving the goals of PBL early in the process through formative assessment in order to support them in the atypical learning role required of learners in PBL (BIE, 2012a:7-8) (§2.5.1.2).

Not only did PBL foster a positive learning experience for most of the participants, but it also supported the development of various skills.

4.3.2 Sub-theme 2.2: Skills participants developed as part of project-based learning

It emerged that participants developed several skills as part of the PBL process. *A priori* codes (Figure 2.3 and §2.6), based on thematic codes identified from literature, were utilised in the data analysis. Evidence was found regarding the development of participants' (1) planning skills, (2) time-management skills, (3) collaboration, (4) problem-solving and critical thinking skills, and (5) assessment skills, which are discussed in subsequent sections.

4.3.2.1 Planning skills

Participants were asked to name the single skill which they thought they had developed most during PBL. Their responses have been listed below and explicitly indicate their personal perceptions regarding their own skills development in PBL:

P1: "Organisering." – [Organising.] (AP6:160)
P2: "Dissipline, ek kom daarby uit." – [Discipline – I get things done.] (AP6:161)
P3: "Beplanning." – [Planning.] (AP6:159)
P4: "Tydsbestuur." – [Time-management.] (AP6:158)
P5: "Beplanning." – [Planning.] (AP6:164)

Both P3 and P5 thought that their planning skills had increased the most. Organisational skills (as mentioned by P1) are closely associated with planning skills, as is time-management (mentioned by P4). Participant 1 and P4 also believed that their planning skills improved as a result of the PBL process. The structured approach participants used in the identification, handling and sharing of resources (§4.4.2.2), also reflects planning skills.

Planning skills are crucial in CS education — both for teachers and as part of the subject content to be taught to learners. Consumer Studies teachers are required to have efficient planning skills to be able to organise and manage all aspects surrounding the subject (§2.3.1.1), such as teaching plans, as well as time, infrastructure, equipment and finances in the subject (DBE, 2011:9, 17). The participants' belief that their planning skills developed as part of PBL, was therefore believed to be constructive.

4.3.2.2 Time-management skills

The CS curriculum sets out in detail the importance of time-management in the subject (DBE, 2011:9). Time-management is therefore a skill that ought to be developed in pre-service CS teachers.

The group drew up a time frame (Addendum E) to assist participants in managing their time in the PBL process efficiently. The resultant time frame was simple but clear, with specific goals to be attained by the group (as a unit) in each week. Time-management skills of participants during the development of the topic-specific projects varied. Participant 3 and P4 worked according to strict schedules, both voicing disappointment when they had not adhered to their planned time frames, as reflected in the following quote from P3:

"… ek het byvoorbeeld te veel tyd aan onnodige dele, wat nie baie tyd moes duur nie, bestee en dit het gemaak dat ek minder tyd gehad het om tyd aan belangriker aspekte te spandeer …" – […for example, I spent too much time on unnecessary parts, which should not have taken much time, and that resulted in me having less time to spend on more important aspects …] (AP56:4)

In contrast, P5 and P1 both mentioned that they would have liked to manage their time better, implying that they perceived their time-management skills as inadequate, but that it could be improved. Participant 5 stated:

"Ek wens ek het my tyd beter bestuur …" – [I wish I have managed my time better …] (AP47:5)

One particular participant's lack of time-management skills and her procrastination was a source of concern for the researcher. This participant was procrastinating from the start of the project and had to be reminded to submit outstanding documentation on occasion (researcher's field notes, dated 5/03/2013). Almost to the conclusion of the project, the participant continued the same pattern of poor time-management skills.

4.3.2.3 Collaboration skills

Since the group of participants was small (only five students) and came from four different tertiary institutions, none of them knew each other before the start of their PGCE-course (§3.7). The development of collaboration skills within the group might therefore have been expected to be problematic. Consequently, the remarkable increase in collaboration between participants in the group from the beginning to the end of the semester was an unexpected result. Though evidence thereof was found throughout the data, the increase in collaboration is most evident from quotes taken from two participants' weekly project sheets (P3 & P5, CD doc. 4: Question 6) over the course of the project, which has been tabulated in Table 4.8.

Table 4.8: Quotes from two participants demonstrating progressive collaboration within the group

Progression of comments over a few weeks in the PBL process				
P3	*"Ons as groep kom redelik goed oor die weg."– [As a group we get along reasonably well.]*	*"Ons het redelik goed gewerk saam as groep. … Ons ruil al met mekaar inligting uit en gee vir mekaar idees ..." – [We've worked together reasonably well as a group. … We are already sharing information and ideas ...]*	*"… werk ons groep nogal rêrig lekker saam en indien iemand verskil van die groep het ons genoeg respek vir mekaar om te luister na die rede daarvoor." – [… our group functions really well and if somebody disagrees with the group, we have enough respect for each other to listen to the reason for it.]*	*"Die groep motiveer mekaar tans sodat ons kan klaarkry."– [The group motivates each other at present, so we can finish.]*
P5	*"Ons groep is redelik interaktief en deel alle inligting wat relevant is teenoor die temas asook die PBL." – [Our group is relatively interactive and share all information relevant to the topics as well as PBL.]*	*"Ons as groep is baie interaktief, ons deel als met mekaar en help mekaar met als …" – [As a group we are very interactive, we share everything with each other and help each other with everything …]*	*"Ons groep werk geweldig goed saam en ons help mekaar met alles, al gaan dit nie oor die projek, herinner ons mekaar oor als wat NGOS betref." – [Our group works incredibly well together and we help each other with everything, even if it is not about the project, we remind each other regarding everything about the PGCE.]*	*"Ons as 'n groep kommunikeer ten alle tye oor enige probleme wat enige een van ons ervaar." – [As a group we communicate at all times about any problems that any one of us is experiencing.]*

From these quotes, the increase in the level of collaboration between group members is clear: from the tentative 'getting along reasonably well' (P5) to the members 'motivating each other' (P3) and 'communicating at all times about any problems' (P5). Collaboration also expanded from working together solely on the PBL project within the VWVD511-module, to collaborating regarding 'everything about the PGCE' (the whole teaching qualification — way outside the scope of the VWVD511 teacher preparation module).

Collaboration between group members also included the sharing of resources (§4.2.2.2), as shown in this example from P5's weekly journal:

"websites het ek gekry by x wat sy gedink het sal my help" – [websites I got from x which she thought might be useful to me] (AP53:4)

Additionally, participants collaborated to help each other to understand the work, share ideas and support incorporation of subject content into projects (P1, P2, P3, P4 and P5).

Furthermore, another life skill emerged, namely appreciating others' perceptions and opinions (P1). Both P3 and P4 remarked that different people might have different perspectives regarding topic content, as reflected by this quote from P3:

"Dit is verder interessant om te sien hoe elkeen 'n ander perspektief op 'n saak het." – [It is also interesting to see how each person has a different perspective regarding an issue.] (AP56:4)

Valuing others' opinions is a beneficial life skill, as well as an important insight to have in CS education and relates to literature that learners learning to value other's perspectives, is one of the benefits of PBL (Mitchell et al., 2009:340) (§2.5.1.3).

The results indicate that collaboration skills in the group increased from the start of the module to the end thereof. Collaboration included the sharing of resources, as well as sharing ideas and motivating supporting each other in various aspects and not only in the PBL project. Collaboration skills are indispensable in the 21st century (Bell, 2010:39; Larmer & Mergendoller, 2012:3), as well as in PBL (Hixson et al., 2012:8) (§2.5.2.4). Collaboration skills are also considered vital in the field of CS education (§2.3.1.2), especially where teachers are expected to teach diverse populations (Swafford & Dainty, 2010:209), as is often the case in South African schools. Furthermore, to support the development of CS as a dynamic subject through enhanced partnerships with industry, communities, policy makers and other professionals in the field of CS, collaboration skills are imperative (Swafford & Dainty, 2010:209). Additionally, an important 21st century life skill associated with collaboration (Mitchell et al., 2009:340), namely appreciating

others' perceptions and opinions, surfaced in the data. The evident development of participants' collaboration skills as part of PBL was therefore deemed notable.

4.3.2.4 Problem-solving and critical thinking skills

Question four of the project sheet (Addendum F) completed weekly by each participant, enquires if participants experienced problems during each week, which prevented them from achieving their goals towards the project. Question five enquires how the problem was resolved. The completed weekly projects sheets (CD doc. 4) were therefore seen as a possible rich source of data regarding participants' development and use of problem-solving skills. The data from the projects sheets were tabulated and analysed by both the researcher and a co-analyst to support trustworthiness of the findings (§3.9.3). However, it became clear from the analysis of this data that not all participants related the problem with the resolving thereof. This might be due to the formulation of the questions: question four asks about the problem(s) of an individual and question five asks how the group dealt with the problem. Results, however, did indicate that Participants 3 and 4 regularly demonstrated problem-solving skills and were able to resolve their perceived problems regarding the project (CD doc. 4). The other participants did not mention problem-solving, nor did they relate their responses to the problems mentioned.

One of the general aims of the South African National Curriculum Statement Grades R–12, which encompasses the full school curriculum and includes the CAPS for different subjects, is to develop learners who are able to "identify and solve problems and make decisions using critical and creative thinking" (DBE, 2011:5). Both problem-solving and critical thinking skills are also important in CS education, partly because there are so many links to real-life situations contained within the subject (Smith, 2007:14; Smith & De Zwart, 2011:24) (§2.3.1 and §2.3.2). Problem-solving is also central to PBL, where the project and learning is structured around a core problem (Larmer & Mergendoller, 2012:2; Savery, 2006:15) (§2.5.2.2), which is solved during the PBL process. It was therefore imperative that the participants in this study develop problem-solving skills and could implement it into their topic-specific projects, and it was discouraging to find that participants did not address this skill more prominently.

Some indication was found of participants employing critical thinking skills. Critical thinking was not mentioned directly by participants, but the development thereof was implied in the following quotes, which indicate that two participants (P3 and P5) had thought wider and critically regarded aspects surrounding the implementation of their topic-specific projects:

"Ek het leer wyer dink, soos ek was eerstens geneig om altyd maar die maklikste of die naaste antwoord te kry, maar nou het ek bietjie meer in diepte gaan dink en ek het ander opsies oorweeg." – [I have learned to think more broadly, I was initially prone to always use the easiest or

closest answer, but now I have started to think in more depth and considered other options.] (P3, AP7:25)

"… tydens die proses dink mens aan nuwe en beter interessante idees om die projek beter te maak vir die leerders." – […during the process one thinks about new and better interesting ideas to improve the project for the learners.] (P5, AP53:3)

Critical thinking is a 21st century skill listed by McGregor (2009a) as a prerequisite for CS professionals (§2.3.1.2) and is a key skill in entrepreneurial learning (Carwile, 2009:211), which is one of the core aims in CS in South Africa (§2.3.1.1 and §2.3.1.2). Critical thinking skills should be intentionally incorporated and assessed in PBL (§2.5.2.3). Additionally, it is a skill that empowers students for the world of work (Bell, 2010:42, 43). It is therefore a skill that pre-service CS teachers ought to develop and that should intentionally be included and assessed as part of their preparation.

4.3.2.5 Assessment skills

Participants were initially asked about the assessment that they intended to implement into their topic-specific projects. From participants' responses, it emerged that they were all intending to summatively assess their projects (Table 4.9), with only three participants intending to include additional types of (formative) assessment during the implementation of the project.

Table 4.9: Assessment participants intended to implement in their projects

Formative assessment incorporated into project		Summative assessment incorporated into project
P1	Checklist to monitor progress and give hints for development	Rubric for assessment of whole project upon completion
P2	-	
P3	Analytical rubric for peer assessment of presentations	
P4	Worksheet on identifying fibres	
P5	-	

In response to this limited planned assessment, the module facilitator recommended that participants should include other (formative) types of assessment into their projects as well. Table 4.10 contains a list of the assessments that participants implemented into their final projects. From Table 4.10, it is clear that P2 and P3 abided by the suggestion of the module facilitator, since they both included a variety of assessments for different aspects of the learners' projects. Peer assessment, as well as self-assessment, was also included in P3's project.

The comparison of the participants' intended assessment (Table 4.9) with the assessment they included in their final projects (Table 4.10), indicate development of assessment skills in some participants. The assessments mentioned in Table 4.10, refer to the assessments that participants intended to implement in their topic-specific projects and relate to the tasks and content, which each participant included in their separate projects, such as designing a pamphlet (P2) or developing a storyboard (P3).

Table 4.10: Assessment implemented in participants' final projects

	Types of assessment incorporated into final project
P1	Comprehensive analytical rubric for assessment of whole project at the end, mostly assessing the completeness of answers to questions stated in the project
P2	Memorandum for project tasks and/or questions Rubric for the assessment of the pamphlet individual learners have to design Rubric for assessment of learners' presentation in groups Summative rubric for assessment of whole project completed by individual learners
P3	Rubric to assess the execution of the interview learners have to conduct Detailed analytical rubric for assessment of storyboard Rubric for assessment of presentation Peer assessment tick-list for assessing groups' presentations and storyboards Self-assessment and peer assessment table to assess group's and group members' participation Memorandum included for interview, project questions, as well as worksheet
P4	One rubric with 5 criteria used for summative assessment of whole project
P5	Learner reflection sheet included for self-assessment by learners regarding the project Two generic rubrics included (not own design) with no heading and vague descriptions

Source: Completed topic-specific projects of participants

Participants 2 and 3 also referred to assessment as a main concept in their final reflections: Participant 3 described how she has found it difficult to determine what to assess in the projects, as well as formulating the rubrics so that it made sense. Participant 2 stated that she has learned a great deal regarding the creating of rubrics and that she has made changes to her rubrics to ensure that the assessment was on the right level, as well as assessing all aspects in the project. She explained that her rubrics were formative in nature, aimed at affording learners a chance to learn from their mistakes and to possibly improve in a next assignment:

"Die rubrieke is dalk nou baie wyd uitgebrei maar ek sien dit, dat leerders groter kans het om te presteer op so wye skaal as op 'n kleiner skaal." – [The rubrics might be expansive but I believe that learners have a bigger chance to achieve on such a wide scale, rather than on a small scale.] (AP55: 14).

All aspects discussed by P2 and P3 regarding assessment, mirror learning content contained in the VWVD511-module (Reitsma & Koekemoer, 2012:21). This implied participants' implementation and application of the teacher preparation module learning content to the new context of their projects, which was reassuring. Conversely, the remaining three participants only included a rubric for assessing their projects summatively. Though rubrics provide (some) feedback to learners, such assessment does not formatively support learning if it is only administered at the end of a project. A comment made by Participant 1 in her final reflection, however, indicates her realisation of the importance of assessment:

"Ek sou meer aandag aan al die verskillende rubrieke gee, dalk kon dit my punte verbeter …" – [I would have given more attention to all the different rubrics, it could possibly have improved my marks …] (AP15:8)

Effective assessment is vital to support learning as part of the PBL process (Bagheri et al., 2013:21; Mergendoller & Thomas, 2000:30) and therefore requires that teachers implementing PBL as a strategy should be skilled in such assessment. The important role that feedback plays as part of assessment in PBL (Barron et al., 1998:284; Grant, 2009:2; Krajcik et al., 2008:9) (§2.5.2.6) should not be disregarded and should be addressed as part of the planning of assessment in PBL, as was found in the results of this study (§4.3.1.2).

The development of the various skills discussed in Section 4.3.2 are all notable, addressing skills required of CS teachers, 21st century skills required to be able to cope in this new era, as well as requirements of PBL for effective learning and assessment. In addition, participants utilised their learning to design and plan a template, which could be used for the scaffolding of effective CS projects in PBL, as discussed in the next section.

4.3.3 Sub-theme 2.3: Scaffolding and developing Consumer Studies projects by applying project-based learning

A problem which emerged in the literature review is the lack of guidance available to South African CS teachers (Umalusi, 2014:14, 16, 24) (§2.3.2.2 and §2.3.2.4). Guidance regarding preferred teaching-learning strategies and pedagogical approaches is inadequate both for CS education, as well as for preparation of pre-service CS teachers (§2.3.1). In addition, the importance of scaffolding PBL to support the learning intended as part thereof, was also recurrent in literature (Grant, 2002:2; Thomas, 2000:3) (§2.5.2.1 and §2.5.3). An attempt was made by participants to address the lack of guidance available to CS teachers by developing a template that can be utilised as scaffold for the design and development of CS projects within PBL. Participants embedded a number of essential elements of PBL into the template design, as well as into the resulting projects that they designed for various CS content topics.

Participants collaboratively designed and developed the CS project template in the first phase of the case study (Figure 3.1 and §3.4.5) after studying PBL as a teaching-learning strategy, as well as the requirements for effective teaching-learning in CS education. Individual participants subsequently employed the template designed by the group to develop five topic-specific CS projects (§3.4.5) in the second phase of the case study (Figure 3.1 and §3.4.5). Several skills were fostered in participants as part of the development of the template — most notably planning and collaboration skills (§4.3.2).

The group's first template design was basic and mostly aligned to generic lesson plans used by teachers for preparing daily lessons (CD doc. 6). It had little structure and elements were seemingly randomly put together in the design. The group's final template (Addendum G) was a clear improvement on the first design and displayed skilful implementation of design skills. Design skills, such as scaffolding (structuring) and coherent inclusion of elements required in effective PBL projects (§2.5.2 and §2.5.3), were evident in the final template.

In addition to the requirements for effective projects in PBL, the participants also embedded several elements crucial to CS education (§2.3.1.2), such as considering the context in which the project will be executed, the role of the teacher as facilitator, and addressing diversity of learners. It was encouraging to find that participants have utilised this new learning in their template.

The template designed by the group indicated their implementation of newly acquired knowledge regarding requirements for effective application of PBL, as well as VWVD511-module content, specifically relevant to CS. Though insight was gained from the way participants scaffolded the template (the process), it was however outside the scope of this study to delve into a deeper analysis of the template itself.

Within Theme 2 ('PBL experiences relevant to Consumer Studies teacher preparation'), it therefore emerged that participants experienced PBL as an interesting and useful teaching-learning strategy. Participants developed various 21st century skills, including planning, time-management, collaboration, problem-solving and critical thinking, as well as assessment skills during PBL. Additionally, participants aimed to address the lack of guidance available to CS teachers by developing a comprehensive template, which could be utilised to design and develop effective, subject-specific CS projects.

Research sub-question (2) concerning the role of PBL to develop skills in pre-service CS teachers, which relates to the findings of the theme 'Project-based learning experiences related to CS teacher preparation', have been addressed in Section 5.3.2. The next section describes and

discusses results about 'Factors contributing to the development of SDL in pre-service CS teachers', which was the third and final broad theme that emerged from the data.

4.4 THEME 3: FACTORS CONTRIBUTING TO THE DEVELOPMENT OF SELF-DIRECTED LEARNING IN PRE-SERVICE CONSUMER STUDIES TEACHERS

Various factors contribute to the promotion of SDL from both the facilitator's and learners' sides, and controlling or regulating these factors will maximise SDL (Brockett & Hiemstra, 1991:118). Factors such as identifying learning needs and setting learning goals, outlining desired learning outcomes, selecting appropriate learning strategies, creating an optimal learning environment through regulation of factors, and setting the learning pace by managing time, are suggested as contributing to the promotion of SDL (Brockett & Hiemstra, 1991:118-119).

Cognitive and metacognitive factors, affective factors and control factors have been found to contribute to and promote SDL in learners in other studies (Mok & Lung, 2005:21-22; Pilling-Cormick & Garrison, 2007:16-17), specifically in pre-service teachers (Mok & Lung, 2005:21). *A priori* codes (Figure 2.3 and §2.6), developed from thematic codes obtained from literature, were utilised in the data analysis. The results have been grouped and discussed in sub-themes according to that broad organisation found in literature (Table 4.11). To facilitate the discussion of the results regarding Theme 3 ('Factors contributing to the development of SDL in pre-service CS teachers'), the sub-themes used in this discussion were delineated in Table 4.11 (an excerpt from Table 4.1).

Table 4.11: The delineation used for the results and discussion in Theme 3

THEME 3: Factors contributing to the development of SDL in pre-service CS teachers (§4.4)		
Sub-theme 3.1: Cognitive factors contributing to SDL (§4.4.1)	4.4.1.1	Participants' understanding of the learning tasks
	4.4.1.2	Participants' metacognition
	4.4.1.3	Participants' beliefs about their own learning
Sub-theme 3.2: Affective factors contributing to SDL (§4.4.2)	4.4.2.1	Participants' attitudes toward their own learning
	4.4.2.2	Participants' motivation to learn
	4.4.2.3	The value participants placed on the learning task
Sub-theme 3.3: Control factors contributing to SDL (§4.4.3)	4.4.3.1	Control of self
	4.4.3.2	Control of the task
	4.4.3.3	Control of the learning environment

4.4.1 Sub-theme 3.1: Cognitive factors contributing to self-directed learning

Cognitive factors that might contribute to SDL (Mok & Lung, 2005:21) were identified (*a priori*) (Figure 2.3) and were investigated in this study. These included participants' understanding of the learning task (PBL projects), their metacognition, and their beliefs about their own learning.

4.4.1.1 Participants' understanding of the learning tasks

Different participants had different understandings regarding the learning task, which in this case was the development of the project template, and employing the template in a topic-specific project, as well as the associated learning of CS subject content — all within PBL. Participants' understandings have been paraphrased and abbreviated below to support the flow of the text.

Three participants (P1, P3 and P4) appeared to have a better understanding regarding the task than the others. Participant 1 comprehended that the task required research and reading of sources, as well as that she had to understand the content and concepts to enable her to transfer such content or concepts to learners. Participant 3 noted the underpinning importance of having subject-specific content knowledge to be able to execute the task:

"… ek sal moet bietjie moeite doen om weer op hoogte van alles in Verbruikerstudies te kom." – […I will have to make an effort to come up to date again with everything regarding Consumer Studies.] (AP28:6).

Participant 4 identified gaps in literature to support her development of the task and understood the beneficial role that structure and sequencing of task components play in the completion of the task. All these participants' understanding of the learning task reflects consideration of preferred pedagogical principles for CS, which is incorporated in the VWVD511 teacher preparation module (Reitsma & Koekemoer, 2012:13, 46-49).

Participant 5 expressed uncertainty regarding the boundaries of the task, but otherwise did not voice difficulty regarding the understanding of the task. Participant 2 seemed to have a very vague understanding of the task and approached the task with a "trial and error" strategy. A significant finding, though, was that she understood that the task (the project she developed) had to be pitched at the level of the learners for whom it was being designed (§4.2.1):

"Struikelblokke en moeilike besluite wat ek ervaar het met die ontwikkeling van die projek, is om op die vlak te dink wat 'n graad 10 leerling gaan verstaan …" – [Hindrances and difficult decisions that I experienced with the development of the project, was to think on a level which a grade 10 learner would understand …] (AP55:10)

This implied application of newly acquired learning from the VWVD511 teacher preparation module (see §4.2.1 for more detail regarding the levels in the NQF).

Francom (2010:33) prescribes that learners should practice SDL in the context of learning tasks. Learners are presented with opportunities to develop and practice SDL skills when they have to merge subject knowledge with such skills to address and solve problems (Francom, 2010:37-38). Participants' understanding and grasp of the learning task is a cognitive factor contributing to the promoting of SDL (Francom, 2010:37; Mok & Lung, 2005:21; Pilling-Cormick & Garrison, 2007:17). The results, which indicate participants' understanding of the learning task, implies metacognition and might therefore contribute to SDL.

4.4.1.2 Participants' metacognition

Metacognition and cognition can be discerned, but not be separated since elements are intermingled within both concepts. Metacognition focuses on the understanding of processes to solve problems, and managing, controlling and planning of strategies to achieve goals (Van Der Walt, 2006:54). Three factors contributing to metacognition (Mok & Lung, 2005:21) were contemplated (*a priori*) in this study (Figure 2.3), namely participants' learning goals, their learning strategies, as well as their understanding of the relevancy of their prior learning to the current task. Additionally, participants' reflection emerged (*a posteriori*) as a factor that contributed to their metacognition in this study.

Though P1 and P4 mentioned that the task had clear and attainable learning goals, none of the participants mentioned their own personal learning goals. Participant 4 stated:

"… ons weet waarna toe ons werk …" – [… *we know what we are working towards …]* (AP4:8)

This result suggests that participants reverted to the external (task) goals and did not set or clearly define their own personal learning goals. Setting learning goals is part of cognitive regulation, a key aspect of metacognition (IAL, 2012:2), and some studies have shown that visualising the end state of learning goals contribute to SDL (Brockett & Hiemstra, 1991:88).

Despite not stating clear learning goals, most participants were convinced of their preferred learning strategies. Preferences identified for learning strategies by the participants have been condensed in Table 4.12.

Table 4.12: Participants' preferred learning strategies

Participant	Preferred learning strategy
P4	Drawing up and studying mind map/ spider diagram
P3, P5	Visual learners — like to learn from pictures
P3, P4, P5	Uses applied learning and (practical) examples to remember and learn content
P1, P2, P3	Prefer a structured layout, e.g. bulleted, tabled content, enough white space to make learning content "easier" to learn
P1, P4	Use mnemonics to remember content
P3, P4, P5	Make summaries of learning content before studying

Participants utilised more than one learning strategy and they combined strategies to support successful learning. Visual learning, utilising examples and applications, mind maps, mnemonics and summaries, were all popular strategies employed by participants. These results link to literature stating that skilled learners use learning strategies, such as elaboration or re-organisation, to attain their learning goals (Mok & Cheng, 2001:180).

They were explicit on what they liked (tabulated in Table 4.12) and disliked — for example when P4 stated that she could not learn from someone else's summaries. Most participants therefore had clear and preferred learning strategies in place to help them attain the learning goals for PBL, which in turn contributed to SDL. Learners' plans to meet learning goals are included in metacognition (IAL, 2012:2). Such plans typically include the selecting and implementing of learning strategies to effectively address learning goals as part of the SDL process (Bagheri et al., 2013:15; Brockett & Hiemstra, 1991:116; Knowles, 1975:18).

Another result that emerged was that participants understood the value and relevance of their prior learning. All participants mentioned that they utilised prior knowledge in the execution of the PBL task (P1, P2, P3, P4 and P5) (§4.2.2.2), as reflected by this quote from P4:

"… ons het laasjaar in ons derde jaar, Textiles Science gehad as 'n vak, so ek daar deur die boek geblaai…" – […last year, in our third year, we had Textile Science as a subject, so I paged through that book …] (AP1:40)

An unexpected finding was that participants realised that their prior (undergraduate) learning was not seamlessly aligned with the requirements in the CS school curriculum (§4.2.1 and Table 4.3) and therefore additional learning was required of them. Therefore, not only did participants understand the usefulness of their prior knowledge in their SDL process, but they also grasped that they could not rely solely on their prior knowledge, which led to their realisation that continued lifelong learning would be required of them (§4.2.2.1 and Table 4.5). These results link to literature

stating that prior knowledge plays an important role in subsequent learning by providing groundwork for new learning (Mok & Lung, 2005:23).

Participants had to submit a weekly journal throughout this study, as well as a comprehensive reflection at the conclusion of the study. Keeping journals is one technique to support reflection (Brockett & Hiemstra, 1991:137). The results indicate that participants utilised reflection for different reasons, but that those reasons were all related to metacognition (understanding and regulating their thinking processes) (§2.4.1.3). Participant 3 stated that reflection supported the effectiveness of her project design. Participant 1 and P4 utilised reflection for the improvement and adaptation of their tasks and learning, and stated that reflection led to refinement and a better understanding of their learning and the task, as is evident in this quote from P4:

"Ek het meer as eenkeer 'n vraag gevra en wanneer ek dit begin doen dan kom ek agter dat ek self nie verstaan wat ek verwag nie." – [More than once I asked myself a question and when I started doing it, I realised that I did not understand what I am expecting.] (AP57:5)

In line with this, P1 mentioned that reflecting on her work actually motivated her to improve and continue her learning and task. The findings mentioned in this section for Participants 1, 3 and 4 indicate that these participants understood that the knowledge gained from their reflections would be useful in future situations.

Participant 2 often referred to reflection, mainly mentioning the potential that reflection offered for improvement and adaptations in her project. To quote:

"… jy kan kyk of het jou projek nou gewerk, of wat moet jy verander of dat jy nou kan skryf wat moet jy volgende keer anders doen." – […you can check if your project is successful, or what you have to change or that you can now write up what you would have to do differently the next time.] (AP1:13)

Participant 2's repeated references to improvement and adaptations in her task and learning possibly relates to her self-professed lack of self-discipline (§4.4.3.1). Related to this result, was the same participant's statement that she experienced PBL as complex and difficult to start (§4.3.1.3), being the only participant to experience PBL negatively.

Though metacognition was not mentioned by name, it was inferred from the data that participants considered and endeavoured to regulate their thinking processes. Metacognition refers to one's knowledge and understanding of one's own process of thinking, as well as the regulation thereof (IAL, 2012:2; Pilling-Cormick & Garrison, 2007:23). Results indicate that most participants utilised reflection to improve, better understand, and regulate their learning and task outcomes, which all in turn contribute to metacognition. Reflection can contribute to the development of metacognitive

skills (Mergendoller et al., 2006:607) and is an essential characteristic of PBL (§2.5.1.2). Metacognition is closely linked to and contributes to SDL (Carwile, 2009:35; IAL, 2012:2) and supports lifelong learning (Bagheri et al., 2013:18) (§2.4.1.3), which is required of CS teachers (§2.3.1.2). The knowledge gained through reflection contributes to SDL by providing learners with insight, which they might apply in future situations or learning (Brockett & Hiemstra, 1991:134).

4.4.1.3 Participants' beliefs about their own learning

Participant 3 believes that she is perfectionistic when it comes to learning (AP23:7) and that she thinks others see her as being a "control freak" because she considers learning to be of primary importance:

"…my familie noem my 'n control freak … maar ek hou van presies weet wat ek volgende gaan doen …" – [… my family calls me a control freak … but I like knowing precisely what I am going to do next …*]* (AP24:42)

Participant 2 seems to believe that her own learning ability is lower than that of the other participants, but also that incorporating learning into projects leads to better learning than "just hearing" information:

"… dan gaan ons eintlik meer geleer het as wat ons dit sou hoor ..." – [... then we would probably have learned more than if we only heard it ...] (AP4:38)

Participant 2's belief that PBL may result in "improved learning" was noteworthy, since she seemed to have a negative perception about her own learning ability. She might connect her perception of "improved learning through PBL" as a key to address her own (alleged low) learning ability. Being able to think about and understand learning are important concepts in SDL (Pilling-Cormick & Garrison, 2007:16) and supports students in understanding how and why learning is constructed.

4.4.2 Sub-theme 3.2: Affective factors contributing to self-directed learning

Participants' attitudes toward their own learning, their motivation to learn, as well as the value they placed on the learning task were identified from the literature (Mok & Lung, 2005:22) as affective factors which contribute to SDL and was explored in this study (Figure 2.3).

4.4.2.1 Participants' attitudes toward their own learning

Two participants specifically commented regarding their attitudes about their own learning and the task. Participant 3 held a positive attitude towards her learning and the task. She repeatedly

referred to being “enthusiastic” and “excited” about the task, and that she found the learning to be “enjoyable”.

Participant 4 found the PBL task and learning “informative” and it gave her a sense of achievement (satisfaction). Remarkable, though, was this comment she made about how PBL strengthened her passion for the subject CS — implying that a positive attitude regarding the process of learning and her belief that PBL and CS can contribute greatly to the lives of South African learners:

“My passie vir die vak is versterk na die projek en ek wil dit net bemark oral waar ek kom. Omdat ek weet wat die vakinhoud kan doen vir leerders. Dit kan hulle in soveel maniere bevoeg om dinge op hulle eie te doen na skool.” – [My passion for the subject has been strengthened after the project and I just want to market it everywhere I go. Because I know what the subject can do for learners. It can increase their competence in so many ways to do things on their own after leaving school.] (AP39:3)

Participants 3 and 4 maintained positive attitudes toward the task and the associated learning. Positive attitudes contribute to learners’ motivation to learn and they should therefore be supported in developing positive attitudes toward learning (Mok & Lung, 2005:18), which will also foster independence and SDL (Brockett & Hiemstra, 1991:109).

4.4.2.2 Participants’ motivation to learn

Motivation refers to learners’ willingness to learn and is a key factor in successful learning (Mok & Lung, 2005:23). Participant 4 mentioned that progress acted as motivation for the group to work on the task, and that PBL allowed her to do things in her own way, which served to motivate her. Participant 1 believed that the PBL process helped her “to think like a teacher”; implying her understanding of the application possibilities it offered her and thus helping her develop professionally:

“Wat nogals lekker is vir my van die hele projek, dit help my om bietjie te dink soos ’n onderwyser … So dit … bevorder my.” – [What I enjoyed of the project, was that it helped me to think like a teacher … it therefore … developed me.] (AP4:39)

This remark gave credence to the use of PBL in the preparation of pre-service teachers, linking to literature stating that PBL benefits learners by increasing their motivation to learn (Center of Excellence in Leadership of Learning (CELL), 2009:2). It also served as motivation for the participant to learn (and complete the task) since she understood the value it contributed to her professional development. O’Shea (2003:68) quotes Furze (1999) who suggested that SDL and motivation is intertwined and that more motivated learners are more self-directed. Learners who are more motivated are more likely to endure in learning processes than less motivated learners

(Mok & Lung, 2005:23). Increased learner motivation is also listed as a benefit of SDL (O'Shea, 2003:68).

4.4.2.3 The value participants placed on the learning task

Results indicate that participants mostly valued PBL and the accompanying projects as a means to an end. Participant 4, for example, valued the task for its contribution to the expansion of her subject knowledge, supporting better learning, and improving her capability to transfer and apply learning. Participant 2 valued the task for the development of self-discipline — a life skill that she believes she developed as part of the process:

"… self-dissipline wat ek deur hierdie projek of hierdie ervaring geleer het, kan ek in alles in my lewe toepas …" – […I can apply the self-discipline that I've learned through this project or experience to everything in my life …"] (AP7:163)

Referring to the perceived value that PBL and projects might have for learners, P5 mentioned its valuable contribution to the lives of the learners and P3 expanded on the same idea:

"… 'n projek te skep waarop ek self kan trots wees en wat iets sal beteken vir die leerders in Suid-Afrika." – […create a project that I can be proud of and that will be meaningful to learners in South Africa.] (AP27:3)

Participant 2, P3, P4 and P5 mentioned that they wanted learners to enjoy the projects that were created and hoped that learners would find it useful and informative. Participants thus also valued the positive contribution the task could possibly make in future to the learning of learners who would be executing the projects planned by the participants. Project-based learning was therefore valued for its development of the participants' own learning and skills development, but also for the potential it has for contributing to the lives of learners in a meaningful way. This links to literature that notes that academic achievement is authentic if it has value to individuals or groups beyond school (Mergendoller et al., 2006:9).

Especially the remark that PBL helped to develop P1 "to think like a teacher" (§4.4.2.2) was seen as significant — implying the usefulness of PBL as a teaching-learning strategy in preparing pre-service teachers. Additionally, most participants valued the positive contribution PBL could make to learners and wanted to produce interesting and enjoyable projects for learners (§4.4.2.3). These results are related to findings in the literature, which state that affective factors motivate students to excel at what they do and prepare them for future employment opportunities (Mok & Lung, 2005:22). The mostly positive views held of PBL by participants (§4.3.1.3) probably also contributed to the value placed on the task.

4.4.3 Sub-theme 3.3: Control factors contributing to self-directed learning

Accepting personal responsibility for own learning, which includes actively controlling the learning process, is a critical element of SDL (Bagheri et al., 2013:22; Brockett & Hiemstra, 1991:94; Guglielmino, 2008:2; O'Shea, 2003:63; Pilling-Cormick & Garrison, 2007:16). Control refers to students' intentional efforts to regulate the circumstances and results of their learning (Mok & Lung, 2005:21). Three thematic codes for control factors were identified (*a priori*) from the literature as contributing to SDL (Mok & Lung, 2005:21), namely control of self (personal factors), control of the task, and control of the learning environment (Figure 2.3).

4.4.3.1 Control of self

The level of commitment participants showed towards the task, by intentionally choosing to prioritise and expend effort on it, varied. Two noteworthy but opposing instances of the control of self were that of P3 and P2.

Participant 3 perceived herself as very much in control of herself, as did others, which relates to her beliefs about her own learning (§4.4.1.3). She even mentioned that it unsettled her when the group upset her carefully laid learning plans:

"… dit het my net agter gesit en duidelik hanteer ek dit nie so goed soos ander mense nie …" – […it only put me behind and clearly I do not handle it as well as other people do …] (AP24:42)

Participant 2, however, displayed little control of self throughout the process: always putting other tasks and entertainment before the PBL task, having a long list of excuses for not prioritising the task (CD doc. 4: Question 2) and procrastinating often (§4.3.2.2). It was therefore unexpected when this same participant mentioned her belief that she had developed self-discipline (in other words "control of self") as a skill during the PBL process (AP6:161; AP7:163). However, insufficient evidence could be uncovered of this participant's perceived development of self-control.

In SDL, learners should control their behaviour and their thinking (Pilling-Cormick & Garrison, 2007:19). When learners take control of themselves, they retain control over the learning process and become responsible for their own learning outcomes (Brockett & Hiemstra, 1991:126).

4.4.3.2 Control of the task

Participant 3 controlled the task by breaking it up into manageable sub-sections, using lists and deciding what to focus upon in the task. Being in control of the task gave her a sense of achievement and progress, which again reflects her belief about her controlling nature regarding learning (§4.4.1.2 and §4.4.1.3).

Evidence was also uncovered that P1 exhibited task control, such as when she mentioned that she needed to find solutions to create cohesion in her project (the task), and also in the following quote where she indicated how control contributed to her time-management and planning:

"Ek gaan al my brainstorming probeer afhandel in die week — dit gaan my help om reg te beplan en om my werk betyds af te handel." – [I am going to try to finalise all my brainstorming this week – it will help me to plan correctly and to finish my work in time.] (AP13:1)

Both these participants demonstrated control of the task and indicated an understanding of how controlling the task contributed to their development. Participant 3 developed a sense of achievement and progression and P1 believed the control of the task contributed to her development of skills such as planning and time-management. Both internal and external control factors contribute to SDL, such as personal, environmental or social factors (Pilling-Cormick & Garrison, 2007:16). The control of the task through the external management or regulation of learning activities is core in SDL and is described as the "strength of SDL" (Pilling-Cormick & Garrison, 2007:15, 29). In situations where the aim is to promote SDL, such external control factors and their influence on learners should be taken into account (Pilling-Cormick & Garrison, 2007:27).

4.4.3.3 Control of the learning environment

Though various physical, psychological, social and technological factors contribute to control of the learning environment (Mok & Lung, 2005:22), in this study only participants' control of time and resources (sources of information) was explored.

None of the participants reported difficulty in identifying and controlling resources within the learning environment. They all followed the same sequence for identifying resources, namely referring to the CS curriculum (CAPS) as primary document to orientate and define their searches, followed by an exploration of the Internet (*Google*) for other relevant resources (P2, P3, P4 and P5) (§4.2.2.2). This quote from P1 represents what all the other participants also mentioned:

"… na CAPS gekyk om soos dit net eintlik eers onder die knie te kry en te verstaan wat hulle presies verwag" – [… looked at the CAPS to first gain an understanding of precisely what is expected …] (AP1:42)

Other examples of how participants controlled resources within the learning environment are reflected in their quotes tabulated in Table 4.13. From these quotes it was inferred that participants wanted to include the resources in an interesting manner, they prioritised resources, they added additional content in addition to the minimum requirements of the curriculum (to make

the projects "nicer" for learners), and they utilised primary sources to help identify other resources (Table 4.13).

Table 4.13: Participants' control and utilisation of resources

Participant	Quotes	Interpretation of quotes
P3	*"… oulike websites gekry wat ek graag op 'n interessante wyse op my projek kan inwerk …" – […found nice websites which I want to incorporate into my project in an interesting manner …]*	Intention to incorporate resources in an interesting manner
P3	*"… so ek moes organiseer presies wat is my belangrike bronne, wat is minder belangrik, wat wil ek insluit, wat is onnodig …" – […so I had to organise precisely which were my important and less important resources, which ones I wanted to include and which ones were unnecessary …]*	Prioritising resources
P4	*"… ek het begin leer om te kyk na die CAPS en wat is die minimum vereistes wat hulle moet weet en dan het ek gekyk wat kan ekstra wees wat oulik is …" – […I started to learn to look at the CAPS to determine minimum requirements which they need to know and then I looked at what would be extra and nice …]*	Adding additional extra "nice" content in addition to that prescribed of curriculum document
P5	*"… hulpbronne gaan soek het en mens kry iets en dan kyk mens verder en dan kry mens nog iets wat mens iets beters laat leer …" – […search for resources and one finds something and then one looks further and then one finds something else that teaches you more …]*	Utilising primary resources to identify secondary resources

The results relate to literature on SDL, where participants identify, select and prioritise (control) resources to support their development of knowledge and understanding within the SDL process (Pilling-Cormick & Garrison, 2007:16). Regulating resources and managing time contribute to cognitive regulation — a key aspect of metacognition (IAL, 2012:2) which contributes to SDL. Identifying and selecting resources for learning, thereby regulating which resources would be utilised in learning, has formed part of definitions for SDL almost from its inception (Knowles, 1975:18). Francom (2010:36) refers to a study (i.e. Cotterall & Murray, 2009) in which it was found that allowing learners to decide what to learn and which resources they would use for their learning, promoted and developed those learners' SDL skills.

Considerable evidence was found regarding participants' control of time (Table 4.14). Section 4.3.2.2 described results regarding participants' time-management (regulating time) skills, which developed as part of the PBL process. It emerged that Participants 3 and 4 exhibited excellent time control skills; Participants 1 and 5 believed that they could have improved their control over time. Additional evidence of these statements has been captured in Table 4.14.

Table 4.14: Participants' perceptions regarding their own control of time

Participant	Quotes	Interpretation of quotes
P1	*"Om my tyd beter te benut en vooraf te beplan." – [To utilise my time better and plan ahead.]*	Thought that her control of time could still improve
P2	*"… paar dae vir die goedjies wat min tyd gaan vat dat ek meer tyd het vir die wat langer gaan vat …" – […few days for the things that will take little time so I have time for the things that will take longer …]*	Vague concepts regarding management and control of time
P3	*"… toe het ons die weke gaan neerskryf van presies van nou tot die einde …" – […then we wrote down the weeks from precisely now to the end …]*	Clear and structured control of time; made adaptations where necessary
P4	*"My tydsbeplanning het baie verbeter …" – [My time-management improved greatly …]*	Clear control of time; thought that her time-management improved
P5	*"Ek wens ek het my tyd beter bestuur … ek het nie regtig gedoen wat ek wou nie." – [I wish I had managed my time better … I really did not do what I wanted to.]*	Thought that her control of time could still improve

It was significant that Participants 1 and 5 recognised their own need to improve their control over time. This self-realisation implies that they have thought about the possible contributing causes to their perceived shortcomings (metacognition) and identified a skill (improved time-management) which they might use to address those perceived shortcomings. Participant 2 demonstrated a lack of control over time. Evidence of P2's ineffective control of her time relate to Grant's (2011:53) statement that difficulties with time-management are often associated with conflict between learning and social objectives (§4.4.3.1). In traditional teacher-led learning, time is regulated and controlled by the teacher, as opposed to SDL, where facilitators should create opportunities to develop learners' time-management skills to facilitate learners' control of their learning environment (Mergendoller & Thomas, 2000:17, 47). When learners understand the role that the control of time can play in their learning, it contributes to SDL (Linder, 2013:163).

The results therefore indicate that most participants demonstrated control over their time and resources. Some indications were found of participants' control of themselves and the task. The findings of participants controlling time, resources and the task, is in line with literature describing SDL as a process during which students control and monitor learning tasks and activities (Pilling-Cormick & Garrison, 2007:16). Controlling the learning environment involves deliberate efforts and dedication towards the learning task. Regulating the learning environment by controlling elements therein stimulates learning and could promote SDL (Brockett & Hiemstra, 1991:119).

Within Theme 3 ('Factors contributing to the development of SDL in pre-service CS teachers'), it emerged that most participants had well-developed preferences regarding their own learning strategies to attain learning outcomes. Participants appreciated the value of their prior learning in the construction of "new learning" and they utilised reflection to improve new tasks and further their learning. All these aspects contribute to metacognition, which is a key concept in SDL. Participants were motivated by a desire to provide CS learners with interesting and useful projects in their (participants') future careers. Participants therefore placed more value on the task and the associated learning, as it was perceived to contribute to a better "product" for the learners. Indications of participants' control regarding the task, time and resources, reflect their desire to regulate their learning environment with the explicit purpose to support their learning, implying SDL.

Research sub-question (3), concerning the role of PBL to support the promoting of SDL in pre-service CS teachers, which relates to the findings of the theme 'Factors contributing to the development of SDL in pre-service CS teachers', have been addressed in Section 5.3.3.

4.5 TRIANGULATION

Since adverse results were often encountered regarding Participant 2 during the study, triangulation between different data sources have been included to support validity and trustworthiness of the results. Data that was collected during focus group sessions and individual interviews, as well as from weekly reflective journal entries and weekly project sheets, was triangulated for selected sub-themes. Triangulation was conducted specifically regarding P2's experiences regarding PBL (§4.3.1.3), her planning skills (§4.3.2.1), her time management (§4.3.2.2), and her control of herself (as a factor contributing to SDL) (§4.4.3.1). The results of this triangulation have been included in Table 4.15.

Table 4.15: Triangulation of data from Participant 2 for selected sub-themes

Selected sub-themes	Data from focus group sessions	Data from individual interviews	Data from weekly reflective journal entries	Data from weekly projects sheets	Triangulation
Experiences regarding PBL (§4.3.1.3)	*"… in hierdie vak voel dit vir my alles is 'n mengelmoes, so ek weet nie waar om te vat en waar om te los nie." – ["… in this module everything feels mixed up, so I don't know where to start or where to carry on."]* (AP4:12)	*"Ek het half gevoel ek begin weer … van vooraf leer …" – ["I felt like I was starting to learn from scratch …"]* (AP54:13)	*"As ek my met die res van my groeplede moes vergelyk sou ek lankal gevoel het ek gaan hierdie projek nie kan doen nie." – ["If I had to compare myself to the rest of the group members I would have felt that I cannot do this project a long time ago."]* (AP18:3)	*"Die projek is nog te nuut en die inhandiging nog te ver ek voel nog heeltemal te onseker oor die projek." – ["The projects I still too new and the submission still too far, I feel totally uncertain about the project."]* (Week 1, Question 4)	Participant 2 viewed PBL as complex and difficult to get started on.
Planning skills (§4.3.2.1)	*"Ek het nog meer net daaroor gedink as wat ek regtig daaroor al gaan navors het…" – ["I have only just thought about it rather than really researched it …"]* (AP1:39)	*"…ek het klaar beplan … toe ek by die laaste deel kom, toe dink ek … ek kan nie eers die ding maak nie …" – [" I finished planning … and when I got to the last part I thought…I can't make the thing first …"]* (AP54:11)	*"Ek het tot dusver nog glad nie gevorder met my projek nie." – ["Up to this point I have not made any progress on my project."]* (AP20:4)	*"Ek het al meer aan my projek begin dink en oor wat ek alles gaan moet voltooi ..." – ["I have started to think about my project more and about what I have to complete so that I could have a better idea ..."* (Week 7, Question 2)	Participant 2 did not exhibit development of planning skills
Time-management (§4.3.2.2)	*"… paar dae vir die goedjies wat min tyd gaan vat dat ek meer tyd het vir die wat langer gaan vat…" – ["… few days for the things that will take little time so I have time for the things that will take longer …"]* (AP1:13)	*"... dit voel vir my dis nog ver en ek weet dis 'n groot projek ... maar ek weet nie waar om te begin nie…" – ["… it feels to me that it is still far un the future and I know it is actually a large project …but I don't know where to start …"]* (AP16:9)	*"Na 'n fokus sessie is die projek weer in my kop maar as ek te lank wag raak ek al minder bewus van projek." – ["After a focus session the projects is in my head again, but if I wait too long I become less aware of the project."]* (AP19:3)	*"… dit voel nog ver voor ek die projek finaal moet klaar hê…" - ["… it still feels a long way off before I have to have the project finalised …"]* (Week 5, Question 4)	Participant 2 demonstrated poor time-management skills
Control factors contributing to SDL: Control of self (§4.4.3.1)	*"… ek kan net onder druk werk, soos die laaste nippertjie … " – ["… I can only work under pressure, at the last minute …"]* (AP7:123)	*"… so ek verander die heeltyd, waar ek net eintlik moet besluit en begin …" – ["… so I change the whole time, where I actually should just make a decision and start …"]* (AP54:17)	"*Het nie by my projek uit gekom nie. Die koshuis het my te besig gehou…" – ["Did not get to my project. The hostel kept me too busy …"]* (AP17:2)	*"Koshuis verpligtinge is altyd iets wat baie tyd vat ..." – ["Hostel responsibilities are always something that takes a lot of time …* (Week 8, Question 4)	Participant 2 displayed little control of self, listing many excuses for not prioritising the task.

4.6 SUMMARY OF RESULTS

The results of this study have been presented visually in Figure 4.1.

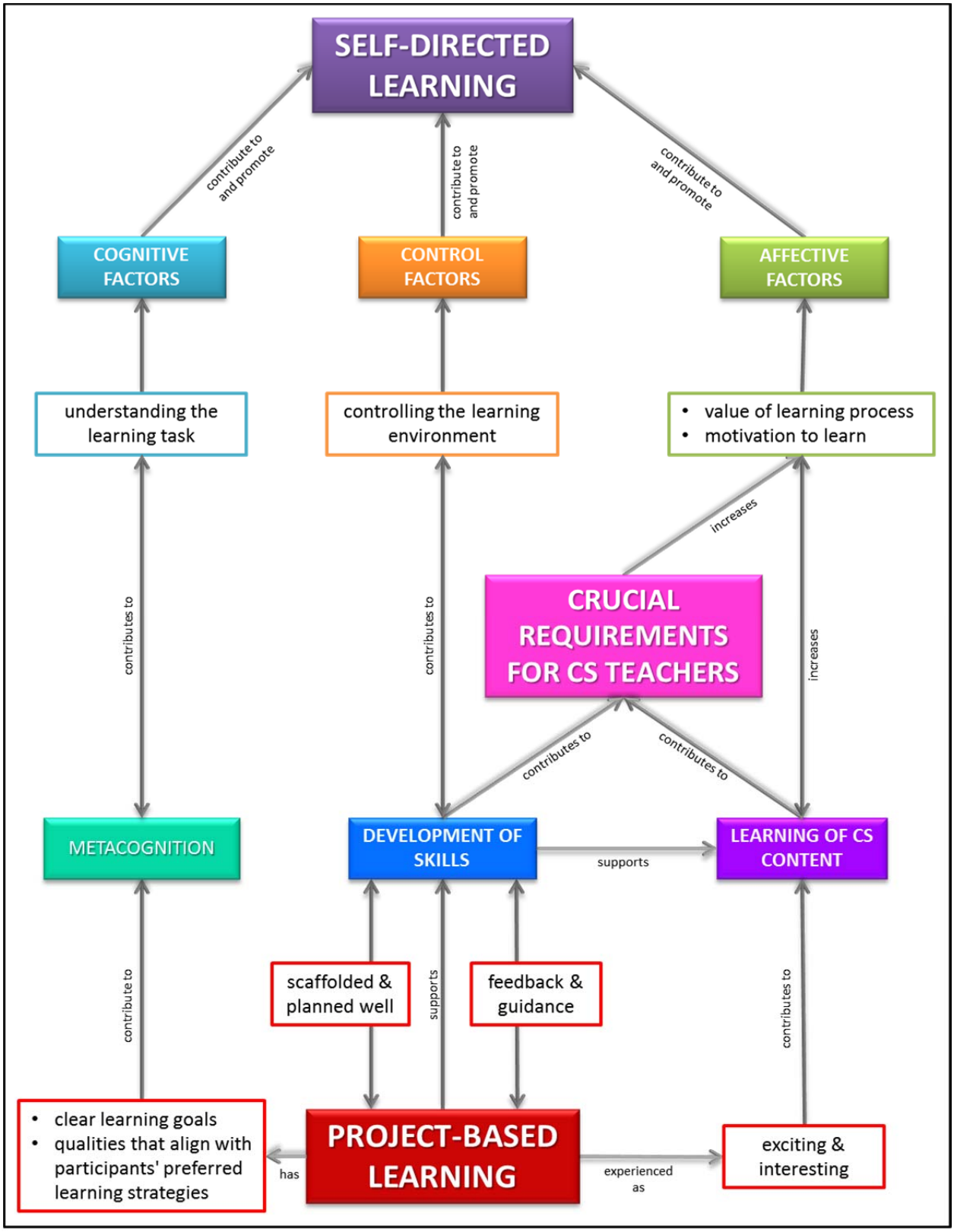

Figure 4.1: A visual presentation of results for this study

Project-based learning as a teaching-learning strategy provided clear learning goals and was aligned well with the learning strategies preferred by participants. This alignment, as well as the learning goals, contributed the development of metacognition. The distinct learning goals contributed to a better understanding of the learning task by the participants, which also contributed to metacognition. Metacognition and understanding of the learning task were identified from literature as cognitive factors, which contribute to and promote SDL.

Several skills were developed in participants as a result of well-planned and scaffolded PBL, and through providing feedback and guidance to support the participants in the process. Collaboration skills, problem-solving skills, time management skills and planning skills were developed in participants. These skills contributed to the controlling and management of the learning environment, which supported learning of CS content. Control factors were also identified from literature as contributing to and promoting SDL.

The skills, which participants developed through PBL, as well as the expansion of their learning of CS content, are crucial in the preparation of CS teachers. Both these elements increased the value participants placed on the learning process. Additionally, the skills that participants developed were used for the sharing of resources and CS knowledge, which supported the learning of CS content, adding further value to the learning process. Participants experienced PBL as exciting and interesting, which increased their motivation to learn. Participants' increased motivation and their positive experiences regarding PBL supported the learning of CS content. The value placed on learning and the motivation to learn were declared in literature as affective factors that contribute to and promote SDL.

CHAPTER 5

FINDINGS, CONCLUSIONS AND RECOMMENDATIONS

5.1 INTRODUCTION

This final chapter brings the study to a close with a brief overview of the chapters used to present this study, followed by the answering of the research questions. This chapter is ended with conclusions and recommendations for further research.

5.2 SUMMARY OF CHAPTERS

Chapter 1 introduced the study by providing some background and stating the rationale for the research. The rationale for the study emanated from the need to align pre-service CS teacher preparation with the requirements of CS education. The rationale was further underpinned by the gap that exists in research regarding pre-service CS teacher preparation in South Africa in terms of preferred teaching-learning strategies that might be used to develop skills and knowledge required of such teachers, as well as the need to promote SDL to support continued, lifelong learning of teachers in a dynamic subject such as CS. The main research question and sub-questions were formulated to address the problem (§1.5). The planned research design and methodology were described, followed by the anticipated contribution that the research could bring to the field.

Chapter 2 provided a conceptual-theoretical framework, which was used to orientate this study. The crucial elements, which form the foundation of education in CS, were discussed and related to the requirements for preparation of CS teachers. The literature was then explored to discover how SDL could be promoted as an integral part of the preparation of pre-service CS teachers to empower them to support lifelong learning in their subject. Links were identified between PBL as a teaching-learning strategy and the promoting of SDL. Project-based learning and the scaffolding of projects within PBL was explored to determine how projects in CS ought to be designed to facilitate the crucial elements of CS education. In addition, various thematic codes were identified from literature for essential elements of CS education and factors that may contribute to SDL (Figure 2.3).

Chapter 3 elaborated on social constructivism — the philosophical point of departure which was used for this qualitative study. A qualitative case study research design, incorporating a variety

of techniques to collect data from a small group of pre-service CS teachers, was used in a natural setting. Data was coded and analysed both deductively and inductively, mainly using ATLAS.ti™ software. Data interpretation focused on the PBL process as a whole, considering the perceptions and opinions of participants as vital. The chapter was concluded describing how trustworthiness and validity was applied for quality assurance, as well as ethical aspects considered in the research.

Chapter 4 presented and discussed the study's results within three broad themes, namely (1) Elaborating CS content by using PBL; (2) PBL experiences relevant to CS teacher preparation; and (3) factors contributing to the development of SDL in pre-service CS teachers. The themes emerged from analysing the data and are also generally aligned with the original research framework used to orientate the study (Figure 2.1). The presentation of the results was followed by discussions to indicate alignment or divergences with literature.

The next sections describe how the results of the research (Chapter 4) answer the research sub-questions, as well as the main research question.

5.3 ANSWERING THE RESEARCH QUESTIONS

This section indicates how the results discussed in Sections 4.2, 4.3 and 4.4 relate to the sub-questions and main research question that guided the study. The three sub-questions were addressed first, followed by how the findings addressed the main research question.

5.3.1 Supporting the learning of Consumer Studies subject content in project-based learning

Research sub-question (1): ***How can the use of project-based learning in a pre-service Consumer Studies teacher preparation module support the learning of subject content?***

Applying PBL in the pre-service CS teacher preparation module, supported the learning of subject content through linking learning and 21st century skills to a real-life context (§2.5.2.3) through increasing the participants' motivation to learn and by adding value to their learning (through making the learning more meaningful), as described in the subsequent paragraphs.

The utilisation of PBL as a teaching-learning strategy in the teacher preparation module allowed participants to experience the implementation of CS subject content in a **practical, life-relevant** manner (Table 4.7 and §4.3.1.3). The same preferred approach was found in literature on international comparable subjects (HEc and FCS), which requires hands-on, practical application and transference of knowledge (Smith & De Zwart, 2010:14), and learner-centred learning, which connects learning to real life (McGregor, 2009b:261) (§ 2.3.2.3). Project-based learning as a strategy additionally matches the active applied learning styles and strategies preferred by most participants (Table 4.12). Pre-service teachers ought to be exposed to specific teaching-learning strategies to help them understand how learning is constructed in CS to support productive learning in the subject (Pickard & Reichelt, 2008:196) and to accustom them to the preferred approaches to CS education.

The positive perceptions of participants regarding PBL as a teaching-learning strategy (§4.3.1.3 and Table 4.7) moreover fostered learning of CS subject content. They experienced PBL as interesting, exciting and constructive to learning (Table 4.7). This positive view of PBL increased the value participants placed on the learning task and their **motivation** to learn and to do well (§4.4.2.1 and §4.4.2.2), mirroring literature that states that PBL improved students' attitudes toward learning.

All participants felt that their **learning of CS subject content have increased** as a result of applying the PBL approach (§4.2.2.1). The realisation by participants at the start of the teacher preparation module that their subject content learning was insufficient (at that stage) (§4.2.1), makes this result noteworthy, as specialised subject knowledge is itemised as one of the minimum requirements for teacher education qualifications (NQF Act, 2011:8). Participants also grasped that their undergraduate learning was not directly aligned with the requirements of the CS curriculum and therefore inadequate to fully prepare them to teach all aspects of CS in schools (§4.2.1), which resulted in their own realisation that they would **need to continue to learn** (Table 4.5). This finding reflects literature which state that CS teachers should continue to learn to be able to offer learners high-quality education (Smith & De Zwart, 2011:24) due to the dynamic nature of CS (§2.3.1.2).

Project-based learning therefore supported the learning of CS subject content within the teacher preparation module. Additionally, it offered an opportunity for participants to experience firsthand the preferred teaching-learning approach for CS, namely active real-life learning and the application of subject content to solve real-world problems. These combined findings relate to literature, which states that PBL enhances the quality of students' learning of subject content (Thomas, 2000:35).

5.3.2 Fostering the development of skills in project-based learning

Research sub-question (2): ***How can project-based learning foster the development of skills to plan, design, implement and assess projects as part of pre-service Consumer Studies teacher preparation?***

The findings indicate that several skills were fostered through the implementation of PBL as part of the participants' pre-service Consumer Studies teacher preparation, both for individuals and within the group (§4.3.2). Project-based learning fostered these skills through intentionally embedding 21st century skills into the objectives for the PBL process (§2.5.2.3) by assigning more responsibility to participants for their own learning (§2.5.1.1) and by utilising reflective practices to support the development of metacognition, which underpins several skills such as the selection of resources for learning (§2.5.1.2). According to the participants' own opinions, the skills that they each individually developed most during the PBL process, were organising (P1), self-discipline (P2), planning (P3, P5), and time-management (P4) (§4.3.2).

Planning emerged as a skill which was fostered in Participants 1, 3, 4 and 5 (§4.3.2.1). Only P2 did not exhibit development of planning skills (§4.3.2.1). Planning skills were supported by the facilitator providing a structured environment in which the participants could implement their learning through the scaffolding of the PBL process (§2.5.3). The scaffolding of the PBL process by the facilitator involved the intentional inclusion of activities, which would require planning and independent learning effort from the participants, such as requesting the drawing up of a time frame, and identifying and selecting their own resources. Planning skills are crucial in CS education — both for teachers presenting the subject and as part of the subject content to be taught to learners. Consumer Studies teachers are required to have efficient planning skills to be able to organise and manage all aspects surrounding the subject, such as teaching plans, addressing diversity and inclusivity, as well as time, infrastructure, equipment and finances in the subject (DBE, 2011:5, 9, 17). Consumer Studies subject content includes several instances where planning skills feature prominently, implying that pre-service teachers should be prepared to transfer planning skills to learners. Examples are found across all grades in the curriculum, such as 'Planning a basic wardrobe' (Gr. 12), "'Space planning' (Gr. 11), and 'Planning for small-scale production' (Gr. 10) (DBE, 2011:15). It was therefore meaningful that the majority of participants thought that their planning skills have increased as a result of the PBL process. Time-management is a 21st century skill closely associated with planning (Bell, 2010:40).

Participants 3 and 4 displayed strong time-management skills and Participants 1 and 5 understood that they both needed to improve their time-management skills in order to improve their results in the PBL process (§4.3.2.2). Participant 2 demonstrated poor time-management skills (§4.3.2.2).

Designing skills were fostered in the group of participants, as was evident from the development of the template for CS projects, which they designed as a deliverable for the PBL process (§4.3.3). The facilitator provided guidance and basic information regarding the components of PBL in the form of a toolkit (§4.3.1.1), which participants had to utilise to design and implement their own PBL projects. Guidance and feedback from the facilitator and peers fostered the development of design skills by providing clues which participants could use to improve their initial designs (§4.3.1.2). Individual participants and the group both effectively incorporated and **implemented** newly acquired knowledge regarding PBL and CS education into the template and into topic-specific projects (§4.3.3).

Evidence was found in the data that **skills to assess projects were fostered** in Participants 2 and 3. Disappointingly and despite an explicit intervention by the module facilitator to address this, the other participants only included limited assessment into their projects (§4.3.2.5 and Table 4.10). This result signifies the importance of emphasising assessment as part of pre-service CS teacher preparation. Being able to apply and implement assessment in CS education involves various types of assessment (such as informal and formal assessment) and utilising various instruments, including projects (§2.3.1.2). The assessment of Bloom's domains (i.e. cognitive, affective and psycho-motoric) is endorsed in CS, where not only subject knowledge and skills are assessed, but also learners' progress and achievement of learning aims (Briers, 1989:25, 77). Assessment is therefore a crucial skill required of CS subject teachers (§2.3.1.1 and §2.3.1.2) and forms an integral part of the VWVD511-module content (Reitsma & Koekemoer, 2012:21, 54–64).

Not only were skills to plan, design, implement and assess projects fostered, but **additional skills** deemed essential in the 21st century were also found to have developed in some participants during the PBL process. These skills were the identification and selection of appropriate resources (§4.2.2.2), problem-solving and critical thinking skills (§4.3.2.4), and the development of collaboration skills in the group of pre-service teachers (§4.3.2.3 and §4.2.2.3). Project-based learning created opportunities for collaboration in this module by necessitating listening skills, shaping of own opinions, and negotiation within the group when team work was prescribed to complete parts of the task (§2.5.2.4). Participants initially had a common goal (the

development of the template) and problem to solve, which additionally fostered collaboration in the PBL process.

The progressive increase in the amount and complexity of the collaboration between group members as a result of PBL (§4.3.2.3 and Table 4.8), was perceived as being highly significant and contributed to the designing and development of their projects. Collaboration is a crucial element in CS education (§2.3.1.2) and therefore also a requirement of CS teachers (§2.3.2). The fostering of collaboration skills as part of PBL is vital (§2.5.2.4), as well as being a valued 21st century (life) skill (§1.4.3 and §2.3.1.2). Collaboration and sharing between learners additionally promotes their motivation to learn (Mok & Lung, 2005:24). Collaboration skills are also considered vital in the field of CS education, especially where teachers are expected to teach diverse populations, as is often the case in South African schools (§4.3.2.3).

Project-based learning therefore effectively fostered most participants' skills to plan, design, implement and assess CS projects. Collaboration and other skills were additionally fostered through PBL. Though not all skills were fostered equally in all participants, the gains were still substantial. The findings relate to existing research which found that PBL supported the development of skills such as collaboration, planning and problem-solving skills (§2.5.1.3). It is also important to note that facilitators who employ PBL need to be aware of students who might need additional support (such as P2 in this study) (§4.4.3.2 and §4.3.2.2) and need to be prepared to offer additional help in such cases (Thomas, 2000:34).

5.3.3 Promoting self-directed learning through project-based learning

Research sub-question (3): ***How does the use of project-based learning in pre-service Consumer Studies teacher preparation promote self-directed learning?***

SDL was promoted in participants through the utilisation of PBL as a teaching-learning strategy. As part of the PBL strategy, participants were expected to take control of and responsibility for their own learning, they had to identify and select resources, choose strategies for learning, and reflect on and evaluate learning results (§2.4.1.2). Project-based learning increased participants' motivation to learn and the value they placed on the learning, which supports the promoting of SDL. The development of participants' metacognition as part of PBL was also essential in supporting successful self-direction (§2.4.1.3 and Table 2.3). The facilitator

contributed to the promotion of SDL through providing guidance and feedback within PBL to support participants' learning experiences.

When learners make deliberate efforts to **control factors in support of learning**, it contributes to SDL (Mok & Lung, 2005:21) — as was the case in this study when participants deliberately controlled time and resources in an effort to support their learning. Participants were not outspoken about how they controlled themselves to support learning (§4.4.3.1), possibly because they were not used to the emphasis being placed on the process of learning, as opposed to learning content (SDL as a process — §2.4; PBL as a process — §2.5.3). Two participants demonstrated control of the task and both indicated an understanding of how the control of the task contributed to their development as pre-service teachers (§4.4.3.2). Results also indicate that most participants controlled their learning environment through the identification and selection of appropriate resources (§4.2.2.2 and §4.4.3.3) and by managing their time (§4.3.2.2 and §4.4.3.3). The deliberate efforts of participants to regulate both internal and external factors that influenced their learning, implies development of their SDL.

Project-based learning allows learners to actively take part in and manage their learning, which increases their **motivation** to learn (Bagheri et al, 2013:26). This was also found to be true in the current study (§4.4.2.1) when P4 expressed her belief that PBL and CS can contribute greatly to the lives of South African learners and when P1 noted that the PBL process helped her "to think like a teacher" (§4.4.2.2). Participants were offered a chance to solve a life-relevant educational problem, adding value to the task (Bagheri et al., 2013:26) and further motivating them to learn. The positive perceptions participants held towards PBL as a vehicle for learning within the teacher preparation module, acted as motivation to support learning and to excel in their tasks (§4.3.1.3) — such perceptions and motivation are affective factors that contributed to the value participants placed on the learning task (§4.4.2.3). Literature mentions that more motivated learners are more self-directed (O'Shea, 2003:68). The motivation found in participants in this study, which they attributed to PBL, is therefore believed to have enhanced their self-directed learning.

Findings related to participants' **metacognition** indicate that they expressed clear and succinct preferences for certain learning strategies (§4.4.1.2) to attain learning outcomes. Reflective practices, such as the keeping of a reflective journal and discussions during the focus group sessions, were intentionally included in the PBL process (§4.4.1.2) to assist in the development of participants' metacognition. Metacognition gives an indication of learners' awareness regarding their own thinking and learning processes, and is a key cognitive factor contributing to

SDL (Pilling-Cormick & Garrison, 2007:17). Developing participants' metacognition probably contributed to the promoting of their SDL.

The **facilitator contributed to the development of SDL** specifically through providing support and resources (§4.3.1.1) and providing feedback to participants (§4.3.1.2), linking to literature (Mok & Lung, 2005:21) which mentions feedback as a crucial factor to support the expansion of learners' metacognition. More could have been done to emphasise the importance of setting personal learning goals (§4.4.1.2), which could have supported the promoting of SDL further.

In this study the intentional scaffolding of the PBL process according to the four phases identified from literature (§2.5.3.3 and Figure 2.2) provided opportunities for participants to choose strategies for learning, work collaboratively, and create links between real-life and learned content (§2.5.2.3). Expecting participants to take responsibility for their own learning in the PBL process (§4.4.3), supported by the facilitator's guidance where needed (§4.3.1.1), also created opportunities for the promotion of SDL. Project-based learning has similarly been established as an effective vehicle to promote SDL in other studies (§2.4.2). The next section describes the findings of this study regarding PBL in the promoting of SDL as part of the preparation of pre-service CS teachers specifically in an effort to address the study's main research question (§1.5).

5.4 PROMOTING SELF-DIRECTED LEARNING THROUGH THE IMPLEMENTATION OF PROJECT-BASED LEARNING IN PRE-SERVICE CONSUMER STUDIES TEACHER PREPARATION

The three research sub-questions discussed in Section 5.2 were formulated to help address the main research question that guided this study (§1.5), which was:

How can project-based learning be implemented in pre-service Consumer Studies teacher preparation to promote self-directed learning?

Results from this study indicate that the application of PBL in the pre-service CS teacher preparation module promoted SDL in various ways.

Project-based learning underpinned participants' understanding of the learning task (§4.4.1.1) through providing clear external learning goals in the form of a structured, organised approach (§4.3.1.3 and Table 4.7). Understanding of the learning task is a cognitive factor which contributes to promoting SDL (Mok & Lung, 2005:21; Pilling-Cormick & Garrison, 2007:17). Additionally, the similarities between PBL elements and participants' preferred learning strategies (§4.4.1.2), such as PBL being structured and exciting, promoted metacognition by giving them insight into and supporting their learning processes. Metacognition in turn, is an important cognitive factor contributing to and promoting SDL, when learners think about and control (or take responsibility for) their own learning.

Project-based learning motivated participants to learn through making the learning interesting, enjoyable, exciting and challenging (§4.3.1.3 and Table 4.7). It also added value to their learning by affording them opportunities to practically implement subject content (§4.3.3) in ways which participants realised would contribute to their professional development as teachers (§4.4.2.3). The motivation to learn and the value students placed on their learning are affective factors which contribute to the promotion of SDL.

Project-based learning promoted skills which helped participants to control the learning environment, such as planning skills (§4.3.2.1), time-management (§4.3.2.2 and §4.4.3.3) and problem-solving skills (§4.3.2.4). In addition to being valuable 21st century skills which CS teachers should have, these skills support control factors that contribute to the development of SDL, allowing learners to manage their own learning and the factors which influence the learning better. When students intentionally choose to control certain factors (such as time) to support their learning, SDL is promoted if the factor is controlled specifically to support learning.

Collaboration was another 21st century skill which participants developed through PBL. Participants collaborated to acquire and utilise sources to develop their CS subject content (§4.3.2.3). The participants' collaboration increased over the course of the PBL process, expanding to even include work outside the PBL project and the CS teacher preparation module (§4.2.2.3). Collaborative activities promote SDL when learners take responsibility for their own learning construction through collaboration with others to affirm the usefulness of the learning (Mok & Lung, 2005:23). The expansion of collaboration skills thus contributed to the promotion of SDL by providing support for learning.

Results indicate that the implementation of PBL has to be well-planned and well-structured to support learning of subject content, and to attain the learning and the development of skills set for the PBL process (§4.3.3), especially if SDL is to be promoted as part of the process (§2.4.2).

Formative feedback and additional guidance is needed, particularly when PBL is introduced for the first time (§4.3.1.1 and §4.3.1.2). It also emerged that students have to have a clear understanding of the essential elements and preferred outcomes of the PBL process to support their learning therein (§4.3.3). Measures should, however, be put in place to provide additional support to students struggling to attain the preferred outcomes of PBL (§5.3.3).

Aligning learning with preferred professional practice supports the meaningful combination of learning and its application. Utilising such an approach will contribute to transfer of learning and will promote SDL in learners (Francom, 2010:37). Utilising PBL in the preparation (education) of pre-service CS teachers, as a preferred professional practice, therefore enhanced SDL in the participants.

When comparing the results of this research with the features of SDL found in literature (Table 2.3 and §2.6), participants in this study exhibited several SDL features in the PBL process. They took responsibility for their own learning by actively controlling the learning process (§4.4.3), by choosing strategies for learning (Table 4.12 and §5.3.2), by identifying and selecting suitable resources (§4.2.2.2), and through independent learning, which was prompted by the value participants placed on the learning and the learning process (§4.4.2.3 and §4.3.1.3), as well as their own motivation to learn (§4.4.2.2), which participants attributed to PBL. Furthermore, participants in this study increasingly used collaborative strategies to support their learning (§4.3.2.3 and §4.2.2.3) in this module and in other modules outside the scope of this study. Participants also became more adept in transferring learning to new contexts (§4.4.2.3) — a crucial skill needed in CS education (§2.3.1.2) and a feature of SDL (Table 2.3). Evidence was also found of participants reflecting on and evaluating the results of their learning (§4.3.2.5), and using this reflection to improve new learning (§4.3.1.2). Such reflection on learning is also a feature of SDL (Table 2.3) and contributed to participants' metacognition (§4.4.1.2)

Self-directed learning also includes some features related to the roles of facilitators in the process (Table 2.3 and §2.6). In this research, the facilitator provided formative feedback and additional guidance to students regarding PBL to enable the promotion of SDL and other skills as part of their learning (§4.3.1.1 and §4.3.1.2). Facilitators intending to use PBL as a teaching-learning strategy therefore need to carefully plan and implement it, incorporating intended learning and skills (such as SDL) if those qualities are to be developed as part of the preparation of pre-service teachers (§4.3.1).

Final conclusions resulting from the research have been addressed in the next section, followed by limitations faced in this study. Lastly, recommendations were made for further research in this field.

5.5 CONCLUSIONS

This research explored how PBL could be implemented in pre-service CS teacher preparation to promote SDL — a crucial skill needed in CS education. It was anticipated that the findings of this study might help to structure recommendations for CS teacher preparation in the South African context. The results of the research with regard to the research question and sub-questions and in relation to obtainable literature, gave rise to the following conclusions:

The implementation of PBL in the teacher preparation module supported the learning of CS subject content. Given that the emphasis in the VWVD511-module is on didactics of teaching rather than on subject content, the learning of CS subject content attributed to the implementation of PBL in the module illuminates the effectiveness of PBL as a teaching-learning strategy in the preparation of teachers.

Project-based learning offered participants opportunities to apply knowledge and skills to real-life situations through hands-on problem-solving. Such teaching-learning is aligned with international requirements for teaching-learning in the field of CS and with the crucial elements of CS education in South Africa. Participants found PBL constructive to learning, reinforcing the strategy's potential for effective teaching and learning in CS teacher preparation.

Implementing PBL as a teaching-learning approach in the teacher preparation module, promoted several 21st century (and SDL) skills in participants — most notably planning, time-management and collaboration skills. Such skills are crucial in the teaching and learning of CS, but also contribute in a positive way in the lives of the pre-service teachers themselves. Additional support should be provided to students experiencing difficulties within PBL to help them attain such skills.

Self-directed learning is a vital life skill which pre-service CS teachers should develop to support continued lifelong learning in this dynamic subject, as well as to facilitate the interaction between real-life and learned content. The implementation of PBL in the VWVD511 pre-service CS teacher preparation module promoted SDL in various ways, such as expecting participants to take responsibility for their own learning and contributing to their motivation to learn through making the learning interesting, enjoyable, exciting and challenging. Project-based learning

also fostered SDL by developing participants' metacognition and contributing to their professional development as teachers. The development of various skills through the implementation of PBL additionally contributed to the promoting of SDL by affording participants opportunities to control their learning environment.

When facilitators intend to use PBL as a teaching-learning strategy in modules used for the preparation of pre-service CS teachers, they will need to carefully plan and implement PBL. Such planning and implementation should intentionally incorporate CS learning and skills (such as SDL) in the PBL objectives if those qualities are to be developed as part of the preparation of pre-service teachers.

5.6 LIMITATIONS IN THE RESEARCH

Though every effort was taken to ensure that the results would be trustworthy and valid, the following limitations were experienced in the study, which might make generalising of the findings to a larger population problematic. (Also see 'Generalisability of results in case studies' §3.10.4).

The assumption that participants would have some level of SDL before starting their PGCE-course and that only the promotion of SDL would be investigated, can be seen as a limitation as their levels of SDL were not measured nor analysed before the start of this study.

The participant group was small, all were female and from the same race and cultural background, and therefore the sample was not representative of the diversity of race, culture and gender found in the PGCE teacher preparation programme in which the study was conducted. However, in South Africa the norm is that CS educators are female, with rare exception.

The researcher's inexperience with exploring SDL and employing interview techniques, might have led to the overlooking of other elements or noteworthy facts in the research. The qualitative nature of the study allowed for interpretations of data from the researcher's perspective and worldview, and inevitably included personal perceptions and interpretations of the researcher, while other researchers might have uncovered other aspects from the same data not mentioned here. The researcher's inexperience in the skills needed for observation might have been a limitation of using observations as data collection method in this study. She did, however, attempt to address her inexperience by obtaining guidance from various research

texts (e.g. Creswell, 2009:182; Nieuwenhuis, 2010b:84; Mouton, 2012:106) to assist her in her preparation for this task.

The results and conclusions of this research led to the formulation of the following recommendations in this field.

5.7 RECOMMENDATIONS

In the introduction to this study, an expectation was stated that the findings of this study might support the development of recommendations for CS teacher preparation in the South African context. The following recommendations are therefore put forward with regard to CS teacher preparation in the South African context.

5.7.1 Recommendations regarding the preparation of pre-service Consumer Studies teachers

The results and conclusions of this study led to the recommendation that clear, structured guidance should be compiled for the preparation of pre-service CS teachers. Such preparation should include strategies and skills to support lifelong, life-relevant learning of the subject's dynamic content. Though it was not focused upon in this study's empirical investigation, literature indicates that the preparation of CS teachers should also specifically include entrepreneurial learning to enable CS teachers to transfer such learning to their learners, as well as to reap the full benefits that the subject CS offers to learners regarding entrepreneurship.

Project-based learning is recommended as a preferred teaching-learning strategy in the preparation of pre-service CS teachers to support the transfer of learning to real-life situations, as well as active practical learning and problem solving. Utilising this strategy will expose pre-service teachers to preferred teaching-learning strategies in CS and might support the promoting of SDL in those students. Pre-service CS teachers should additionally be provided with clear and structured guidance to enable them to effectively scaffold and implement PBL as a teaching-learning strategy in their profession.

Specifically, the following is recommended to support effective scaffolding and implementation of PBL in a pre-service CS teacher preparation module: the inadequate time-management skills which emerged for most of the participants in this study indicated a need to focus on developing this particular skill in pre-service CS teachers (§2.3.2.2). Problem-solving skills were not addressed prominently in this study (§4.3.2.4) and it is therefore recommended that the value

that problem-solving skills contribute to learning be pointed out to pre-service CS teachers as part of their preparation with PBL. Participants in this study did not all implement assessment throughout the projects that they designed (§4.3.2.5), leading to the recommendation that the role which formative assessment plays in PBL should be emphasised more to develop this type of assessment skill of learners in PBL. The lack of evidence regarding participants' personal learning goals in this study (§4.4.1.2) indicates a need to focus on this aspect in future PBL processes.

Preparing pre-service CS teachers with these skills, might however not be enough since guidance regarding projects is inadequate.

5.7.2 Recommendations regarding guidance for projects in Consumer Studies

At present the CAPS document does not provide detailed guidance for the structuring of CS projects (§2.3.2). Teachers need more guidance in the structuring and assessment of projects, which might promote learning as part of projects and which should facilitate the development and assessment of life skills — such as critical thinking, problem-solving, communication and collaboration — as part of projects. It is therefore also recommended that detailed and specific guidance for projects should be incorporated in the CS curriculum. Such guidance should include recommendations regarding the scaffolding of projects to include intended learning gains, detailed analytical rubrics to facilitate assessment of learning content and skills, as well as clarification of the potential benefits projects hold for learners to implement learning into real-life situations.

The template designed by the participants in this study could be useful in providing some support to teachers on this point (§4.3.3). It is, however, recommended that the usefulness and application potential of the template should be further researched and developed before implementing it. The recommendations made as a result of this study, have been summarised in Table 5.1.

The ever-increasing expansion of knowledge and information, coupled with rapid technological developments in the 21st century, requires that learners and teachers develop skills to enable them to cope in this environment. In Consumer Studies, a dynamic subject offering many potential benefits to South African learners, this is especially true. Pre-service teachers in this subject should be prepared to become lifelong, self-directed learners. The implementation of PBL as a teaching-learning strategy in pre-service CS teacher preparation holds great promise for promoting SDL. Including SDL in the preparation of pre-service teachers has the potential to empower CS teachers with various life skills, such as lifelong, life-relevant learning, problem-

solving abilities, time-management and planning skills. Having these skills would strengthen their practice of the profession and might lead to the transfer of such skills and knowledge to their learners, consequently bestowing the same learning gains on those learners.

Table 5.1: Summary of the recommendations made from this study

Recommendations regarding the preparation of pre-service Consumer Studies teachers (§5.7.1)
• Clear, structured guidance should be compiled for the preparation of pre-service CS teachers; • Consumer Studies teacher preparation should include strategies to support lifelong, life-relevant learning of the subject's dynamic content; • Self-directed learning is a skill which ought to be taught as part of the preparation of pre-service CS teachers to enable lifelong self-directed learning; • Project-based learning is recommended as a preferred teaching-learning strategy in the preparation of pre-service CS teachers; • The value that problem-solving skills contribute to learning should be pointed out to pre-service CS teachers as part of their preparation with PBL; • The role that formative assessment plays in PBL should be emphasised; and • Entrepreneurial learning should be intentionally included in the preparation of pre-service CS teachers.
Recommendations regarding guidance for projects in Consumer Studies (§5.7.2)
• Detailed guidance for the structuring of projects should be incorporated in the CS curriculum, including: o detailed analytical rubrics to support assessment of content and skills; o scaffolding for projects to include intended learning outcomes; and o the benefits projects hold for learners to implement learning into real-life situations. • It is recommended that the template that was developed in this study, be further researched and developed as a prospective tool to provide support and guidance to CS teachers for projects in the subject.

"Our task, then, is to use strategies for developing these skills and attitudes – for moving toward self-directed learning - in formal learning settings." (Guglielmino, 2013:5)

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ADDENDUM A: ETHICAL APPROVAL FOR PROJECT

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Ethics Committee
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1 July 2013

ETHICS APPROVAL OF PROJECT

The North-West University Ethics Committee (NWU-EC) hereby approves your project as indicated below. This implies that the NWU-EC grants its permission that, provided the special conditions specified below are met and pending any other authorisation that may be necessary, the project may be initiated, using the ethics number below.

Project title: TEACHING AND LEARNING STRATEGIES TO PROMOTE SELF-DIRECTED LEARNING

Project Leader: : Prof E Mentz

Ethics number: N W U - 0 0 0 1 0 - 1 3 - A 2
(Institution | Project Number | Year | Status)

Status: S = Submission; R = Re-Submission; P = Provisional Authorisation; A = Authorisation

Approval date: 2013/02/14 **Expiry date:** 2018/02/13

Special conditions of the approval (if any): None

General conditions:

While this ethics approval is subject to all declarations, undertakings and agreements incorporated and signed in the application form, please note the following:

- *The project leader (principle in vestigator) must report in the prescribed format to the NWU-EC:*
  - *annually (or as otherwise requested) on the progress of the project,*
  - *without any delay in case of any adverse event (or any matter that interrupts sound ethical principles) during the course of the project.*
- *The approval applies strictly to the protocol as stipulated in the application form. Would any changes to the protocol be deemed necessary during the course of the project, the project leader must apply for approval of these changes at the NWU-EC. Would there be deviated from the project protocol without the necessary approval of such changes, the ethics approval is immediately and automatically forfeited.*
- *The date of approval indicates the first date that the project may be started. Would the project have to continue after the expiry date, a new application must be made to the NWU-EC and new approval received before or on the expiry date.*
- *In the interest of ethical responsibility the NWU-EC retains the right to:*
  - *request access to any information or data at any time during the course or after completion of the project;*
  - *withdraw or postpone approval if:*
    - *any unethical principles or practices of the project are revealed or suspected,*
    - *it becomes apparent that any relevant information was withheld from the NWU-EC or that information has been false or misrepresented,*
    - *the required annual report and reporting of adverse events was not done timely and accurately,*
    - *new institutional rules, national legislation or international conventions deem it necessary.*

The Ethics Committee would like to remain at your service as scientist and researcher, and wishes you well with your project. Please do not hesitate to contact the Ethics Committee for any further enquiries or requests for assistance.

Yours sincerely

Prof Amanda Lourens
(chair NWU Ethics Committee)

ADDENDUM B: LETTER OF CONSENT

Dear Participant,

I will be conducting research to explore teaching-learning strategies in the preparation of pre-service Consumer Studies teachers and would like to invite you to participate in the study.

As a participant, you will be expected to complete a few questionnaires with open-ended questions, complete a project with a partner, complete an electronic reflective research journal on a weekly basis, and contribute to focus group discussions on topics related to the research. Some of the focus group sessions may be recorded for reference purposes.

The research will take place under the umbrella of ethical consent from the North-West University's Ethics Committee for projects within SDL. All information and data will be handled with the strictest confidentiality. Participants will be assigned pseudonyms to ensure anonymity in the analysis and interpretation of data.

Participation is voluntary and participants have the right to withdraw from the study at any time, for whatever reason, without having to fear discrimination or bias against them.

The potential benefits of the research include the description of a useful learning strategy which can be applied successfully in the training of pre-service Consumer Studies teachers, as well as the potential for students to become more self-directed in their learning.

Should you have any questions regarding the research, please contact me at:

Office G19 in building B10, Faculty of Education, North-West University, Potchefstroom Campus.

Phone: 018 299 4320 Email: DuToit.Adri@nwu.ac.za

Your participation will be appreciated.

Yours,

Ms A. Du Toit
(Researcher)

I _____, hereby accept the invitation to participate in the project-based learning research study as described above. I give consent that the focus groups interviews in which I participate, may be recorded and used for data purposes. I understand that I am under no obligation to participate and that I may withdraw from the study at any time.

Signed on this _____ day of February 2013 at _____.

_____ _____

NAME **SIGNATURE**

ADDENDUM C: ORIENTATING LETTER TO PARTICIPANTS

VWVD511-PROJEK/ PROJECT: PrBL om SDL te bevorder

Punte: 400
Inhandigingsdatum: **21 Mei 2013**

Jy word versoek om deel te neem aan 'n projek in hierdie module waar **studente** individueel en in 'n groep gaan saamwerk om projekte te ontwikkel vir gebruik in Verbruikerstudie-onderrig. Die doel van hierdie projek is om jou die geleentheid te gee om **buite formele klastyd** addisionele inligting in te win en te leer om dit op 'n wetenskaplike wyse te gebruik om jou eie leer te bevorder. Die projek moet bestaan uit 'n 1) **projek (volgens jou tema)**; 2) **onderrigmedia** wat gebruik kan word in die onderrig van die tema waaroor jou projek handel; en 3) 'n **assesseringsinstrument** waarmee jou projek geassesseer sal kan word. Jy gaan ook 4) jou projek **formeel** aan die klas **voordra**. Julle moet verder op 'n weeklikse basis 5) 'n **projekwerksblad op *eFundi*** voltooi, asook 6) 'n **reflektiewe gestruktureerde joernaal**, wat die vordering van jul projek beskryf en toelig.

1. Projek volgens tema (Elke student handig EEN projek in)

- Die onderwerp van die projek moet die tema wat aan jou toegeken is dek vir 'n jaargroep in die VOO fase.
- Gebruik die KABV dokument as riglyn om te verseker dat die minimum inhoud van jou tema in jou projek gedek word.
- Jy moet SELF bronne identifiseer wat jy kan gebruik om inligting aangaande jou tema te bekom.
- As groep, lees deur die artikels en bronne op *eFundi* in die TOOLKIT aangaande PrBL.
- As groep kan jul ook ander bronne identifiseer aangaande PrBL.
- As groep, identifiseer die eienskappe, elemente, vereistes en beste struktuur vir die opstel van projekte in Verbruikerstudie (vakspesifiek) en vir gebruik van PrBL.
- As groep, stel jul nou 'n raamwerk ("scaffold") op wat geskik sal wees vir gebruik in meeste Verbruikerstudie-projekte.
- As individu gaan jy nou die voorgestelde raamwerk gebruik om 'n projek vir jou tema te ontwikkel (jy mag die raamwerk effens aanpas indien nodig, maar dan moet jy verduidelik WAAROM jy dink dis nodig).

- Jy gaan die projek wat jy ontwerp het, self uitvoer om sodoende enige probleme daarmee te kan identifiseer en uitsorteer. [100]

2. Onderrigmedia (Elke student handig TWEE onderrigmedia in)

- Ontwikkel TWEE hulpbronne wat gebruik kan word in die onderrig van die tema waaroor jou projek handel.
- Die rubriek vir die merk van hierdie opdrag is beskikbaar op *eFundi* onder *Resources* vir LE 5. [100]

3. Assesseringsinstrument (Elke student gee EEN assesseringsinstrument in)

- Ontwikkel een assesseringsinstrument wat gebruik kan word vir die behoorlike assessering van jou projek.
- Die rubriek vir die merk van hierdie opdrag is beskikbaar op *eFundi* onder *Resources* vir LE 6. [100]

4. Projekvoordrag

- Jy gaan jou projek aan die klas voordra (verduidelik met bewyse en voorbeelde).
- Jy sal ’n punt kry vir jou voordrag (soos vir ’n mikro-les).
- Mede-studente kan kommentaar lewer/ vrae vra oor jou projek en tema-inhoud. [100]

5. Projekwerksblaaie (Slegs EEN werksblad per student per WEEK)

- Hierdie werksblaaie word weekliks individueel voltooi en dan op *eFundi* ingehandig.
- Maak asseblief seker dat die datum van die week waarvoor jy die werksblad inhandig, korrek ingevul is.

6. Reflektiewe joernaal (halwe tot een bladsy per week)

- Ander ervarings/ kommentaar oor die projek en die uitvoer daarvan word op *eFundi* ingehandig.
- Sluit assblief die datums van die week waarvoor jy die joernaal gedoen het, by die dokument in.
- Wees so eerlik as moontlik — jy sal NIE gepenaliseer word NIE.

Baie dankie

ADDENDUM D: PRE-MODULE QUESTIONNAIRE

BIOGRAPHICAL DATA:

1. Birth date: _____
2. Gender: _____
3. Senior certificate subjects: _____
   _____
4. Tertiary qualification(s): _____
   _____
5. Main subject(s) or specialisation(s): _____
   _____
   _____
6. Final module mark for main subject(s) or specialisation(s): _____
   _____

CONSUMER STUDIES SUBJECT KNOWLEDGE AND PERCEPTIONS:

7. What type of information do you think is important to be taught in Consumer Studies? _____
   _____
   _____
   _____
8. Please give reasons for your answer in question 7 above. _____
   _____
   _____
   _____
   _____
   _____
9. Which type of teaching approach do you think will be most effective to teach the information that you have listed in question 7 above to school learners? _____
   _____
   _____
   _____
   _____
10. Please give reasons for your answer in question 9 above. _____
    _____

CONSUMER STUDIES SUBJECT CONTENT KNOWLEDGE

11. What do you think are the main aims of the subject Consumer Studies? _____
    _____
    _____

12. Consumer Studies has 7 main content themes which need to be taught in order to cover the minimum curriculum content requirements. Please list ALL the **sub-themes** which you think you will be able to teach *with confidence*, for each main theme:
    a. The consumer: _____
    b. Food and nutrition: _____
    c. Design elements and –principles: _____
    d. Textile fibres and fabrics: _____
    e. Clothing: _____
    f. Housing and interiors: _____
    g. Entrepreneurship: _____
13. Which of the 5 practical options in Consumer Studies do you think you can teach *with confidence*? _____

LEARNING STRATEGIES IN PRE-SERVICE CONSUMER STUDIES TEACHER PREPARATION

14. During your degree course, were you mostly *taught* content or do you think you have *learned* content using your own strategies? _____
15. Which strategies did you employ during your degree course to study course material (How did you learn content)? _____
16. What are your expectations regarding teaching-learning approaches used in modules of the Post Graduate Certificate of Education (PGCE)? _____
17. What is your understanding of project-based learning? _____
18. Do you have any prior experience in using project-based learning? If so, please give details. _____

SELF-DIRECTED LEARNING PERCEPTIONS

19. What is your understanding of self-directed learning? _____

20. Do you have any prior experience in using self-directed learning? If so, please give details. _____

21. Which activities would you (as a student-learner) associate with self-directed learning? _____

22. Do you think that self-directed learning is a skill which can be learned? _____

23. If you answered "Yes" in question 20 above, which methods or strategies do you think could help someone to become a more self-directed learner? _____

Thank you for taking the time to answer these questions.

ADDENDUM E: TIME FRAME DRAWN UP FOR PROJECT TEMPLATE

Projek: Studente tydsraamwerk / *Project:*	Datum/ *Date*: 21/02/2013	
Groep-tydsraamwerk		
HOOF AKTIWITEITE ***MAIN ACTIVITIES***	**VERANTWOORDELIKE PERSOON** ***PERSON RESPONSIBLE***	**SPERDATUM** ***DUE DATE***
Lees al die artikels oor projek-gebaseerde onderrig en –leer en gaan soek ook na verdere bronne daaroor *Read all the articles about project-based learning and teaching and find other resources in this regard*	Al die groepslede neem deel *All group members participate*	21 Feb. – 28 Feb.
Bespreek al die voor en nadele van verskillende soort projekte en besluit op 'n spesifieke projek na aanleiding van al die inligting wat verwerk is *Discuss all the advantages and disadvantages regarding different types of projects and decide on a specific project on account of all the information that has been processed*	Al die groepslede neem deel *All group members participate*	1 Mrt. – 7 Mrt.
Beplanning van die projek-raamwerk. Bepaling van doelwitte, sowel as assesseringskriteria *Planning of the project template. Determining aims, as well as assessment criteria*	Al die groepslede neem deel *All group members participate*	8 Mrt. – 14 Mrt.
Implementering van inligting wat ingewin is op die projek-raamwerk *Implementation of information gathered in the project template*	Al die groepslede neem deel *All group members participate*	15 Mrt – 21 Mrt.
Finaliseer die finale raamwerk *Finalise the final template*	Al die groepslede neem deel *All group members participate*	22 Mrt. – 28 Mrt.

ADDENDUM F: WEEKLY PROJECT SHEET USED BY PARTICIPANTS

Student's Weekly Project Sheet	Date: __ /__ / 2013
COMPLETE THIS SHEET AT THE END OF EACH WEEK **Student nr., initials, surname:** **Underline the main step you were using this week: (1) Initial Planning (2) Search for resources**	
1. What were your team's <u>main</u> aims/ goals/ responsibilities/ project activities for this week?	
2. Specify your <u>own</u> individual aims/ goals/ responsibilities/ project activities for this week.	
3. Briefly mention relevant information you have obtained that will contribute to the final project.	
4. Mention any problems or challenges that you have experienced (e.g. any reason why you did not obtain your aims/ goal(s)/ activities with regard to content/ resources).	
5. Explain how your team will solve/ has solved the above mentioned problems or challenges.	
6. Give feedback/ reflect on the personal interaction and communication between the members of your team.	
7. List all the resources that you have used for this week's project activities.	

ADDENDUM G: FINAL DESIGN OF PROJECT TEMPLATE

The template has been translated to English for the purposes of this report, but was originally designed in Afrikaans by the participants.

Project Template Guidelines

Project title	Related to chosen theme	
Teacher	The name of the teacher who teaches the subject	
School	The name of the school where the project will be conducted	
Grade	The grade to which the project will be relevant	
Subject	The name of the subject in which the project will be completed	
Theme	Choose one of the 7 topics as set out in the CAPS	
Connection to real life	The chosen project must connect to the lives of the learners and be life-relevant.	
Approach of project	The teacher can decide how the project should be executed. It may be completed individually or in groups. Groups should not be larger than 4 learners per group.	

Key activity – Bloom's taxonomy:	Knowledge	Understand	Apply	Analyse	Synthesise	Evaluate

Time required	The given time schedule should be based on school activities; therefore the teacher decides on the basis of the activities how much time she will spend on the project (2–3 & 3–4 weeks). Teacher determines time according to the complexity and breadth of the project.	
Aims of the project	Learners should be able to: (1) Identify concepts of the theme; (2) Differentiate, explain and give feedback regarding the content; (3) Apply the content practically to make it life relevant; (4) Analyse the practical skills and content and be able to evaluate it if it has relevance to real-life contexts; (5) Combine and structure the content learned in class with the project content in order for it to be easily understood; and (6) Apply value and critical thinking to the project and be able to justify it.	
Context	Classroom setup/ group compilation/ availability of resources for the execution of the project and adaptations that have to be made so all learners will gain from the execution of the project.	
Life skills?	Project-based learning should also include skills. It may be developed in the following ways: • Learn to think critically; • Promote team work; • Solving complex problems; • Developing verbal communication (verbal presentation); • Developing written communication skills; • Technological skills are developed when they use technology themselves; • Social development is encouraged when local and global problems	

	are identified and solutions developed for such problems; • Expanding knowledge regarding related career opportunities; and • Do research regarding content and application of all the above-mentioned elements.	
Teacher's role in PBL	<u>The teacher fulfils one of the following roles:</u> • Facilitator; • Leader; • Advisor; • Mentor. *Note: The teacher may only facilitate and may not actively take part in the project.*	
Announcing the project	Create the context through life-relevant examples to introduce the work to learners in a practical manner. It should be interesting to the learners.	
Introductory question	<u>The question should be related to the content, as well as the aims of the topic as set out in the curriculum document (CAPS).</u> <u>When formulating the introductory question, keep the following in mind:</u> • It should be challenging; • Should be open-ended • The question may develop from a real-life situation which learners find interesting; • The question should relate closely to curriculum content and –requirements.	

Monitoring and time frame (progress is assessed)		
Start	The learner conducts research through collecting and analysing data, e.g. learners bring resources to school.	
Middle	The learners analyse, interpret, synthesise and evaluate data findings, e.g. the learners share findings with peers — collaborative learning takes place.	
End	The learners communicate and make sense from knowledge in Consumer Studies	

Assessment criteria			
Unpacking the project			
Teacher ticks blocks where relevant:	**Prior knowledge and skills** (Knowledge which learners already have)	**New knowledge and skills** (Knowledge gained as part of the project)	**Unanticipated knowledge and skills** (Knowledge which learners gained from the project which was not anticipated)
Critical thinking			
Product for project			
Collaboration			
Communication			

Approach towards inclusivity/ Diversity/ Differentiation:
As stipulated in CAPS p. 5: prepare to support learners with learning barriers in teacher's own class

Reflection of learners:	
Reflection of teacher:	

Does the project adhere to the following: (tick if appropriate)	
Aims reached	
Learners involved	
Focused on essential knowledge	
Promoted higher-order thinking skills	
Used clear and measurable assessment criteria	
Ensured that all learners have an equal chance of achievement	
Entrenching of basic skills	
Requires the useful utilisation of technology	
Related to life-relevant contexts	