A conceptual model of Adult Education and Occupational Health and Safety training of mineworkers in a Mining Company

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ABSTRACT

Education in South Africa is integral to the country's rebuilding, development and transformation process. Adult Education and Training provide access to numerous continued education and development platforms. On the other hand, South African mining is known for its shocking health and safety statistics. Unskilled workers in the industry have the lowest levels of education and are most vulnerable to accidents and fatalities. The general aim of the study is to conduct a theoretical study to determine if better planning and provision of Adult Education and Training and Occupational Health and Safety could reduce mine-related accidents and fatalities. It also aims to define the concept of ownership and responsibility in South Africa in general and in the mining sector specifically, to explore the concept of management and leadership to determine the most appropriate model for the Mining Company and assess the impact of enhanced communication on Occupational Health and Safety performances. The thesis concludes with the development of a conceptual model for Adult Education and Occupational Health and Safety training of mineworkers. A convenience sample of 522 responses was obtained from a survey conducted at a Gold and Platinum Mining Company. A total of 522 participants responded to the initial survey, resulting in a convenience sample used in its entirety for the present study.

The first article revealed that the following training interventions, namely enablers and training methodologies, should be considered as future interventions to enhance better planning and provision of Adult Education and Training and Occupational Health and Safety to reduce mine-related accidents and fatalities. The modernisation of training strategies and interventions should place a reintroduced emphasis on enablers to bring about the necessary changes that will assist the Mining Company to stay viable, conform to legislations, develop their workforce, and to create a learning organisation and setting in which workers can grow and reach their full potential. The need to bolster a learning culture and break down learning obstacles is of utmost importance if the Mining company wants to reinvent the organisation and bring it into line with revised training strategies. The quality of training material, training facilities and competent facilitators are key strategic deliverables that will ensure the implementation of the proposed conceptual model.

The second article corroborated that the Mining Company can gain from the practical application of certain basic concepts of ownership and responsibility as a contributor to more skilled employees and improved safety achievements by establishing higher, practical and measurable standards for compliance and behaviour. The responsibility for taking ownership of Adult Education and Occupational Health and Safety training practices and behaviours will require well-defined role classification and dissection of responsibilities to ensure that the Company adheres to legislation and that the workforce is accomplished and capable of performing their duties.

The third article revealed that a mining company in South Africa must apply the principles of enhanced behavioural-based safety training with the addition of consequential thinking as a new training methodology and consequently to be included in developing new training material. The concepts of better management, direction and leadership of AE&T and Occupational Health and Safety practises and behaviours are according to the study deeply rooted in the revitalised focus on behaviour-based safety training and consequential thinking, with a renewed focus on hazard identification, risk assessment, health and safety practises, policies, mine standards and assessments. One major advantage of behavioural-based safety training is establishing a common language which is a necessary change to improve communication from fault finding to understanding the facts related to the risk.

The fourth article confirmed that the effects of improved communication concerning the implementation of revised guidelines, norms, standards and information dissemination are of great importance to allow for more interaction between workers and stakeholders concerning AE&T and H&S training programs. The improved communications model should include the articulations of the method to be used in terms of the engagement process between employees and management on the matter of new learning material and the implementation of new technologies. The conceptions of a new and improved communication model should be clear and accepted by all stakeholders. An ongoing consultation process in terms of implementing new learning material and new technologies is proposed to ensure that employees are put at ease and not intimidated by the changes.

The results for articles one to four provided a leading-edge conceptual model for Adult Education and Occupational Health and Safety Training of mineworkers in the Mining Company. The model's outcome can provide input for decision-making regarding the appropriate allocation of resources to implement the proposed model. The result also confirmed that better planning, provision, ownership, management, direction, leadership and communication of Adult Education and Occupational Health and Safety Training of mineworkers contribute to more literate employees and fewer fatalities. In conclusion, the model provided important information about how and through which means the objective can be achieved and act as a guideline for the implementation thereof.

Keywords: Adult Education and Training (AET), Occupational Health and Safety (OH&S), training, literacy, illiteracy, accidents and diseases, health and safety.

DECLARATION

I, Andre Botma, declare that the thesis titled "*A conceptual model of Adult Education and Occupational Health and Safety training of mineworkers in a Mining Company*" is my work. I further declare that the thesis and the subsequent content thereof will not be submitted to any tertiary institution to obtain another qualification. All the viewpoints and ideas expressed here are the author's or from properly cited literature listed in the bibliography.

Andre Botma November 2022

REMARKS

Note the following considerations:

- The thesis consists of four stand-alone research articles.
- These articles will be submitted to the African Journal of Employee Relations for possible publication.

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TABLE OF CONTENTS

LIST OF FIGURES

LIST OF EQUATIONS

LIST OF TABLES

Chapter 1

Chapter 2: Article 1

Chapter 3: Article 2

Chapter 4: Article 3

Chapter 5: Article 4

Chapter 6

CHAPTER 1

INTRODUCTION

The thesis investigates the extent and impact of planning, ownership, leadership, and communication on mineworkers' adult education and occupational health and safety training as contributing factors to a more literate and skilled workforce, thereby reducing fatalities, and accidents in the Mining Company.

1.1 PROBLEM STATEMENT

Education in the national context must be considered an integral element in national reconstruction, growth and change. The formulation of government adult education and training (AE&T) policies must be consistent with the larger goal of building a fair and equitable education system and ensuring and managing quality education and training for mature learners across the country. The Bill of Rights (1996) in the Constitution of the Republic of South Africa underlines the right of all citizens "to primary education, including adult education, which the State must make increasingly accessible and amiable by reasonable means". The White Paper on Education (1995:37) states that "the right to basic education is owned by all the people". Therefore, as a nation, we must ensure that our nation's future is a collective future and our shared responsibility (Policy Document on Adult Education and Training, 2003: 4-5).

According to the Policy Document on Adult Education and Training (2003:8-9) Adult Education and Training (AE&T) initiates and shapes a learning ethos that lays the foundation for focused and planned learning to acquire the compulsory education and competencies needed for social and economic expansion. In this way, it ensures that relevant individuals act purposefully and contribute to the country's social, financial and governmental stages. Describing the concept of human capital in this way, which in turn refers to intercession, such as education and training and other imaginative enterprises, to increase the level of knowledge, skills and abilities that can make a significant contribution to society and, in the long run, the national economy. Adult Education and Training (AE&T) also offers admission to functional literacy and

remedial education, comprising work-related, occupational, further and higher education, schooling, and employment. Adult Education and Training (AE&T) includes literacy but also accentuates the schooling of grown persons to ensure they get the necessary learning and training for income generation intent. Subsequently, Adult Education and Training (AE&T) can be seen as leading further education and training (FET). Adult Education and Training (AE&T) and further education and training (FET) can be viewed as the two parts of adult education and training that systematically establish mature learners onto a course of enduring learning and development (Policy Document on Adult Education and Training, 2003:8-9).

Table 1: Backgrounds of Adult Education and Training (AE&T)

1930	Driven by the churches and the Communist Party.
1946	Decree to encourage and arrange night schools.
1950's	Separatist Government challenges evening schools.
1966	Launching of campaign Improvement.
1970's	Earliest government night schools established, and many NGOs established – Project Literacy, Learn & Teach, ELP, USWE, CEP, etc. Unions begin to look at more effective programmes.
1989	Many universities that present English as a first language commence grownup literacy sections or areas in the faculty of Education.
Early 1990	Flourishing time. IEB arranges the initial adult examinations. Significant additions of overseas and resident funding.

	The policy works finally sanctioned the NQF with an itinerary for lifelong learning and RPL.
AE&T Institutionalised 1994	AE&T noticeable in White Paper on education.
Things fall apart (1997 - 2001)	The destruction of the NGO sector.

Source: Adapted from WHAT IS AE&T (2002:1); Aitcheson (2003:151-158)

A limited number of papers on adult education have been conducted in South Africa, almost all of this research and material currently focuses on providing adult education and training (AE&T) in disadvantaged communities and the general workplace (Sibiya, 2007:3; Botma 2015:3-4). Table 1 shows that the AE&T beginnings are intertwined with the political history of South Africa, the 1990s being a solid testament to the progress made in the policy framework and the publication of the White Paper on Education and Training in 1995. As a result, limited literature exists to accurately represent the country's adult education and training (AE&T) state.

According to Aitchison (2003:33), the South African collected works on the history of adult education, till the present day, have not been recorded, as there is only a restricted volume of references available in the form of autobiographies from the first half of the 20th century. There are brief references in the over-all history of education and infrequent citations to the history thereof in modern academic papers and policy studies. The acknowledged study of adult education at South Africa universities has only occurred from the eighties onwards and can be regarded as very disappointing and inadequately to say the least. For the last two decades, the effort was erroneously placed on short-term achievement as opposed to on the vison and the objectives thereof. University means in the form of resources for the study of adult education have reduced radically over the last few years and tender no hope that the situation will radically change. The volume of publications with specific references to the history of adult education is very few and far between. The obtainable literature can be classified into three major categories namely policy, practice and research.

The literature on policy in the early eighties concentrated mainly on non-formal and adult basic education. From 1992 onwards, the focus was mainly on the actual policy documents. A restricted number of policy documents were also published, except for the National Education Policy Investigation (NEPI) of 1992/93. Concerning the policy documents, only the following were published: A survey of adult basic education in South Africa in the 90s. Harley *et al.,*1996, journal articles and papers published in conference proceedings (for example, Fisher, 1992; Morphet *et al.*, 1992; Greenstein, 1995; Aitchison, 1996a, 1996b, 1998; Bhola, 1997; Aitchison *et al.*, 2000). There are, nonetheless, areas of concern concerning replicated papers transcribed by the policy task team members, for example, NEPI and Centre for Education Policy Development (CEPD) ABE groups (Aitchison, 2003:33).

A study was conducted in 1991 on the provision of Adult Education and Training (AE&T) in businesses and mines in South Africa. Van Heerden (1991:21) concluded that literacy in the workplace is esteemed as very valuable, but on the other hand, emphasised the focus of the unions on Adult Education and Training (AE&T) and the insistencies by the unions to conduct literacy classes. The White Paper on Education and Training published in 1995 declared that:

- All South Africans shall gain from the assistance of educational prospects available to meet their essential needs and that all South Africans will have admission to a lifetime of education and training (Sibiya, 2007:1).

South African mining companies are known for their distressing occupational health and safety (OHS) records. The number of casualties due to ground fall accidents, transport-related accidents, explosives, or general mining accidents has decreased in recent years but is still considered too high (Tuchten & Nkomo, 2011; Annual Report – Mine Health and Safety Council, 2015:4). Unqualified workers, machinery operators and drivers are of particular concern and are seen as a specific group of workers most at risk from accidents and illnesses, often with the lowest levels of formal education and/or training. According to the Mining Qualification Authority (MQA), the Education and Training Authority for the mining and minerals sector, these worker categories

have been highly valued and stressed that they are vulnerable to accidents and illnesses. Replacement demand for these categories of workers due to occupational and other illnesses related to death has been accentuated by the Mining Qualification Authority (Tuchten & Nkomo, 2012:11; Botma, 2015:4). Colleague-reviewed literature on the relationship between adult education (AE&T) and occupational health and safety (OHS) training in the South African mining industry is non- existent. Social and political changes in South Africa in 1994 transformed the country's education system. Thus, this shift led to the White Paper on Education and Training publication in 1995.

The White Paper (1995:37-38) recognises Adult Education and Training (AE&T) and states that every adult, youth, child and everyone should benefit from a vision of education designed and developed to meet their basic needs and that all individuals will continue to receive education and training throughout their lifetime. The above statement is critical if the tone considers past imbalances and limited access to education for the broader South African population. Many black South African adults are still unable to read and write (Tuchten & Nkomo, 2012: 11). Due to their illiteracy, they are barred from accessing multiple forms of information. Stakeholders, including government and industry, are currently focusing on learners at the adult basic education level to meet the needs of individuals as well as industry and countries (Tuchten & Nkomo, 2012: 11; Annual Report – Mine Health and Safety Committee, 2015: 4; National Development Plan 2030, 2011:294-322).

Adult education and health and safety training for underground miners will require new topics or content education. Exploratory research is critical to understanding the impact of adult education and occupational health and safety training on miners. The question under investigation can be drawn according to the following themes, namely:

Adult education and occupational health and safety training for miners must be repositioned to ensure a sustainable contribution to abundant literate workers and fewer fatalities in mining companies. Subsequently, the following research questions are derived from the above problem statement.

The researcher thus addressed these questions raised in article format.

ARTICLE 1

Can better planning and provision of Adult Education and Training and Occupational Health and Safety training of mineworkers contribute to more literate employees and fewer fatalities in the Mining company by means of?

- Improve the quality and reduce waste of training and learning materials.
- The establishment and reinforcement of a learning culture.
- Remove learning barriers - create capacity, send people to H&S training and AE&T training.
- Implement proactive training.
- Increased informal training.
- Support peer teaching.
- Great focus on retention of standards knowledge.
- Appropriate learning design.
- Quality of facilitation.
- High standard assessment.
- On-the-job coaching.
- Specific skills courses.
- Dedicated capacity-building courses.
- Instructed formal practical courses.
- Formal exposure under supervision.
- Supervisory and leadership development.

ARTICLE 2

Can the ownership of Occupational Health and Safety practices and behaviours contribute to fewer fatalities and incidents and accidents in a mine by means of?

- Establish higher standards of compliance and conduct.
- Resume responsibility for developing employees.
- Role clarification and responsibilities.

- Consequential thinking - understanding the consequences.
- Control Points.
- Skill building.
- Confidence in ability.
- Reason carefully.
- Use judgment when evaluating information.
- Achieve predetermined results.
- Understand the impact of proposed actions.
- Analyze relationships between previously unrelated sets of information to determine possible future impacts and consequences**.**

ARTICLE 3

Could better management, direction and leadership of Adult Education and Training and Occupational Health and Safety contribute to more literate employees and fewer fatalities, incidents, and accidents in a mine by means of?

- Enhance behavior-based safety training and thinking accordingly.
- A renewed focus on hazard identification and risk assessment.
- Strengthen basic health and safety practices.
- Revisions to mine policies and procedures are subject to change.
- Enhanced Mine Standards Summative Assessment.

ARTICLE 4

Could improved communication with regards to guidelines, norms and standards and information dissemination lead to the decrease of accidents and fatalities in a mine by means of?

- Strengthen management communication.

- AE&T and H&S training programs allow interaction between workers and all other stakeholders.
- Clearly articulate the methodology to be used (how staff and management should discuss, plan and practice new learning).
- Communication aspects of the training program will be managed by all stakeholders.

1.2 RESEARCH OBJECTIVE

The research objectives are divided according to general objectives and specific objectives emanating from them.

1.2.1 General Objectives

1.2.1.1 Planning and provision of AE&T and OHS

The study's primary purpose is to conduct theoretical research to determine whether better planning and provision of adult education and training and occupational health and safety can reduce mine-related accidents and fatalities.

1.2.1.2 Ownership and responsibility

The primary objective of this research is to define the concept of ownership and responsibility in South Africa and the mining sector.

1.2.1.3 Leadership and management

The study's primary objective is to explore the concept of management and leadership and determine the most appropriate model for the Mining Company.

1.2.1.4 Enhanced communication

The primary objective of the research is to determine the impact of enhanced communication on Occupational Health and Safety performance.

1.2.2 Specific Objectives

The following specific objectives were identified:

Article 1: Planning and provision of AE&T and OHS in the Mining Company.

- Define the meaning of Adult Education and Training and Occupational Health and Safety in the Mining Company.
- Analyze conceptual approaches, applicable theories, perspectives, policies and legislation to inform the better planning and delivery of AE&T and H&S training for mining companies.
- Improve the quality and reduce waste of training and learning materials.
- The establishment and reinforcement of a learning culture.
- Remove learning barriers and create capacity to send personnel to H&S training and AE&T training.
- Implement proactive training.
- Increased informal training.
- Support peer teaching with an increased focus on retention of standard knowledge, appropriate learning design, promotion of quality, high standards of assessment, job coaching, specific skills courses, professional capacity building courses, guided formal practice courses, formal exposure to supervisory and supervisory leadership under development.

Article 2: Ownership

- Critically define, discuss and explain the impact of ownership and liability concepts throughout South Africa, particularly in the mining industry.
- Determine if the concept of ownership helps improve health and safety practices by means of:
  - Investigate the following interventions (i.e., by establishing superior standards of compliance and conduct, restoring accountability to developing employees, role clarification and accountability, consequential thinking), understanding consequences, control points, capacity building, confidence in competencies, careful reasoning, and use of judgment in evaluating information, achieving

predetermined outcomes, understanding the effects of proposed actions, and analyzing relationships between previously unrelated sets of information to identify possible future effects and consequences.

Article 3: Leadership and Management

- To identify and analyse global and international trends and perspectives on management concepts, particularly Adult Education and Training (AE&T) and Health and Safety Management.
- To identify the role of enhanced behaviour-based safety training and consequence thinking, refocus on hazard identification and risk assessment, strengthen basic health and safety practices, revise mine policies and procedures that may change, and strengthen summative assessments of mine standards.
- Establish the most appropriate management and leadership model for the mining company, specifically for adult education and training and health and safety.

Article 4: Communication

- To investigate the impact of enhanced communication on Occupational Health and Safety (OHS) performances.
- Identify the concepts of communication and the most appropriate communication models in the context of adult education and training and health and safety in mining companies.

1.3 CONTRIBUTION OF THE STUDY

Despite the successes of adult literacy efforts in the fight against apartheid, literacy alone cannot be seen as sufficient to bring about social transformation in the country. One of the main views of trade unions and businesses in South Africa is that education, including adult education, has little to no role in everyday living and the work environment, while training is interpreted as teaching mundane and day-to-day work

with no focus on knowledge and or values. Adult education and training aim to provide a suitable adult pathway to general education and qualifications to significantly improve the quality of life of many South Africans (WHAT is AE&T, 2002: 1). It is further estimated that as many as 80% of underground miners never complete their education (Tuchten & Nkomo, 2012:12). Walker (2014: 33) indicated that although mining companies account for only 1% of the global workforce, it is responsible for 8% of annual occupational deaths. Consequently, there will be challenges regarding reduced productivity, increased costs, low employee morale, and lack of motivation (Walker, 2014: 33).

1.4 RESEARCH METHODOLOGY

The research methodology to be applied in this paper is proposed to be through the application of a historical procedure and a survey procedure. The results are reported in the form of four research articles. Coherently with the historical approach, the researcher embarked on a literature review to provide a theoretical overview to determine and analyse global and international trends and perspectives regarding Section B, Section C, Section D and Section E, as well as an empirical study (quantitative research). The survey methods will be used in this study. Regarding research methods, the broad consensus is that there are two perspectives on gathering research information, quantitative and qualitative. Quantitative methods can be seen as an objective approach that measures and analyses the target concept accurately and is less time-consuming. Qualitative research methods are a form of descriptive research and are subjective as researchers interpret the data, for example, responses to open-ended questions posed by participants in this study (Welman *et al*., 2010: 207; Botha, 2012: 43-44).

The objective of each phase is as follows.

- A theoretical and empirical study will determine if effective planning and delivery of Adult Education and Training and Occupational Health and Safety could reduce mine-related accidents and fatalities.

- A theoretical study and an empirical study to determine and critically define, discuss and interpret the impact of the concept of ownership and responsibility in South Africa in general and in the mining sector specifically and to analyse conceptual approaches, applicable theories, perspectives, policies and legislation to inform the effective planning and delivery of AE&T and H&S training in the Mining Company.
- A theoretical and empirical study to determine the concept of management with specific reference to Adult Education and Training (AE&T) and Health and Safety (OHS) management.
- A theoretical study and an empirical study to determine and investigate the impact of communication on Occupational Health and Safety (OHS) performances.

1.4.1 Research design

The research method comprises a literature review and an empirical study (quantitative research).

1.4.1.1 Literature Review

The research design for Article 1, Article 2, Article 3 and Article 4 consists of a literature review and an empirical study.

The literature reviews were conducted using various research databases, for example, Google Scholar, Google, the North-West University Library (Ferdinand Postma, Potchefstroom Campus), published articles, doctoral and master's theses, and academic journals. The search names comprised of the following: Adult Education and Training, Department of Mineral Resources, Department of Minerals and Energy, literacy, illiteracy, Department of Labour, Mines Qualification Framework, Recognition of prior learning, Occupational Health and Safety, unskilled and semi-

skilled workers, accidents and diseases, South African Mining Company, Mining Qualification Authority and Health and Safety.

1.4.1.2 Empirical study

The empirical study conducted in this thesis consists of four articles, with each section having its empirical study as per the following research questions:

Article 1: Can effective planning and provision of Adult Education and Training and Occupational Health and Safety training of mineworkers contribute to more literate employees and fewer fatalities in a Mining company?

Article 2: Can the ownership of Occupational Health and Safety practices and behaviours contribute to fewer fatalities, incidents, and accidents in the Mining Company?

Article 3: Could better management, direction and leadership of Adult Education and Training and Occupational Health and Safety provide for more literate employees and fewer fatalities, incidents, and accidents in the Mining Company?

Article 4: Could improved communication regarding guidelines, norms and standards, and information dissemination lead to the reduction of accidents and fatalities in the Mining Company?

1.4.1.2.1 Literature review: Article 1

In Article 1 of the study the literature review is conducted on the following:

Adult Education and Training (AE&T) and Occupational Health and Safety (OHS) in the Mining Company. This section defines the meaning of Adult Education and Training and Occupational Health and Safety in the Mining Company. It also conducts a theoretical study of the significance of Adult Education and Training and Occupational Health and Safety in the Mining Company. To analyse conceptual approaches, applicable theories, perspectives, policies and legislation to inform the better planning and provision of AE&T and H&S training in the Mining Company using the following factors, namely: 1) the enhancement of the superiority of training and

learning material and 2) the reduction of wastage. The establishment and reinforcement of a culture of learning. Removing learning barriers and creating the capacity to send people for H&S training and AE&T training. The implementation of proactive training. The increase in informal training. The enablement of peer teaching, a greater focus on the retention of knowledge of standards, proper learning design, quality of facilitation, high standard assessment, job coaching, specific skills courses, specialised capacity building courses, formal practical courses under coaching, formal exposure under the supervision and supervisory and leadership development.

1.4.1.2.2 Empirical study: Article 1

The empirical study conducted for Article 1: Can effective planning and provision of Adult Education and Training and Occupational Health and Safety training of mineworkers provide more literate employees and fewer fatalities in the Mining company?

1.4.1.2.3 Literature review: Article 2

In Article 2 of the study, the literature review is conducted on the following: To critically define, discuss and interpret the impact of the concept of ownership and responsibility in South Africa in general, and in the mining sector specifically. It determines if the concept of ownership contributes to improved health and safety practices by means of the following interventions, namely by establishing advanced standards for compliance and behaviour, bringing back accountability for developing employees, role clarification and responsibility, consequential thinking, understanding consequences, locus of control, capacity building, confidence in ability, careful reasoning, the use of judgement in assessing information, achieving predetermined results, awareness of the implications of proposed actions and the analysis of relationships between previously unrelated sets of information to identify possible future implications and consequences.

1.4.1.2.4 Empirical study: Article 2

The empirical study conducted for Article 2: Can the ownership of Occupational Health and Safety practices and behaviours contribute to fewer fatalities, incidents and accidents in a Mine?

1.4.1.2.5 Literature review: Article 3

In Article 3 of the study the literature review is conducted on the following:

To determine and analyse global and international trends and perspectives concerning the concept of management with specific reference to Adult Education and Training (AE&T) and Health and Safety Management. To determine the role of enhanced behavioural-based safety training and consequential thinking, the renewed focus on hazard identification and risk assessments, reinforcing basic health and safety practices, revising mine policies and processes subject to change, and enhancing mine standards summative assessments. Establish the most appropriate management and leadership model for the Mining Company with precise indication to adult education and training and health and safety.

1.4.1.2.6 Empirical study: Article 3

The empirical study conducted for Article 3: Could better management, direction and leadership of Adult Education and Training and Occupational Health and Safety provide more literate employees and fewer fatalities, incidents, and accidents in the Mining Company?

1.4.1.2.7 Literature review: Article 4

In Article 4 of the study the literature review is conducted on the following:

To investigate the impact of enhanced communication on Occupational Health and Safety (OHS) performances. To determine the concept of communication and the most applicable communication model to be used concerning adult education and training and health and safety in the Mining Company.

1.4.1.2.8 Empirical study: Article 4

The empirical study conducted for Article 4: Could improved communication regarding guidelines, norms and standards, and information dissemination lead to reduced accidents and fatalities in the Mining Company?

1.4.1.2.9 Research approach: Participants and data source

The research setting was limited to a Gold and Platinum mine. The mines were selected based on availability (convenient sampling). The necessary authorisation was obtained from the relevant mining house to conduct the research. For this study, the designated fieldworker handed out questionnaires to top management, senior management, middle management, skilled employees, and unskilled employees at a satellite training campus. A convenience sample of 522 responses was obtained from a survey that was conducted at a Gold and Platinum Mining Company. A total of 522 participants responded to the preliminary survey, which resulted in a convenient sample used in this study. Respondents' educational backgrounds ranged from below high school to university degrees.

1.4.1.2.10 Measuring battery/Instrument(s)

The survey tool used is a questionnaire, which can be used when factual information is required and should be designed according to certain rules and standards (Welman, et al., 2010:73-207). A well-designed questionnaire results from long-term planning of research goals, articulation of questions, and hypotheses. The questionnaire must be carefully curated and designed to increase the reliability and persuasiveness of the data to an acceptable tolerance (Botha, 2012: 43-44). The researcher developed the questionnaire, and in this study, questionnaires will be used to obtain data, as questionnaires allow for anonymity and allow respondents to think before answering questions. Questionnaires can be given to many people at the same time and provide consistency in measurement situations as everyone answers the same questions and last but not least provide data that can be easily analyzed and interpreted (Welman, et al., 2010:73-207). In Parts B through to E of the questionnaire, the respondent must

express their agreement with "strongly disagree," "disagree," "agree," and "strongly agree." Information will be aggregated by category in a table, for example, the number and percentage of respondents.

- Section B measures the effect of training interventions, enablers and training methodologies on reducing accidents and fatalities.
- Section C measures the effect of ownership of training practised and behaviours on reducing accidents and fatalities.
- Section D measures the effect of increased management direction and leadership on reducing accidents and fatalities.
- Section E measures the effect of improved communication practises on reducing accidents and fatalities in the Mining Company.

1.4.1.2.11 Data analysis

Statistical Consulting Services performed data analysis at North-West University (NWU) Potchefstroom campus. The statistical software program SAS 9.4 was used.

To determine whether factor analysis is appropriate, Kaiser's sample adequacy measure (MSA), which indicates the correlation between variables, was calculated (Tabachnick & Fidell, 2001). The index ranges from 0 to 1 and reaches 1 when the others perfectly predict each variable.
The following criteria can explain the measure:

0.80: Active
0.70: Moderate
0.60: mediocre
0 50: Miserable
< 0.50: Unacceptable (Hair *et al*., 1998).

1.4.1.2.12 Facets of Validity

Conceptions are equivalent to conceptual or theoretical formulations that aim to organize and help us understand our environment. Therefore, the main goal is to use

the observed variables to illustrate unobservable constructs or concepts, such as intelligence or anxiety (Pedhazur & Schmelkin, 1991). Construct validity can be viewed as the degree to which a test measures theoretical concepts or characteristics, such as attributes, personality traits and intelligence. Construct validity may include measures of criterion-related validation, convergence validation, and content validation. When measuring the reliability of a questionnaire, the most popular technique is called Cronbach's alpha or coefficient alpha. Cronbach's alpha is a statistical coefficient designed to test reliability and internal consistency. It also indicates whether the item in the measurement tool and the subsections of the item are highly correlated. Therefore, Cronbach's alpha (α) is the reliability coefficient of the items in the survey tool, focusing on the quality of the measurements (Pedhazur & Schmelkin, 1991).

1.5 ETHICAL CONSIDERATION: RECRUITMENT, SAMPLING AND INFORMED CONSENT

Ethical permission for this study was obtained from the North-West University (NWU) Potchefstroom campus Ethics Committee (ethics number: NWU-00552-18-S4). Respondents' educational backgrounds ranged from lower than matric to university degrees. Field staff were briefed on research intent and objectives and were asked to distribute questionnaires to colleagues and learners at their respective training centers for different mining operations. The purpose and objectives were detailed in a covering letter accompanying the questionnaire, which was distributed by field staff to all participants. The questionnaire included an introductory section emphasising in writing to each participant that participation was voluntary and anonymous. Participants were not asked at any stage to provide any information that could personally identify them.

1.5.1 Potential benefits and hazards

All the risks involved were explained, and respondents had the option to withdraw their support in concluding the questionnaire. Respondents were also assured of the researcher's respect for their confidentiality, and respondents were thanked for their participation.

1.5.2 Limitations of the study

A significant limitation becomes apparent because of a lack of research conducted on and by mining companies on Adult Education and Training (AE&T) and Occupational Health and Safety (OHS). This has resulted in a limited number of scientific resources available for this multidisciplinary study. The study was limited to the gold and uranium industries and acknowledged the limitations of using questionnaires to collect data.

1.5.3 Data protection

The North-West University's Statistical Consulting Service performed data analysis, and only the researcher could acquire and analyze the data. During the data capture and post-statistical analysis phase, the questionnaires are kept in a safe and secure environment. Additionally, the questionnaires were answered anonymously by means of marking the correct response and did not capture any personal information that could lead to participant identification.

1.6. OVERVIEW OF CHAPTERS.

The chapters of the thesis are as follows:

Chapter 1: Introduction and problem statement and objectives.

Chapter 2: Can Better planning and provision of Adult Education and Training and Occupational Health and Safety training of mineworkers contribute to more literate employees and fewer fatalities in the Mining company by means of?

Chapter 3: Can the ownership of Occupational Health and Safety practices and behaviours contribute to fewer fatalities, incidents, and accidents in the Mining Company?

Chapter 4: Could better management, direction and leadership of Adult Education and Training and Occupational Health and Safety contribute to more literate employees and fewer fatalities, incidents, and accidents in the Mining Company by means of?

Chapter 5: Could improved communication with regards to guidelines, norms and standards, and information dissemination lead to the reduction of accidents and fatalities in the Mining Company by means of?

Chapter 6: A Conceptual framework

The final conceptual framework is presented in this final chapter.

1.7 CHAPTER SUMMARY

The problem statement, objectives, contribution and added value of this research are presented in this chapter. The research methodology concerning research design and data analysis were discussed and concluded with an overview of the chapter.

LIST OF REFERENCES

Aitchison, J. & Harley, A. 2006. South African illiteracy statistics and the case of the magically growing number of literacy and AE&T learners. *Journal of Education,* (3):89-112.

Aitchison, J.J.W. 2003. Struggle and compromise: a history of South African adult education from 1960 to 2001. *Journal of Education, 29*:33-45*.* http://www.popularеducation.co.za/.../joe29ait.history%20of%20ad%20ed.pdf Date of access: 3 February 2021.

Aitchison, J. 2008. *Again! Bad faith and the educational bureaucracy: Can adult education be provided in Southern Africa?* Paper presented at the Conference of the Southern African Comparative and History of Educational Society (SACHES) in Maputo, 17-19 July 2008.

Annual Report – Mine Health and Safety Council. 2015. http://www.mhsc.org.za/.../Agenda%20Item%203-%20DMR_MHSI_annual%20report%2020 Date of access: 3 March 2017.

Botha, E. 2012*. Information Technology Governance Framework in higher education in South Africa: A paradigm shift.* Potchefstroom: North-West University. (Mini-dissertation – Masters).

Botma, A. 2015*. Managing the influence of adult basic education and training on occupational health and safety in the mining industry.* Potchefstroom: North-West University. (Dissertation – Masters).

Health and Safety Council in South Africa. 1997. *Benjamin and Greef Commission. Presented to the Minister of Labour on 29th May 1997*. Pretoria: Department of Labour.

Hair, J.R., Anderson, R.E., Tatham, R.L. & Black, W.C. 1998. *Multivariate data analysis*. Upper Saddle River, NJ: Prentice Hall.

National Development Plan. 2030. https:// www.gov.za/issues/national-development-plan-2030 Date of access: 10 March 2021.

Pedhazur, E. & Schmelkin, L. 1991. *Measurement, design and analysis*. Hillsdale, NJ: Erlbaum, 819.

Policy Document on Adult Education and Training. 2003. https://www.education.gov.za/LinkClick.aspx?fileticket Date of access: 2 June 2021.

Rule, P. 2006. The time is burning: The right of adults to basic education in South Africa. *Journal of Education*, 3:113-135.

Sibaya, O.S. 2007. *A comparative analysis of methods used in AE&T facilitation*. KwaDlangezwa: University of Zululand. (Dissertation – Masters).

Tabachnick, B.G & Fidell, L.S. 2001*. Using multivariate statistics*. 4th ed. Boston, MA: Allyn & Bacon.

Tuchten, G., Nkomo, M. 2012. *Does AE&T contribute to OHS in Mining? – Occupational Health*. http://www.occhealth.co.za/?/viewArticle/1352 Date of access: 5 May 2021.

Van Heerden, G. 1991. *Adult literacy in South Africa*. Pietermaritzburg: University of Natal.

Walker, S. 2014. Training: The Foundation for Safety. *Engineering & Mining Journal* 2(33). http://nwulib.nwu.ac.za/login?url=http://search.ebscohost.com/login.aspx?direct=true&db=aph&AN=94722410 Date of access: 17 May 2021.

Welman, C., Kruger, F. & Mitchell, B. 2010. *Research methodology*. 3rd ed. Cape Town: Oxford University.

What is AE&T. https://pmg.org.za/docs/2002/appendices/020917AE&T.htm Date of access: 28 January 2021.

White Paper on Education and Training. 1995. *Notice 196 of 1995* http://www.education.gov.za/LinkClick.aspx?fileticket...tabid=191&mid Date of access: 2 February 2021.

CHAPTER 2
RESEARCH ARTICLE 1

ADULT EDUCATION AND TRAINING (AE&T) AND OCCUPATIONAL HEALTH AND SAFETY (OHS) IN THE SELECTED MINES OF A MINING COMPANY

Adult Education and Training (AE&T) and Occupational Health and Safety (OHS) in the Mining Company will answer the following research question: “Can better planning and provision of Adult Education and Training and Occupational Health and Safety training of mineworkers contribute to more literate employees and fewer fatalities in a Mining company?”

The Article is prepared for the African Journal of Employee Relations and the specifications, as outlined by the Journal, were followed in the article's writing.

ABSTRACT

A literature review about Adult Education and Occupational Health and Safety training in the selected Mines in South Africa.

Orientation: Recently, more and more adults are returning to the classroom, and the word "adult education" has taken on a new meaning. Adult education can be viewed as any form of learning undertaken by adults outside of traditional schooling or by adults who do not have the opportunity to attend school. Adult education is all about literacy and adult learning to read and write. Thus, adult education includes basic literacy skills, personal fulfilment, and learners with access to higher education qualifications (Peterson, 2017:1). This study aimed to define the implications of adult education and training and occupational health and safety in the mining industry and to conduct a theoretical study of the implications of adult education and training and occupational health and safety in the mining industry. In addition, it analyzes conceptual methods, applicable theories, perspectives, policies and legislation to inform the better planning and delivery of AE&T and H&S training in the mining industry.

Research purpose: This study aimed to determine whether better planning and provision of adult education and occupational health and safety training for miners can cumulatively promote more literate workers and reduce fatalities, accidents, and incidents in the mining industry. The overall goal of this study is to conduct theoretical and empirical studies to determine whether better planning and provision of adult education and occupational health and safety training for miners can reduce mine-related accidents and fatalities in mining companies. The study's specific purpose is to clarify the meaning of adult education and training and occupational health and safety in mining enterprises and conduct theoretical research on the significance of adult education and training and occupational health and safety in mining enterprises. Additionally, analyze conceptual approaches, applicable theories, perspectives, policies and legislation to better plan and deliver AE&T and H&S training for mining companies.

Motivation for the study: The motivation for this study was to identify the indicators that most influence better planning and delivery of adult education and training and occupational health and safety training.

Research design, approach and method: A convenience sample of 522 responses was obtained from a survey conducted at the gold and platinum mine in South Africa. A total of 522 participants responded to the preliminary survey, which resulted in a convenient sample used in this study.

Main findings: The two structures resulting from the research, training intervention enablers and training methods, should be considered as future interventions to enhance better planning and delivery of Adult Education and Training and Occupational Health and safety to reduce mine-related accidents, incidents and death toll.

Practical/managerial Implications:

One of the most significant limitations to conducting this research is the apparent lack of research on adult education and training (AE&T) and occupational health and safety (OHS) in mining companies in this research area, therefore, scientific resources are limited in number. The research was also limited because it only involved a gold and Platinum mining Company. However, the study significantly contributes to new scientific resources in this particular field of study.

Contribution/value-added: Training Interventions Enabler and Training methodologies to be considered were identified.

Keywords: Adult Education, learning, literacy, read, write, tertiary qualification.

INTRODUCTION

South Africa is well-known for its diversified affluence of minerals and a strictly regulated Mining Company. Mining houses in South Africa offer employment to a substantial portion of the South African populace and employment to mineworkers from the continent and international specialists from abroad. In the mining sector in South Africa, 2003 pledged to reduce the fatality rates by 20% per annum. The number of deaths from mining-related accidents in 2003 was in the order of 270. In 2007 this number decreased to 221 legal mineworkers. The deaths of numerous illegal mineworkers raised alarms concerning the dangers of illegal mining and the health and safety standards of the South African Mining Company. In 2008, the fatality figure was further reduced to 168, and following safety audits that were ordered revealed that mine safety compliance in the South African Mining Company was aimed at 66%. In 2009 the fatality figure in the Mining Company was 169 workers. In 2010, the figures published by the Department of Mineral Resources showed that 128 people lost their lives in mines in South Africa, which indicated a 24% reduction in fatality rates. Bheki Sibiya, the then-CEO of the Chamber of Mines, announced that 2010 could be regarded as the best year in terms of safety achievements in the Mining Company since 2003. As the Chamber of Mines represents 80% of all the mining houses in South Africa, the Government has consequently taken on a challenging viewpoint on Mining Safety. It has enunciated a regenerated initiative towards increasing the safety of mineworkers in South Africa (Mining Safety | Mining Safety in South Africa, 2017:1). Twenty-seven years after apartheid in South African came to an end, the government still faces significant challenges concerning establishing deep-seated essential social changes to eradicate disparities, privation and joblessness. Key socio-political and important changes complemented by unsuccessful policy execution in South Africa and Africa at large have fashioned an elevated demand for efficient teaching and learning in adult education (AE) that would constitute enablement and social transformation in the African context (Danke & Mkhize, 2022:62).

After the first democratic elections in South Africa, the country's Mining Industry and its partners have applied several health and safety initiatives that have produced intense, life-saving results. Between the period 1995 and 2021, the number of fatalities

largely declined by 75%, with fall-of-ground fatalities in specific declining by 85%. Over the same period, the total number of injuries decreased by 66%. Unfortunately, the Mining Industries' safety performance worsened in 2021 for the second year, with the number of fatalities and injuries growing yearly. Fatalities regressed by 23%, thus increasing from 60 in 2020 to 74 in 2021 – and injuries increased by 11% – from 1,814 in 2020 to 2,014 in 2021. This intolerable regression has produced great worry among industry stakeholders. Extra resources have been without delay dedicated to research and aid grasp of the origin of this worsening safety performance (Safety in Mining – Minerals Council South Africa, 2022:1).

Table 1: Causes of fatalities: 2011 - 2021

Description	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**
Fall of ground	40	25	32	35	22	24	33	22	20	22	20
Transportation and mining	38	29	31	14	20	23	31	16	15	9	16
General	25	35	19	29	22	16	18	18	7	18	22
Other	20	23	11	6	13	10	8	25	9	11	16
All	**123**	**112**	**93**	**84**	**77**	**73**	**90**	**81**	**51**	**60**	**74**

Source: Adapted from Safety in Mining – Minerals Council South Africa (2022:1).

Education in South Africa should be seen as an essential part of the country's reconstruction, development and transformation process. The foundation for the government’s Adult Education and Training (AE&T) policy must be aligned with the larger goal of a just and equitable education system to recognize and regulate quality education and training for mature learners across the country. The Bill of Rights in the Constitution of the Republic of South Africa (1996) emphasizes the "right of all citizens to receive basic education, including basic and continuing education for adults, which must be progressively provided and accessible by the State through reasonable measures". The White Paper on Education (1995:37) states that "the right to a basic education applies to all, that is, all children, youth and adults". Therefore, basic

education can be regarded as a legal right enjoyed by everyone. (Policy Document on Adult Education and Training, 2003:4-5).

LITERATURE REVIEW

Adult Education and Training (AE&T) introduces and creates a learning culture that lays the foundation for focused and planned learning, determined to acquire the required knowledge and skills essential to social and economic development. Thereby it ensures that these individuals' purposeful learning contributes to the country's social, economic and political arena. Adult Education and Training (AE&T) provides functional literacy and remedial education, including on-the-job, vocational, continuing and post-secondary education, and training and employment. Adult Education and Training (AE&T) includes literacy and post-literacy because the focus is on literacy and adult education to ensure they receive the necessary training and development to generate income. Therefore, Adult Education and Training (AE&T) can be considered to precede Further Education and Training (FET). Adult Education and Training (AE&T) and Further Education and Training (FET) can be seen as two elements of Adult Education and Training (AET) that methodically guide mature learners on a path of lifelong learning and development (Policy Document on Adult Education and Training, 2003:5).

The South African Ministry of Education's national definition of AE&T is: "Adult education and training is a common theoretical footprint of lifelong learning and development, including the knowledge, skills and attitudes needed for social, economic and political participation and transformation. AE&T can be considered developmental and targets the clear needs of specific audiences, and in an ideal world provide nationally recognized credentials" (Policy Document on Adult Education and Training, 2003:8-9).

The world-wide beatification of adult education approaches and projections at the UNESCO International Conferences on Adult Education in Elsinore in 1949, Montreal in 1960, Tokyo in 1972, Paris in 1985 and Hamburg in 1997 can be regarded as a professional show case for adult education. The United Nations Educational, Scientific

and Cultural Organization (UNESCO) convened the International Conference on Adult Education in Elsinore, Denmark, in June 1949. Ten years later, the Second World Conference on Adult Education was held in Montreal from August 22 to 31, 1960. The conference focuses on education for adults in a changing world. The conference allowed delegates to review educational developments over the past decade and articulate future plans and goals. The importance of the International Conference of UNESCO is to integrate the current state of adult education worldwide and to propose future plans that ultimately lay the foundations for adult education in Africa and South Africa (UNESCO, 1949). Paulo Freire has been instrumental in the consensus on adult education and its use as a transformational tool. He can be considered one of the foremost theorists and practitioners of the critical approach to modern adult education, and his efforts have been recognized worldwide. Paulo Freire's work in adult education was inspired by the Latin American popular culture movements of the 1960s. His writings reveal the two main streams of Marxism and Liberation theology. He is recognized globally as a leading figure in critical pedagogy (Larney, 2006: 17).

The Freirean method is unique in that it emphasises the development of learners' self-awareness of their ability to understand the various pressures of a given social reality, in other words, what constitutes their world and how they create feelings. This method, often referred to as conscience, centres on the learner's ability to develop literacy and cognitive skills, enabling them to diagnostically examine everyday problems and find potential solutions to help cope with everyday life. Freire argues that literacy cannot be seen as a non-substantial technical skill but as a free cultural act. Literacy is seen as part of an intervention involving self-deprecating the historically shaping nature of personal experience. Freire further emphasizes that people can name their life and social experiences. It allows them to understand the wider workings of the wider political spectrum (Larney, 2006:18).

The oil crisis of 1970-1970 was a contributory factor to globalization and thus went hand in hand with the implementation of neoliberal policies in some Western countries, leading to fluctuations in adult education. It is widely believed that globalization has changed the traditional role of adult education from an emphasis on collective interests, to a very individualized form of learning focused on economic needs (Griffins, 1987: 32; Larney, 2006: 21). IMF International organizations such as the

International Organization (IMF), the World Bank and its Structural Adjustment Policy, and UNESCO, have moulded the educational rationality of governments around the world. South Africa will have to align with the international literacy movement, whose sole purpose is to achieve social transformation, reconstruction and development and advance adult education and training (Larney, 2006: 21). The state has used literacy campaigns and many methods of promoting adult education and training to achieve nation-building and a mechanism for nation-building. These actions differ by national goals, levels of leadership involvement, and the duration and level of investment of national resources (Adult Education and Training Policy Paper, 2015: 34).

The Education for All Forum agrees on the certainty of providing education for all, on ethical and economic terms. This further endorses the responsibility of governments to provide Education for all as a societal objective. Education For All (EFA) embraced a comprehensive and expansive notion of education from early childhood to continued learning throughout life. As well as promoting various delivery systems, be that formal, non-formal or informal education. In the African context, the prospect of eradicating illiteracy through Education for all was an opportunity not to be missed (Larney, 2006:24-25). The Africa continent, including South Africa, was, for the first time, offered a chance to eradicate illiteracy with the help and support of the international community. The responsibility is now on the country to offer a transparent and concise strategy and to see that the implementation is effective and founded on a methodological and rational approach (Thiam, 1990:503). One of the outcomes of Education For All (EFA) is the centralised policy-making in adult education, and fewer stakeholders have input on how adult education or basic education policies are developed (Hall, 1996:119; Larney, 2006:25).

Jacques Delors joined the education field through the global dominance of neoliberal and postmodernist fragmentation, providing answers to the role education must play in meeting the challenges of the 21st century. A striking feature of the Delors Commission is its acknowledgement that globalization has not contributed to the social and economic uplift of the poor but has led to global unemployment and more significant disparities between rich and poor countries (Larney, 2006: 25-26). In 2000, the EFA International Consultative Forum, established in 1991 to observe the

implementation of EFA (Education for All), organized the Dakar EFA Forum. There are concerns that the goals set in Jomtien to recognize that the basic learning needs of children, youth and adults are met, have not been achieved and that there has been an unprecedented increase in poverty worldwide (Rani, 2006:26-27). The question can now be raised if UNESCO lives up to its reputation as the guardian of integrity in global literacy, as UNESCO loses focus and leadership shifts to countries with more resources and less enthusiasm for adult education (Larney, 2006: 27).

The fight against apartheid underscored South Africa's emphasis on human rights and adult education. Little was done to educate the black community during the South African Nationalist government (Sibiya, 2007: 12). After the Nationalist government came to power in 1948, one of their first priorities was to appoint a committee to articulate the ideology, aspirations and educational intentions of the indigenous peoples of South Africa as a sovereign race. Following the recommendations made by the committee, the government enacted legislation in the Bantu Education Act of 1953. The law was formulated to treat African education as an isolated entity rather than part of the traditional education system in South Africa. The idea of a substandard and irrelevant education for Africans was introduced in a debate in September 1953 by the then Minister of Indigenous Affairs. The main purpose of the apartheid educational system was to ensure identification with rural culture and to impose obedience, community loyalty, racial division, acceptance of assigned social roles, and connection to rural culture (McKay, 2007: 287).

The result of the Bantu Education Act of 1953 and the effect that the inadequate education system had and is still having due to high illiteracy rates is a hugely painful subject that affects not only individuals but entire nations. This is shown by the human capital theory, which holds a direct positive correlation between education and a country's gross national product. The human capital theory provides a foundation or outline for bringing the economics of education, discrimination, and poverty into a microeconomic framework called human resource economics. The human capital theory is built on the school of thought that educated and well-trained people will be entitled to better jobs and higher salaries, as opposed to people with no or little

education. The focus is now on completing qualifications, as it means individuals are now paying more attention to investing in their education, training and development to remain competitive.

In the words of the Minister of Native Affairs:

"*There is no place for him [the black child] in the European [white South African] community above the level of certain forms of labour. Until now, he has been subject to a school system which drew him away from his community and misled him by showing him the green pastures of European society in which he is not allowed to graze*."

Hendrik Verwoerd (cited in Troup, 1976:22).

It can be argued that the explicit purpose of apartheid and the apartheid educational system was to keep Africans subservient and ignorant. At the same time, the education of black South Africans was regulated economically, socially, psychologically and spiritually by the apartheid system. The choice faced by African parents is to put their children through the poor Bantu education system or not at all. In fact, with only one in every two school-age African children attending school, parents are not prepared to pass up the opportunity to educate their children, even if the quality is poor. Between 1976 and 1994, school attendance was not compulsory, and schools were seen as places to promote liberation struggles. As this results in a lack of education for a large part of the population, it is donated to the huge need for Adult Basic Education (AE&T) in South Africa. The establishment of democracy in South Africa did little to reduce the country's illiteracy rate, and there was no real strategy for determining literacy rates. The fact that South Africa has 11 official languages makes it more challenging to define literacy in the context of the primary language of the economy and the communicative habits of adults who do not speak the primary language when conducting a national survey (McKay, 2007:288).

In trying to understand the importance of education in this country, one must pay attention to the many demographic factors that influence education in South Africa.

Under the South African constitution, the country is divided into nine provinces. Each province has its own legislature, prime minister and provincial executive council members and is known for its unique landscapes, flora, weather and socioeconomic issues. Some provinces are plunged into poverty, where food and shelter are the most important issues, and education is placed second on the agenda. From 1996 to 2001, the number of poor people in South Africa did not change substantially. As a result, households living in poverty became poorer, and the gap between rich and poor widened by 6.3% (Steyn, Steyn, De Waal, Wolhuter, 2011; Mouton, et al., 2012:1213). Poverty eradication should have been the focus of the New Democracy. Still, the focus on reforming the education system made matters worse as it widened the wealth gap in South Africa (Nongxa, 2010: 11). Poverty in these communities is evident in schools, as more than half of South Africa's schools lack classrooms (nearly 65,000 classrooms), and 23 million students attend schools without access to water. As many as 6.6 million students attend schools without toilets (Steyn et al., 2011; Ramphele, 2012:12; Mouton et al., 2012:1213). From 1989 to 1994, South Africa was engulfed in a chapter known as the Moral Panic due to the political and social terror of young black South Africans. The result of broken home boycotts of schools, violent streets and a depressed economy is a failed generation of young South Africans living outside the social fabric and lacking the values needed to maintain a civilized society. In 1991, the Lost Generation was expected to reach 5 million to 6 million people. Educated authors argue that extreme levels of illiteracy also contributed to the loss of the generation from 1990 to 1994 (Seeking, 1996: 103-122). Government statistics in 1996 indicated that 27% of adults had not attended school, and 41% had partially completed primary education, the first seven years of education (Statistics South Africa, 1996). Official figures indicate that by 2002, 54% of the population had completed only part of primary education (Presidency 2003). Worryingly, this group is expanding regardless of the country's policy changes and compulsory education institutions (Statistics South Africa, 1996). During apartheid, a focus was placed on the importance of adult education in the struggle for justice and human rights in South Africa. After decades of democracy in South Africa, Adult Education and Training (AE&T) covers a wide range of practices, the importance of which has changed over the relevant period.

- Adult education and training (AE&T) are also seen as part of job-related training to ensure that adult learning leads to skills development for the industry and the country.
- Adult education and training (AE&T) are also life skills training, including HIV and AIDS training.

Before 1994, Adult Education and Training (AE&T) was driven by various providers, including religious groups, university students, workers' organizations, political parties, literacy programs in state night schools, and training provided by various mining companies. Formal technical and vocational training is often offered to white children and learners. Students of colour entered what were then technical colleges and designated schools, while mission schools were usually reserved for African students. To sum up, it can be said that in the history of adult education, the educational philosophy and the transition from the Reconstruction and Development Program (RDP) policy to the Growth, Employment and Redistribution (GEAR) policy. After 1994, Adult Education and Training (AE&T) became part of a state-driven curriculum that transformed every aspect of the country's education and training system. The new National Qualifications Framework (NQF) has led to integrating adult education and adult training (Larney, 2006:29-30).

In 2020, the South African adult illiteracy rate was 10%, showing an increase of 2.1 percentage points from 2019 and a noteworthy decrease of 8.6 percentage points over the last ten years. Notwithstanding the abovementioned statistics, it is still a grave concern that approximately 3.7 million adults in South Africa are illiterate. Another important statistic is the number of women at a 10.7% illiteracy rate, compared to men at 9.3%. Thus, women still miss out on prospects to contribute fully to society and be absorbed in the workplace. It can be considered that due to traditional family compositions, women fulfil the role of caregivers and stay home to raise children. The table below clearly shows that the highest illiteracy rates are between the ages of 50 to 64 (Khuluvhe, 2022:4-7).

Table 2: Number and percentage of persons in the population who have not completed grade 7 and above by age group - 2010 to 2020.

	2010	2010	2010	2019	2019	2019	2020	2020	2020
Age Group	Number	%Share	Illiteracy rate	Number	%Share	Illiteracy rate	Number	%Share	Illiteracy rate
15-19	468 023	9.5	9.1	273 780	8.2	5.9	249 900	9.2	9.2
20-24	273 759	5.6	5.1	168 264	5.0	3.5	90 726	3.3	3.3
25-29	345 196	7.0	7.0	190 108	5.7	3.5	109 863	4.0	4.0
30-34	336 698	6.9	8.6	252 375	7.5	4.6	201 091	7.4	7.4
35-39	390 863	8.0	11.5	305 203	9.1	6.5	211 387	7.8	7.8
40-44	533 340	10.9	18.9	284 801	8.5	7.9	223 755	8.2	8.2
45-49	639 470	13.0	25.7	360 403	10.8	12.1	286 933	10.5	10.5
50-54	701 422	14.3	33.5	452 181	13.5	18.5	384 427	14.1	14.1
55-59	653 955	13.3	38.2	540 381	16.1	25.8	515 339	18.9	18.9
60-64	560 503	11.4	43.3	524 633	15.7	31.1	451 056	16.6	16.6
Total	4 903 228	100.0	14.8	3 352 128	100.0	8.8	2 724 476	100.0	100.0

Source: Adapted from Khuluvhe (2022:4-7)

The specific objective of the study is to define the meaning of Adult Education and Training and Occupational Health and Safety in the Mining Company and to conduct a theoretical study of the significance of Adult Education and Training and Occupational Health and Safety in the Mining Company.

METHODOLOGY

The study undertook a survey research design and used a convenience sampling technique selected from the study's target population. The data were collected utilizing questionnaires and analyzed using factor analysis and descriptive statistics with the help of SAS software version 9.4.

Respondents have qualifications ranging from lower than matric to tertiary qualifications. Are employed in the Mining Company in positions ranging from unskilled, skilled, middle managers, senior managers and top management levels.

The total sample (n=522) consisted of 265 (50.77%) participants from the Gold Operations and 257 (49.23%) from the Platinum Operations. 422 (81.15%) were males, and 98 (18.85%) were females. The highest age distribution is 40-49 (30.06%). A large number of the group, 164 (31.84%), have matric, and the majority, 164 (31.84%), have a certificate as the highest level of education. Most of the Gold Operations participants are from the Kloof Mine (23.91%). In platinum, the Rustenburg Operations had (26.28%) participants, with skilled workers at (48.60%) the highest level of participants in the study.

Research procedure

The rationale and intent of the study were detailed in a cover letter to obtain initial data. The cover letter clearly states that participation in the research is entirely voluntary and anonymous, and the information obtained will be used for research purposes only. Also attached was the questionnaire to be distributed to participants in a gold and platinum Mine. The University Ethics Committee approved the use of these data and received a permission number for this specific purpose.

Measuring instrument

The survey tool used is a questionnaire that can be used whenever factual information is required and should be designed according to certain rules and standards. A well-designed questionnaire results from long-term planning of research goals, articulation of questions, and hypotheses. The questionnaire must be carefully curated and designed to increase the reliability and persuasiveness of the data to an acceptable tolerance (Botha, 2012: 43-44).

In sections B to E of the questionnaire, the respondent had to indicate his or her agreement in terms of *Strongly disagree, disagree, agree, and strongly agree.*

B: Effect of training interventions

C: Effect of ownership

D: Effect of increased management and direction

E: Effect of improved communication.

Part B measures the impact of training interventions, enablers, and training methods on reducing the number of accidents and fatalities. Part C measures the impact of training ownership and behaviour on reducing accidents and fatalities. Part D measures the impact of enhanced management guidance and leadership on reducing accidents and fatalities. Part E measures the impact of improved communication practices on reducing mining company accidents and fatalities.

Data Analysis

Kaiser's sample adequacy (MSA) was calculated to determine if factor analysis was appropriate, indicating the mutual correlation between variables (Tabachnick & Fidell, 2001). The index ranges from 0 to 1 and reaches 1 when the others perfectly predict each variable.

The measure can be explained using the following guidelines:

0.80: Active

0.70: Moderate

0.60: Mediocre

0 50: Miserable

< 0.50: Unacceptable (Hair et al., 1998).

Test reliability refers to the constancy of scores obtained when the same person uses the same test on different occasions, with a different array of equivalent items, or when reassessed under new variable examination conditions (Anastasi & Urbina, 1997: 84). Test validity refers to what the test measures and how well it is performed (Anastasi & Urbina, 1997: 113). If the test is valid, it measures the effect it should measure across all effects. Since "reliability is a property of the data" (Eason, 1991:84), researchers must pay attention to the effect of participants on the quality of scores in each study. As Thompson (1994: 839) explains since total score variance is an important

component of reliability, the participants in the study themselves will influence score reliability: "The same measure, when applied to a more heterogeneous or homogeneous groups of participants, scores with opposite reliability will be generated."

Considering the diversity of research participants involved in different fields and the fact that research designers involving psychological tests must provide reliability coefficients for the scores of the analyzed data. As Pedhazur and Schmelkin (1991: 86) argue: "Researchers who take the trouble to report reliability approximations for the instruments they use, in many cases report only reliability guesses contained in the instrument manuals or statements made by others Estimates of researchers. Information of this nature may be beneficial for comparative reasons. Still, it is important to know that the applicable reliability estimates are those of the sample used in a particular study" because similar arguments have validity. According to Nunnally and Bernstein (1994: 84), validity is the degree to which an all-or-nothing entity is related, and authentication is a never-ending practice. All psychological measures require constant assessment and reassessment to determine whether they continue to work. Test validity refers to what the test measures and how well the test is appropriate (Anastasi and Urbina, 1997). Aiken and Groth-Marnat (2006) see the inadequacy of this definition because it implies that a question test has only one type of validity.

It has been argued that a test may have many opposing validities, depending on the specific reasons for which it was designed, the target sample, the specific conditions and circumstances in which it was performed, and the actual method used to determine its validity. However, Pedhazur and Schmelkin (1991) took a position and rejected the idea of a per-sy type of validity but acknowledged that it is suitable for the organization, especially for discussion purposes. For them, the different aspects of effectiveness are not mutually exclusive and end; therefore, there are no different variants. It must always be considered that reliability is only affected by occasional measurement errors. However, the validity of tests is affected by both non-systematic

and systematic (constant) errors. For this reason, a test may be reliable or not valid, but in no case can it be valid or unreliable.

Facets of Validity

Conceptions are equivalent to conceptual or theoretical formulations that aim to organize and help us understand our environment. Therefore, the main goal is to use the observed variables to illustrate unobservable structures or concepts, such as intelligence or anxiety (Pedhazur & Schmelkin, 1991). Therefore, construct validity can be viewed as the degree to which a test measures theoretical concepts or characteristics, such as attributes such as personality traits and intelligence.
Construct validity may include measures of criterion-related validation, convergence validation, and content validation.

- Standards-Related Validation.
- Standards-related validation has two opposing aspects:
    - Concurrent verification; and
    - Predictive validation.

Both are built on correlation (Aiken & Groth-Marnat, 2006; Anastasi & Urbina, 1997). For example, suppose a test is designed to measure intelligence. In that case, it must show that test scores are highly correlated with the results of a recognized intelligence test (intelligence standard or scale) (Aiken & Groth-Marnat, 2006; Anastasi & Urbina, 1997). In establishing concurrent validity, researchers test a group of participants and associate scores with standard measures indicative of the tested variable. Predictive validity is an integral part of validation concerning criteria, for example, criteria measures obtained in the future, usually, months or years after the test scores are reached (Nunnally & Bernstein, 1994). For instance, if a high score on this subtest coincides with a high score in Math, and on the other hand, a low score on this subtest coincides with a low score in Math, the GSAT total subtest score will have predictive validity (3).

Convergent and Discriminant Validation

A construct-validating tool should have a high correlation with measures or methods measuring the same construct (convergent validity) but little correlation with measures of a different construct (discriminant validity) (Anastasi & Urbina, 1997). Convergence verification is a structurally valid method that indicates that the real test results match the expected results. For example, if there is a test that assesses digital proficiency, and if it excels in convergent validity, hypothetically, an employee in a risk management department, such as an organization's risk manager, is likely to score higher on the following than employees from other departments tested. Discriminant validity can be seen as a complement to convergent validation. Measuring an unrelated concept in a situation where one attribute is not strongly correlated with another one can assume that the test is discriminatively valid. For example, leadership skills cannot be assumed to be highly correlated with introversion.

Content Validation

Content verification is not to be confused with the term "appearance validity", which can be viewed as a non-scientific judgment, referring to how good a test is likely to be to the person applying it. However, the test must have face validity because, without face validity, it can be assumed that collaboration and inspiration, as well as client and public acceptance, would be problematic (Linn, 1989:610).

Content validation focuses on two issues, namely:

- Does the test contain content of interest? For example, are the items on the math achievement test based on math concepts?
- Is the test right for your participants? For example, is the content consistent with a college math major?

Evaluating content effectiveness is done in one of two ways, namely:

- Subjectively.
- From experience.

The subjective approach involves asking experts to judge the importance of the test items concerning the subject area being assessed. Empirical methods, such as principal component analysis and factor analysis, identify the basic structure of the test items.

When measuring the reliability of a questionnaire, the most popular technique is called Cronbach's alpha or coefficient alpha. Cronbach's alpha is a statistical measurement tool designed to test reliability and internal consistency. It also indicates whether the item in the measurement tool and the subsections of the item are highly correlated. Therefore, Cronbach's alpha (α) is the reliability coefficient of the items in the survey tool, focusing on the quality of the measurements (Farmer, 2010: 53-54).

Cronbach alpha represents how well a statement measures the same underlying concept. Therefore, it can be assumed that the larger the obtained Cronbach's alpha, the more reliable the scale. This, in turn, means that if similar individual responses are observed for a set of statements, it can be concluded that these statements measure the same structure. It is important to note that values greater than 0.7 should be obtained for reliable items (Farmer, 2010: 53-54). An example that can be used is a questionnaire, which produces a different score each time it is used and is subject to the same conditions. This will then result in a low-reliability factor. Values > 0.7 are acceptable. A value > 0.8 is good (Botha, 2012:53). The following formula can be used to calculate Cronbach's alpha:

Equation 1: Cronbach's alpha coefficient

$$\boldsymbol{a} = \frac{\boldsymbol{k}}{\boldsymbol{k-1}}\left[\mathbf{1} - \frac{\sum_{\mathbf{1}}^{\boldsymbol{k}} \boldsymbol{Q}_{y_i}^{\mathbf{2}}}{\boldsymbol{\sigma}_{\boldsymbol{x}}^{\mathbf{2}}}\right]$$

Where:

α= Cronbach's alpha coefficient

$\boldsymbol{k}$ = number of items in the construct

$\boldsymbol{Q}_{\boldsymbol{y_i}}^{\boldsymbol{2}}$= variance of item, I , where I = 1 to $\boldsymbol{k}$

$\boldsymbol{\sigma}_{\boldsymbol{x}}^{\boldsymbol{2}}$= variance of the observed total item scores

Individual questions were analysed to establish Cronbach's alphas for the study. The mean value as basic descriptive statistics was used in the analysis. It can be described as the most common measure to describe trends in a dataset, is the degree to which all data values are grouped around a central value. The mean is calculated by adding the variable values for all observations and dividing it by the number of observations (Levine et al., 2008: 97; Farmer, 2010: 53). Variance is calculated by finding the squared difference between an observation and the mean, taking the sum of all cases, and dividing them by the number of observations minus one. It also describes the average dispersion of values around the mean, which in turn indicates the dispersion of the data (Levine et al., 2008: 106; Farmer, 2010: 53). The standard deviation (SD) can be defined as the square root of the variance, which in turn describes the dispersion of the data around the mean (Levine et al., 2008:107; Farmer, 2010:53).

Ethical Consideration

Ethical permission for this study was obtained from the North-West University (NWU) Potchefstroom campus Ethics Committee (ethics number: 00552-18-S4). The study was conducted on employees with a lower degree than college graduates. Field workers were briefed on the intent and objectives of the study and asked to distribute questionnaires to colleagues and learners in their specific workplaces. The purpose and objectives were detailed in a cover letter accompanying the questionnaire and distributed by field staff to all participants. The questionnaire included an introductory section emphasising in writing to each participant that participation was voluntary and anonymous. Participants were not asked at any stage to provide any information that could personally identify them.

RESULTS AND DISCUSSIONS

Construct Validity

Factor analyses were done individually for Section B of the questionnaire. The factor analysis was conducted to reduce data and ensure the validity of constructs. The results of the factor analysis in section B are as follows:

Table 3: Factor Analysis

Items			Number of factors	% Variance	Cumulative reporting of analysis
Section B	N	MSA	Retained	Explained	Vary between
B1-B4 B5-B16	383	0.96	2	65.49	0.58 and 1.00

As indicated in table 1, the factor analysis in section B produced two factors. The two factors were aptly named:

1. Training Intervention Enablers (B1 to B4) and;
2. Training Methodologies (B5 to B16).

The MSA recognises that the sample was adequate (large enough) to perform the factor analysis. The construct validity will have to be confirmed by how the factor analysis group the questions and the Cronbach alpha values for these groupings.

Reliability

Cronbach Alpha values to confirm reliability are reported in the table.

Table 4: Cronbach's Alpha Values

Construct	**N**	**C.A**
Training Interventions enablers	477	0.82
Training Methodologies	393	0.94

According to Field, all the indicated Cronbach Alpha values are higher than 0.6. Thus, indicating that the constructs are reliable (Field, 2014).

Table 5: Does planning and provision of Adult Education and OH&S contribute to fewer accidents and fatalities?

Variable	N	Mean
B1	477	3.39
B2	477	3.27
B3	477	3.31
B4	477	3.33
B5	393	3.19
B6	393	3.27
B7	393	3.35
B8	393	3.38
B9	393	3.41
B10	393	3.38
B11	393	3.44
B12	393	3.36
B13	393	3.30
B14	393	3.33
B15	393	3.32
B16	393	3.40

Concerning the Likert scale from 1-4, the midpoint can be considered to be 2.5. For this study, 2.5 was utilised to determine if planning and provision of Adult Education and OH&S contribute to fewer accidents and fatalities.

It can be concluded from the sample that participants tend to agree that planning and provision of Adult Education and OH&S contribute to fewer accidents and fatalities lies from agreeing to strongly agree on the questionnaire.

Frequency analysis and descriptive statistics

As can be seen from the descriptive statistics on the statement, “Whether better planning and provision of adult education and training and occupational health and safety training for miners contributes to improving the literacy of mining company employees and reducing fatalities”. None of the respondents responded to a statement with a value greater than 4. However, most statements had an average exceeding the neutral response (3.00). This indicates a tendency to agree positively.

Q# B11 noted that "on-the-job coaching" as a means of better planning and delivering adult education and occupational health and safety training for miners can help improve employee literacy and reduce fatalities in mining companies" scored the highest. The mean is 3.44 and the standard deviation is 0.69.

Q# B5 states that “increasing informal training” as a means of better planning and delivering adult education and occupational health and safety training for miners can help improve employee literacy and reduce fatalities in mining companies, on average. The lowest scores were 3.19 and 1.81; the standard deviations may indicate a need for alternative training methods in the field.

Table 6: Frequencies: QB1- QB16

		R	SD	D	A	SA	MISSING	MEAN	STD DEV
B1	Quality of training and learning material leads to better AE&T OHS training.	502	20	9	222	251	20	3.39	0.71
B2	Reinforcement of a culture of learning.	504	14	20	276	194	18	3.27	0.67

B3	The removal of learning barriers by means of creating the capacity to send people for H&S training as well as AE&T training.	505	17	17	259	212	17	3.31	0.70
B4	The implementation of proactive training (Virtual Reality and Simulation Training).	505	10	21	264	210	17	3.33	0.64
B5	The increase in informal training.	496	30	29	237	200	26	3.19	0.81
B6	The enablement of peer teaching.	492	11	31	247	203	30	3.27	0.68
B7	Greater focus on the retention of knowledge of standards.	495	14	18	227	236	27	3.35	0.70
B8	A proper learning design regarding mine standards and unit standards.	490	14	15	209	252	32	3.38	0.70
B9	Quality of facilitations.	486	10	15	204	257	36	3.41	0.67
B10	High standard assessment.	491	10	21	231	229	31	3.38	0.66
B11	On-job coaching.	490	12	17	196	265	32	3.44	0.69
B12	Specific skills courses.	491	15	21	203	252	31	3.36	0.72
B13	Specialised capacity-building courses.	494	14	27	233	220	28	3.30	0.70
B14	Formal practical courses under coaching.	500	14	15	253	218	22	3.33	0.68
B15	Formal exposure under supervision.	499	12	28	239	220	23	3.32	0.68
B16	Supervisory and leadership development.	495	19	20	199	257	27	3.40	0.72

LEGEND**:** *R - Respondent; SD - Strongly Disagree; D - Disagree; A – Agree; SA – Strongly Agree*

The study aimed to investigate if better planning and provision of Adult Education and Training and Occupational Health and Safety could reduce mine-related accidents and fatalities.

The study wanted to know if improved planning and provision of Adult Education and Training and Occupational Health and Safety training of mineworkers provide more

literate employees and fewer fatalities in the Mining Company. The results are shown in the tables below;

Table 7: Quality of training and learning material leads to better AE&T OHS training.

	Frequency	Percent	Cumulative Percent
Strongly disagree	20	3.98	3.98
Disagree	9	1.79	5.78
Agree	222	44.22	50.00
Strongly agree	251	50.00	100.00
Missing	20	0	
Total	522	100.0	

The results from table 7 reveal that 50 % of the respondents strongly agreed and 44% agreed, 9% disagreed, and 20% strongly disagreed that the Quality of training and learning material leads to better AE&T OHS training. Based on the cumulative percentage, which indicates that most of the respondents agree with the statement, this implies that the Quality of training and learning material leads to better AE&T OHS training.

Table 8: Reinforcement of a culture of learning contributes to more literate employees and fewer fatalities in the Mining Company.

	Frequency	Percent	Cumulative Percent
Strongly disagree	14	2.78	2.78
Disagree	20	3.97	6.75
Agree	276	54.76	61.51

Strongly agree	194	38.49	100,00
Missing	18	0	
Total	522	100.0	

The study wanted to know if reinforcement of a culture of learning contributes to more literate employees and fewer fatalities in a Mining Company. It was observed that 4% disagreed, 3% strongly disagreed, 38% of the respondents strongly agreed, and 55% the respondents agreed that a reinforcement of a culture of learning contributes to more literate employees and fewer fatalities in a Mining Company.

Table 9: The removal of learning barriers by means of creating the capacity to send people for H&S training as well as AE&T training contributes to more literate employees and fewer fatalities in the Mining Company.

	Frequency	Percent	Cumulative Percent
Strongly disagree	17	3.37	3.37
Disagree	17	3.37	6.73
Agree	259	51.29	58.02
Strongly agree	212	41.98	100.00
Missing	17	0	
Total	522	100	

The results from table 9 highlighted that in the majority, 42% of the respondents, strongly agreed, 51% agreed, 3% strongly disagreed, and 3% disagreed that the removal of learning barriers by creating capacity to send people for H&S training as well as AE&T training contributes to more literate employees and fewer fatalities in a Mining Company. 52% of the respondents agreed that implementing proactive training

(Virtual Reality and Simulation Training) contributes to more literate employees and fewer fatalities in a Mining Company.

Table 10: The implementation of proactive training (Virtual Reality and Simulation Training) contributes to more literate employees and fewer fatalities in the Mining Company.

	Frequency	Percent	Cumulative Percent
Strongly disagree	10	1.98	1.98
Disagree	213	4.16	6.14
Agree	264	52.28	58.42
Strongly agree	210	41.58	100
Missing	17	0	
Total	522	100	

It was noted that 42% of the respondents strongly agreed, 52% agreed with the statement, 2% strongly disagreed, and 4% disagreed that implementing proactive training (Virtual Reality and Simulation Training) contributes to more literate employees and fewer fatalities in a Mining Company. The result shows that 52%, the majority, agree with the statement, which implies that implementing proactive training with specific reference to virtual reality and simulation training contributes to more literate employees and fewer fatalities in a Mining Company.

Table 11: The increase in informal training contributes to more literate employees and fewer fatalities in the Mining Company

	Frequency	Percent	Cumulative Percent
Strongly disagree	30	6.05	6.05
Disagree	29	5.85	11.90
Agree	237	47.78	59.68
Strongly agree	200	40.32	100
Missing	26	0	
Total	522	100	

The study wanted to know if the increase in informal training contributes to more literate employees and fewer fatalities in a mining Company form the results of the study, 40% of the respondents strongly agreed, 48% of the respondents agreed, 6% strongly disagreed, and 6% disagreed to the statement.

Table 12: The enablement of peer teaching contributes to more literate employees and fewer fatalities in the Mining Company

	Frequency	Percent	Cumulative Percent
Strongly disagree	11	2.24	2.24
Disagree	31	6.30	8.54
Agree	247	50.20	58.74
Strongly agree	203	41.26	100

Missing	30	0	
Total	522	100	

From the study results, 41% of the respondents strongly agreed, 50% agreed, 2% strongly disagreed, and 6% disagreed with the statement that the enablement of peer teaching contributes to more literate employees and fewer fatalities in the Mining Company. Therefore, the results indicates that 50%, the majortiy agree with the statement, which implies that the enablement of peer teaching contributes to more literate employees and fewer fatalities in the Mining Company.

Table 13: Greater focus on the retention of knowledge of standards contributes to more literate employees and fewer fatalities in the Mining Company.

	Frequency	Percent	Cumulative Percent
Strongly disagree	14	2.83	2.83
Disagree	18	3.64	6.46
Agree	227	45.86	52.32
Strongly agree	236	47.68	100
Missing	27	0	
Total	522	100	

From the results of the study, 48% of the respondents strongly agreed, 46% of the respondents agreed, 3% strongly disagreed, and 4% disagreed with the statement that a greater focus on the retention of knowledge of standards contributes to more literate employees and fewer fatalities in a Mining Company.

Table 14: Proper learning design regarding mine standards and unit standards contributes to more literate employees and fewer fatalities in the Mining Company.

	Frequency	Percent	Cumulative Percent
Strongly disagree	14	2.86	2.86
Disagree	15	3.96	5.92
Agree	209	42.65	48.57
Strongly agree	252	51.43	100.00
Missing	32	0	
Total	522	100	

The study results reveal that 51% of the respondents strongly agreed, 43% agreed, 3% strongly disagreed, and 4% disagreed with the statement that proper learning design regarding mine standards and unit standards contributes to more literate employees and fewer fatalities in a Mining Company. Because the results further indicate that the majority of the total respondents which is 51%, strongly agreeing with the statement, which implies that proper learning design regarding mine standards and unit standards contributes to more literate employees and fewer fatalities in a Mining Company.

Table 15: The quality of facilitations contributes to more literate employees and fewer fatalities in the Mining Company.

	Frequency	Percent	Cumulative Percent
Strongly disagree	10	2.06	2.06
Disagree	15	3.09	5.14
Agree	204	41.98	47.12

Strongly agree	257	52.88	100
Missing	36	0	
Total	522	100	

The study results reveal that 53% of the respondents strongly agreed, 42% agreed, 2% strongly disagreed, and 3% disagreed with the statement that the quality of facilitations contributes to more literate employees and fewer fatalities in a Mining Company.

Table 16: High standard assessment contributes to more literate employees and fewer fatalities in the Mining Company.

	Frequency	Percent	Cumulative Percent
Strongly disagree	10	2.04	2.04
Disagree	21	4.28	6.31
Agree	231	47.05	53.36
Strongly agree	229	46.64	100.00
Missing	31	0	
Total	522	100	

The results in table 16 highlighted that the majority of the respondents of the study that is 47% agreed that high standard assessment contributes to more literate employees and fewer fatalities in a Mining Company. Also, 46% strongly agree with the statement. However, 2% strongly disagreed, and 4% disagreed with the statement that high standard assessment contributes to more literate employees and fewer fatalities in the Mining Company.

Table 17: On the job coaching contributes to more literate employees and fewer fatalities in the Mining Company.

	Frequency	Percent	Cumulative Percent
Strongly disagree	12	2.45	2.45
Disagree	17	3.47	5.92
Agree	196	40.00	45.92
Strongly agree	265	54.08	100.00
Missing	32	0	
Total	522	100	

The study results reveal that 54% of the respondents strongly agreed, 40% agreed, 2% strongly disagreed, and 3% disagreed with the statement that job coaching contributes to more literate employees and fewer fatalities in a Mining Company. Therefore, the results indicates that 54%, the majortiy strongly agree with the statement, which implies that on the job coaching contributes to more literate employees and fewer fatalities in the Mining Company.

Table 18: Specific skills courses contribute to more literate employees and fewer fatalities in the Mining Company**.**

	Frequency	Percent	Cumulative Percent
Strongly disagree	15	3.05	3.05
Disagree	21	4.28	7.33
Agree	203	41.34	48.68

Strongly agree	252	51.32	100.00
Missing	31	0	
Total	522	100	

It was noted that 51% of the respondents strongly agreed, 41% agreed, 3% strongly disagreed, and 4% disagreed with the statement that specific skills courses contribute to more literate employees and fewer fatalities in the Mining Company.

Table 19: Specialised capacity building courses contribute to more literate employees and fewer fatalities in the Mining Company.

	Frequency	Percent	Cumulative Percent
Strongly disagree	14	2.83	2.83
Disagree	27	5.47	8.30
Agree	233	47.17	55.47
Strongly agree	220	44.53	100.00
Missing	28	0	
Total	522	100	

The study results reveal that 44% of the respondents strongly agreed, 47% agreed, 3% strongly disagreed, and 5% disagreed with the statement that specialised capacity-building courses contribute to more literate employees and fewer fatalities in the Mining Company. Therefore, the results indicates that 47%, the majortiy agree with the statement, which implies that specialised capacity building courses contribute to more literate employees and fewer fatalities in the Mining Company.

Table 20: Formal practical exposure under supervision contributes to more literate employees and fewer fatalities in a Mining Company.

	Frequency	Percent	Cumulative Percent
Strongly disagree	14	2.80	2.80
Disagree	15	3.00	5.80
Agree	253	50.60	56.40
Strongly agree	219	43.60	100.00
Missing	22	0	
Total	522	100	

The results in table 20 highlighted that the majority of the respondents of the study that is 50% agreed that formal exposure under supervision contributes to more literate employees and fewer fatalities in a Mining Company. Also, 44% strongly agreed to agree with the statement. However, 3% strongly disagreed, and 3% disagreed with the statement that high standard assessment contributes to more literate employees and fewer fatalities in the Mining Company.

Table 21: Formal exposure under supervision contributes to more literate employees and fewer fatalities in the Mining Company.

	Frequency	Percent	Cumulative Percent
Strongly disagree	12	2.40	2.40
Disagree	28	5.61	8.02
Agree	239	47.90	55.91
Strongly agree	220	44.09	100.00

Missing	23	23	
Total	522	100	

The study results reveal that 44% of the respondents strongly agreed, 48% agreed, 2% strongly disagreed, and 6% disagreed with the statement that formal exposure under supervision contributes to more literate employees and fewer fatalities in the Mining Company. Therefore, the results indicates that 48%, the majortiy agree with the statement, which implies that formal exposure under supervision contributes tributes to more literate employees and fewer fatalities in the Mining Company.

Table 22: Supervisory and leadership development contributes to more literate employees and fewer fatalities in the Mining Company.

	Frequency	Percent	Cumulative Percent
Strongly disagree	19	3.84	3.84
Disagree	20	4.04	7.88
Agree	199	40.20	48.08
Strongly agree	257	51.92	100.00
Missing	27	0	
Total	100	100	

The results in table 22 highlighted that the majority of the respondents of the study that is 52%, strongly agreed that supervisory and leadership development contributes to more literate employees and fewer fatalities in a Mining Company. Also, 51% strongly agreed with the statement. However, 4% strongly disagreed, and 4% disagreed with the statement that supervisory and leadership development contributes to more literate employees and fewer fatalities in the mining company. Therefore, the results indicates that 52%, the majortiy strongly agree with the statement, which

implies that supervisory and leadership development contributes to more literate employees and fewer fatalities in the Mining Company.

PRACTICAL IMPLICATIONS

The outcomes of the current study have enlarged the prevailing body of knowledge with regard to better planning and provision of Adult Education and Occupational Health and Safety training and the contribution thereof to reduced accidents and fatalities in the Mining Industry**.** Intervention enablers and training approaches should be considered as future interventions to enhance better planning and delivery of adult education, training, and occupational health and safety to reduce mine-related accidents and fatalities. Modernizing training strategies and interventions should refocus on enablers to bring about the necessary changes to help companies remain competitive, comply with regulations and develop their workforce, creating a learning organization and environment in which employees can grow and thrive and reach their full potential.

LIMITATIONS AND RECOMMENDATIONS

Though the research provided some prized findings, it is also essential to note the current study's limitations. One of the most significant limitations to conducting this research is the apparent lack of research on adult education and training (AE&T) and occupational health and safety (OHS) in mining companies in this research area, as scientific resources are limited in number. The research was also limited because it only involved the gold and uranium industries. However, the study significantly contributes to new scientific resources in this particular field of study. Construct validity was confirmed with an MSA of 0.96 for both constructs, suggesting that construct validity can be a useful tool for assessing factors influencing training, occupational health, and safety to reduce mine-related accidents and fatalities in South African workplaces. Future research may consider more variables influencing better planning, AET, and occupational health and safety. The two factors resulting from the research, training intervention enablers and training methods, should be considered as future interventions to enhance adult education and training and better planning and delivery of occupational health and safety to reduce mine-related accidents and death toll.

The following training intervention enablers and training methods may be considered:

- Virtual Reality
- Simulation training

CONCLUSION

In conclusion, the objective of the article was achieved as the need to reinforce a learning culture and break down learning barriers was identified and confirmed as a key deliverable if the Mining Company wants to reinvent the organisation and align with revised training strategies. The quality of training material, training facilities and competent facilitators are key strategic deliverables that will ensure the successful role out and implementation of the proposed conceptual model. Furthermore, the results support the idea that better planning and provision of Adult Education and Occupational Health and Safety training contributes to reduced accidents and fatalities in the Mining Industry. This is possible by focusing on the quality of training and learning material and, as alluded to earlier, reinforcing and implementing a culture of learning. Removing learning barriers by creating the capacity to send employees for training could ultimately result in a more productive workforce. The modernization of learning methodologies and the implementation thereof could provide the Mining Company with a competitive edge in the industry.

REFERENCES:

Aiken, L.R. & Groth-Marnat, G 2006. *Psychological testing and assessment*. 12th ed. Boston, MA: Pearson Education.

Anastasi, A. & Urbina, S. 1997. *Psychological testing*. 7th ed. New York, NY: Prentice Hall.

Botha, E. 2012*. Information Technology Governance Framework in higher education in South Africa: A paradigm shift.* Potchefstroom: North-West University. (Minidissertation – Masters).

Danke, S. & Mkhize, T.R. 2022. *Adult learner perceptions of Adult Basic Education and Training curriculum in a rural village of North West Province, South Africa: curriculum, career aspirations and social change alignment*. http://ul.ac.za/aportal/application/downloads/Article%205_5_2_nov_2021.pdf Date of access: 20 August 2022.

Farmer, R.A. 2010. *Improving Occupational Health and Safety in a petrochemical environment through culture change*. Potchefstroom: North-West University. (Mini-dissertation – Masters).

Griffins, C. 1987. *Adult education: as social policy*. London: Croom Helm.

Hair, J.R., Anderson, R.E., Tatham, R.L & Black, W.C. 1998. *Multivariate data analysis*. Upper Saddle River, NJ: Prentice Hall.

Hall, B. 1996. Adult education and political economy of global economic change. (In Wangoola, P. & Youngman, F., eds. *Towards a transformative political economy of adult education: Theoretical and practical challenges*. Champaign, IL: LEPS Press. http://www.jceps.com/wp-content/uploads/PDFs/05-1-10.pdf Date of access: 15 October 2021.

Khuluvhe, M. 2022. *Fact Sheet - Adult illiteracy in South Africa.* http.www.dhet.gov.za Date of Access: 20 August 2022.

Larney, R. 2006. *AE&T programmes at community learning centres in the Western Cape*. Cape Town: University of the Western Cape. (Mini-dissertation – Masters).

Levine, D. M., Stephen, D. F., Krehbiel, T. C. & Berenson, M. L. 2008. *Statistics for managers.* 5th ed. Upper Saddle River, NJ: Pearson. http:/www./aditya30702.files.wordpress.com/statistics-for-managers-using Date of access: 5 April 2021.

Linn, R.L. 1989. *Educational measurement*. New York, NY: Macmillan

McKay, V. 2007. *Adult education and training in South Africa*. http://www.ncsall.net/fileadmin/resources/ann_rev/rall_v7_ch9.pdf Date of access: 5 May 2021.

Mining Safety. 2022. *Mining safety in South Africa* https://www.miningsafety.co.za/dynamiccontent/61/mining-safety-in-south-africa Date of access: 10 April 2022.

Mining Laws. 2022. *Mining safety. Health and safety legislation* http://www.miningsafety.co.za/mininglaws?p=&sp=&ssp=&sssp= Date of access: 14 June 2022.

Mouton, N., Louw, G.P. & Strydom, G.L. 2012. A historical analysis of the post-apartheid dispensation education in South Africa (1994-2011). *International Business & Economic Research Journal,* 11(11):1213. http://www.nwu.ac.za/webfm_send/62311 Date of access: 17 September 2021.

Nongxa, L. 2010. Tertiary institutes ignore the first fewer ones at peril. *Sunday Times, p11.*

Nunnally, J. & Bernstein, I.H. 1994. *Psychometric theory.* 3rd ed. New York, NY: McGraw-Hill.

Pedhazur, E. & Schmelkin, L. 1991. *Measurement, design and analysis*. Hillsdale, NJ: Erlbaum, 819.

Peterson, D. 2017. *Basic Information on Adult Education*. ThoughtCo. https://www.thoughtco.com Date of access: 28 April 2022.

Policy Document on Adult Education and Training. 2003. http://www.education.gov.za/LinkClick.aspx?fileticket Date of access: 20 June 2021.

Rosenthall, R. 1991. *Meta-analytic procedures for social research*. Newbury Park: CA. Sage.

Ramphele, M. 2012. Partnerships can help SA teaching. *The Star, p12.*

Safety in the Mining. 2022. *Minerals Council of South Africa*. https://www.mineralcouncil.org.za/downloads/send/3-factsheet/1915-safety-in-mining-2021 Date of access: 20 June 2022.

Steyn, H.S. (Jr.). 2000. Practical significance of the difference in means. *Journal of Industrial Psychology*, 26(3):1-3.

Seekings, J. 1996. *The 'Lost Generation': South Africa's 'Youth Problem' in the early – 1990's* http://archive.lib.msu.edu/DMC/African%20Journals/pdfs/.../tran029007.pdf Date of access: 8 July 2021.

Sibaya, O.S. 2007*. A comparative analysis of methods used in AE&T facilitation*. KwaDlangezwa: University of Zululand. (Dissertation – Masters).

Tabachnick, B.G & Fidell, L.S. 2001. *Using multivariate statistics*. 4th ed. Boston, MA: Allyn &Bacon.

Thiam, I.D. 1990. The *Jomtiem plan of Action in the Sub-Saharan context*. Prospects, XX(4). http://www.unesdoc.unesco.org/images/0010/001015/101554eo.pdf Date of access: 11 August 2021.

Troup, F. 1976. *Forbidden pastures.* London: International Defence Aid Fund. http://www.unesdoc.unesco.org/images/0010/001015/101554eo.pdf Date of access: 18 April 2021.

UNESCO. 1949. *Summary Report of the International Conference on Adult Education*. Elsinore: UNESCO http://www.unesdoc.unesco.org/images/0007/000712/071263eo.pdf Date of access: 27 May 2021.

What is AE&T. https://pmg.org.za/docs/2002/appendices/020917AE&T.htm Date of access: 20 March 2021.

White Paper on Education and Training. 1995. *Notice 196 of 1995* http://www.education.gov.za/LinkClick.aspx?fileticket...tabid=191&mid Date of access: 2 February 2021.

CHAPTER 3: RESEARCH ARTICLE 2

TO CRITICALLY DEFINE, DISCUSS AND INTERPRET THE IMPACT OF THE CONCEPT OF OWNERSHIP AND RESPONSIBILITY IN GENERAL IN THE SELECTED MINES

The article is prepared for the African Journal of Employee Relations. The specifications, as outlined in the Journal, were followed in writing the article.

ABSTRACT

Orientation: Taking ownership is all about being inventive, creative, and taking the initiative all in one. The moment that we believe that taking action is not somebody else's responsibility is the exact time we take ownership of an event or situation (Tanner, 2017:1). As individuals, we are responsible for the excellence and correctness of an end product, irrespective of whether we are working alone or in groups. As an individual, you are concerned about the product and results like the company's owner or owners would be. In reality, it does not require an individual to take ownership of the project, or they should necessarily involve others. It does, however, indicate that an individual has an obligation towards the desired outcomes, results and products of the company and to influence events that directly impact the anticipated outcomes. A team member may have a grand idea of saving the company money or working more safely. Still, it falls outside the scope of their role, and it could probably take a lot of time and resources, and the ultimate responsibility lies elsewhere in the organisation. Taking ownership would then mean that you share your ideas with someone in a position with the time, resources, and capacity to influence the situation (Tanner, 2017:1).

Research purpose: The principal objective of this research is to define and interpret the concept of ownership and responsibility in South Africa in general and in the mining sector in particular.

Motivation for the study: To obtain more insight into the literature to define the concept of ownership and responsibility in South Africa and the Mining sector in particular.

Research design, approach and method: A convenience sample of 522 responses was obtained from a survey that was conducted at a Gold and Platinum mine in South Africa. An overall number of 522 participants responded to the initial survey, resulting in a convenience sample used in its entirety for the present study.

Main findings: By establishing higher, practical and measurable standards of compliance and conduct, the Mining Company can benefit from the practical

implementation of some basic concepts of ownership and responsibility as contributors to more skilled employees and improved safety achievement.

Practical/managerial implications: One of the most significant limitations to conducting this research is the apparent lack of research on adult education and training (AE&T) and occupational health and safety (OHS) in mining companies in this research area. Therefore, scientific resources are limited in number. The research was also limited because it only involved a gold and uranium Mining Company. However, the study significantly contributes to new scientific resources in this particular field of study.

Contribution/value added: The mining industry can benefit from the practical implementation of some basic concepts of ownership and responsibility as it helps to upskill employees and increase safety achievement.

Keywords: Adult Education, learning, literacy, read, write, tertiary qualification, ownership, responsibility.

INTRODUCTION

Taking ownership articulates, “You can trust me to do the appropriate and right thing”. Why is taking ownership important? The moment employees take ownership of their employment, they regard the company they are working for and its assets as belonging to them. Decisions will be made more contemplatively, conscientiously, and thoroughly. Employees will be more determined, inspired, and creative. They will look for innovative means to enhance and grow the business instead of just completing their daily tasks to receive a salary. In effect, this means that should companies wish to grow and expand their businesses, they must create a culture of ownership, which creates a much more positive and enjoyable working environment for all concerned. A key aspect in inspiring employees to take ownership is setting achievable goals and encouraging them to succeed without dictating the how, when and where in every instance. By focusing on the end goal, you are placing trust in your employees, and that trust empowers them (Tanner, 2017:1). A significant quantity of research has determined that trust without a doubt drastically donates to leader effectiveness. Trust is required in the supervisor-subordinate relationship for the simple reason that leaders and followers depend on each other to perform and to collectively achieve strategic objectives (Heyns, 2015:2).

Trust is essential in motivating employees to take ownership of what they do and care about the outcome. In most cases, employees who are handed responsibility are more than willing to accept responsibility. Employees should know exactly what the result should look like and be trusted to obtain those goals. Interfering and breathing down people’s necks is not a sound practice as it could create anger and smother initiative. Micromanaging can give rise to employees not being enthusiastic to complete tasks, especially where taking the initiative is disciplined because of how the tasks were completed and in instances where outcomes were criticised (Tanner, 2017:1). In light of the significant connexion between trust and numerous organisational processes and outcomes, corporate leaders have a duty to nurture trusting relationships with stakeholders and should esteem trust as a part of the overall business strategy (Heyns, 2015:3).

It also instils a culture in employees that they should ask for guidance and regularly report to ensure they are on the correct path. Problem-solving should be regarded as an enjoyable endeavour that allows employees to utilise other areas of their brains that are more creative than just executing orders. It should be a consideration that when a job or a task is allocated, the key factors should be defined in such a way that it leaves enough freedom to give employees scope for decision making, problem-solving, and creative thinking in order to achieve the desired outcomes (Tanner, 2017:1). Leadership consequently comprises of a highly collaborating process within which the capability to impact others in a multidirectional and non- coercive way constitutes a major catalyst for success (Dervitsiotis, 2006:795-810). Listen to employees to create trust and reciprocated respect, ownership is a collaborative effort. For employees to take ownership of their work, employers must create an environment in which they feel unrestricted to voice themselves amenably and truthfully and share their ideas with their principles. As defined earlier, ownership does not imply that employees will own the project and that others will necessarily, be excluded. It also involves taking the initiative to point out glitches or opportunities. The initiative cannot be contained and needs an outlet. The onus is thus placed on the employer in terms of listening to and acting on the ideas. In doing so, trust is built, as most of these employees are credible to have valid input and with more forthcoming ideas, the bigger the pool that can be utilised for better outcomes. It is, therefore, important to listen to employees and show them that their ideas matter regardless of whether they will be implemented and that the process creates trust and reciprocated respect (Tanner, 2017:1). The outcome of a culture where employees take ownership: The most productive people and those most probable to succeed are the ones who are pre-emptive about discovering solutions and solving problems and are comfortable working with escalating independence and reduced omissions. We live in a world where problems are increasingly multifaceted, resolute, and ground-breaking and problem-solving will stream from those who live their lives as if help and assistance are not forthcoming. Responsibility could, in most circumstances, resort to stronger and more action-oriented individuals; although all circumstances cannot be controlled, there are choices in how we respond. People who are responsible take charge of their actions and do not blame others (Tanner, 2017:1).

When a situation is created, that requires remedial action and a specific person's responsibility to act. The desired state is for someone to take ownership and fix the problem. This, however, does not exclude co-workers from taking ownership, assisting, and taking responsibility for what had transpired. In team environments, ownership represents problems as a collective responsibility, and a true leader will take full responsibility for good or bad results (Tanner, 2017:1).

According to Chester (2015:1-2) in order for employees to take ownership, leaders must equip employees and empower them by means if the following:

- Employees to participate in goal setting and organizing undertakings.
- Employees and managers to share a common vision.
- Manager to explain the reason for their actions.
- Employees to choose the how.
- Manager to trust their employees before they have to.
- Entrust authority to employees.
- Encourage employees to solve problems by themselves.
- Hold employees answerable for their action.
- Provide helpful criticism where necessary.
- Compliment headway made by employees.

LITERATURE REVIEW

Before 1976, government adult classes were held in evening schools for mature learners in primary and secondary schools. The courses are also very academic in variety and time-based, in most cases lasting 40 weeks and containing different courses depending on the literacy level of the adult learner (Larney, 2006:33-34). The current school building is used for classes and supervised by the adult center's head. The teachers employed were day schoolteachers and, in most cases, were not educated in adult education (Larney, 2006:33-34). In 1982, Edward French conducted

an HRSC survey which found that the courses were too theoretical and unsuitable for mature learners. Exam prerequisites are also not conducive to the needs of mature learners. Teaching methods are very rigid and comparable to the formal education system. Academic achievement leads to literacy certificates associated with lower standards in primary school. The courses offered do not consider the actual training needs of mature learners. The HRSC survey was conducted to illustrate and understand the Department of Education and Training (DET) attitude towards 'training' in evening schools: "...*others expressed a desire to introduce a practical curriculum, but proponents of the academic approach claim that this goes beyond the scope of this section (DET) may be impractical, and it is thought that most learners will reject it." (Ministry of Education and Training Official, quoted in French, 1982:25).* As can be seen from the above, there is little imminent need for NGOs or apartheid states to meet the need for practical training for mature learners. The motivation can be found in the ill-fated legal territorial battle between the Ministry of Manpower and the Ministry of Education and Training. This state of affairs has fallen on New Democratic South Africa (French, 1982:25). The new democratic government left behind a broken adult education system with no links between the different state departments or between the state and the private sector or NGOs. In apartheid countries, there is no nationally recognized benchmark for adult education provision. As a result, this leaves the country with very little adult education and no measure of the success or failure of the system. From the 1970s, literacy classes provided by non-governmental organizations (NGOs) and adult education supplied by apartheid governments had to be separated (Larney, 2006: 3-35).

According to French (1982), literacy efforts undertaken by the non-governmental organization (NGO) sector can be divided into three main groups, namely:

1. Non-Aligned Literacy Organisations;
2. Non-aligned training institutions, usually providing services to industry; and
3. Non-profit alternative liberty literacy organizations have played an essential role in liberation and liberation politics.

Non-aligned literacy organisations include the Bureau for Literacy and Literature (BLL/Litsa). The Literacy and Literature Bureau (BLL/Litsa) focuses on *an Organized curriculum that emphasizes individualized learning. Learners take exams to achieve Standard 4 literacy levels.* Action Upgrade (founded in 1966) focuses on *Teaching practical skills, health and religion. The main accusations against "escalation operations" are that there is not enough political focus and that they fail to empower and liberate mature learners.*

Other projects include projects:

- Molteno Project;
- Project literacy; and
- Word to Africa - largely biblical and evangelical based (Larney, 2006:32).

The strength of these organizations is their close relationship with the struggle, not the literacy classes they promote. Other donors to adult education included university students who supported Paulo Freire's work on the process of conscience of those involved in the struggle (French, 1992).

In the early 1990s, people in adult education were very optimistic. The new democratic government is attentive, prioritizing policy, and focusing on policies in the adult education sector that have almost no policy development. 1990 was an important year for individuals who had been deprived of education in the past for the following reasons:

- The United Nations professed 1990 as International Literacy Year, intending to eliminate illiteracy by the year 2000; and
- The unbanning of the people's organisation that occasioned the release of Nelson Mandela foreshadowed the end of Apartheid (Larney, 2006:36).

According to Larney (1982) the country's new political agenda calls for a new socio-economic development strategy. Considered the most important documents to help shape post-apartheid, socio-economic policy, and governance of the new democratic South Africa, including:

- Reconstruction and Development Plan (RDP - ANC 1994);
- Growth, Employment and Redistribution Policies (GEAR - ANC 1996); and
- Constitution of the Republic of South Africa.
- In the post-1994 era, socioeconomic development was built on either of the following two strategies:
  - Instant and fair reallocation of existing resources or
  - The surge in growth allocates greater resources.

These strategies are interpreted as macro-socio-economic policy framework documents, namely RDP (Reconstruction and Development Plan) and GEAR. GEAR (Growth, Employment and Redistribution Policies) was launched in 1996, and in 2005, the development status was proposed as an additional policy. The Reconstruction and Development Plan (RDP) speaks steadfastly about the relationship between growth and development, as growth and development are seen as equally exclusive. Growth takes precedence over development, which begins as a marginal attempt to redistribute to the poor (Reitzes, 2009: 5). Growth is defined as a surge in output and seen as a fundamental goal, however, when considering reconstruction and development, the sustainability of growth, distribution, the extent to which it contributes to building long-term productive capacity, human resource development and impact on the environment are key issues and reassigned to a joint program. It is important to connect an infrastructure project that will provide the citizens of South Arica with modern and efficient services such as electricity, water, telecommunications, transportation, health, education and training. The plan will meet basic needs and open up previously pent-up economic and human potential in urban and rural areas (ANC, 1994: 6).

With the launch of GEAR, the government is sending a message that, while the social goals of the RDP are lofty, they are insufficient to ensure faster economic growth, which is critical in providing resources to meet the country's social and investment needs.

The expected macroeconomic factors affecting GEAR are:

- A shortage of existing accounts is a negative constraint on continued economic growth; and
- A lack of domestic savings and an unwelcomely low level are preventing increased investment levels in the country.

Government deficits and tax policies can be seen as one reason for the low level of saving (Reitzes, 2009: 10). By the implementation of GEAR, the acumen of adult education as a measure to rebuild South African society has reverted from a political and revolutionary stance to a social and incrementalism stance focused on economic growth. Changes now focused on meeting economic needs doomed AE&T centres to embrace change and, by doing so, apply new curricula and diverse teaching methods and approaches. The AE&T Centre was exposed to different quality assurance systems. It introduced new disciplines such as Economics and Management Sciences (EMS), Small and Medium Enterprises (SMME), Technology and Tourism, and AE&T's Centre for Teaching Literacy Skills (Larney, 2006: 37 -38).

The contemporary workplace has experienced some remarkable transformations that has diminished dependance on customary foundations of power propelled from formal stances of authority. Drivers of change for example globalisation, diversity and technological innovations resulted in an increased focus on the interaction and self-directedness of employees as well as more adaptable team based, temporary work structures (Green, 2012:1-5; Heyns, 2015:2).

METHODOLOGY

Participants

The study undertook a survey research design and used a convenience sampling technique to select a sample size of 522 respondents from the study's target population. The data was collected using questionnaires and analyzed using factor analysis and descriptive statistics with the help of SAS software version 9.4. A convenience sample of 522 responses was obtained from a survey that was

conducted at a Gold and Platinum mine in South Africa. A total of 522 participants responded to the preliminary survey, which resulted in a convenient sample used in this study. Respondents' educational backgrounds ranged from below high school to college degrees. They were employed by mining companies in unskilled, skilled, middle management, senior management and top management positions. The total sample (n=522) included 265 (50.77%) participants from the gold operations and 257 (49.23%) participants from the platinum operations. There were 422 males (81.15%) and 98 females (18.85%). The uppermost age dispersal was 40-49 years (30.06%). A large number of the group, 164 (31.84%), have matric, and the majority, 164 (31.84%), have a certificate as the highest level of education. In the Gold Operations, most of the participants were from Kloof Mine (23.91%). In platinum, the Rustenburg Operations had (26.28%) participants, with skilled workers at (48.60%) the highest level of participants in the study.

Research procedure

The rationale and intent of the study were detailed in a cover letter and attached to a questionnaire to obtain initial data. It was distributed to participants in the gold and platinum Mining Company. The cover letter indicates that participation in the research is entirely voluntary and anonymous, and the information obtained will be used for research purposes only. The University Ethics Committee approved the use of these data and received a permission number for this specific purpose.

Measuring instrument

The survey tool used is a questionnaire that can be used when accurate factual information is required and should be designed according to certain rules and standards. A well-designed questionnaire results from long-term planning of research objectives, articulating questions and hypotheses. The questionnaire must be carefully curated and designed to increase the data's reliability and persuasiveness to an acceptable tolerance level (Botha, 2012: 43-44). In Parts B through to E of the questionnaire, the respondent must express their agreement with "strongly disagree," "disagree," "agree," and "strongly agree. “Part B measures the impact of training interventions, enablers, and training methods on reducing the number of accidents

and fatalities. Part C measures the impact of training ownership and behavior on reducing accidents and fatalities. Part D measures the impact of enhanced management guidance and leadership on reducing accidents and fatalities. Part E measures the impact of improved communication practices on reducing mining company accidents and fatalities.

Data analysis

To determine whether factor analysis is appropriate, Kaiser's sample adequacy measure (MSA), which indicates the correlation between variables, was calculated (Tabachnick & Fidell, 2001). The index ranges from 0 to 1 and reaches 1 when the others perfectly predict each variable.

The following criteria can explain the measure:

0.80: Active

0.70: Moderate

0.60: Mediocre

0 50: Miserable

< 0.50: Unacceptable (Hair et al., 1998).

Reliability of a test refers to the constancy of scores obtained by the same person on different occasions, using a different array of equivalent items, or reassessing the same person under new variable examination conditions (Anastasi & Urbina, 1997: 84). Test validity refers to what the test measures, and how well it is performed (Anastasi & Urbina, 1997: 113). If the test is valid, it measures all the effects it is supposed to measure. Since "reliability is a property of the data" (Eason, 1991:84), researchers must pay attention to the effect of participants on the quality of scores in each study. As Thompson (1994: 839) explained, since total score variance is an important component of reliability, the participants in the study themselves will influence score reliability: "The same measure, when applied to a more heterogeneous or homogeneous cohort of participants, a score will be produced as opposed to reliability". In considering the diversity of research participants involved in various fields and the fact that research designers involving psychological tests must provide reliability coefficients for the scores of the analyzed data. As Pedhazur and Schmeling

(1991: 86) argue: "Researchers who take the trouble to report reliability approximations for the instruments they use, in many cases only report reliability guesses contained in the instrument manuals or other researchers stated estimates. Information of this nature may be beneficial for comparative reasons. Still, ultimately it is crucial to know that the applicable reliability estimates are those obtained for the sample used in a particular study as a similar argument has validity. According to Nunnally and Bernstein (1994:84), validity is the degree to which an all-or-nothing entity is related, and authentication is a never-ending practice. All psychometrics need to be assessed continually and reassessed to determine whether they have been working. Test validity refers to what the test measures and how well the test is appropriate (Anastasi and Urbina, 1997). Aiken and Groth-Marnat (2006) see the inadequacy of this definition because it implies that the question test has only one validity. It has been argued that a test may have many opposing validities, depending on the specific reasons for which it was designed, the target sample, the specific conditions and circumstances in which it was performed, and the actual method used to determine its validity. However, Pedhazur and Schmelkin (1991) take a position and reject the idea of an effectiveness type per se but acknowledge that it is suitable for the organization, especially for discussion purposes. For them, the different effectiveness aspects are not mutually exclusive and end; therefore, there are no different variants.

It must always be considered that reliability is only affected by occasional measurement errors. However, the validity of tests is affected by both non-systematic and systematic (constant) errors. For this reason, a test may be reliable or not valid, but it cannot be valid or unreliable.

Facets of Validity

Conceptions are equivalent to conceptual or theoretical formulations that aim to organize and help us understand our environment. Therefore, the main goal is to use the observed variables to illustrate unobservable structures or concepts, such as intelligence or anxiety (Pedhazur & Schmelkin, 1991). Therefore, construct validity can

be viewed as the degree to which a test measures theoretical concepts or characteristics, such as attributes such as personality traits and intelligence.

Construct validity may include measures of criterion-related validation, convergence validation, and content validation.

- Standards-Related Validation
- Standards-related validation has two opposing aspects:
    - Concurrent verification
    - Predictive validation.

Both are built on correlation (Aiken & Groth-Marnat, 2006; Anastasi & Urbina, 1997) Predictive validity is an integral part of validation concerning criteria, for example, criteria measures obtained in the future, usually, months or years after the test scores are reached (Nunnally & Bernstein, 1994). For example, suppose a test is designed to measure intelligence. In that case, it must show that test scores are highly correlated with the results of a recognized intelligence test (intelligence standard or scale) (Aiken & Groth-Marnat, 2006; Anastasi & Urbina, 1997). In establishing concurrent validity, researchers test a group of participants and associate scores with standard measures indicative of the tested variable. For example, if a high score on this subtest coincides with a high score in Math, and on the other hand, a low score on this subtest coincides with a low score in Math, the GSAT total subtest score will have predictive validity (3).

Convergent and Discriminant Validation

A construct-validating tool should have a high correlation with measures or methods measuring the same construct (convergent validity) but little correlation with measures of a different construct (discriminant validity) (Anastasi & Urbina, 1997). Convergence verification is a structurally valid method that indicates that the real test results match the expected results. For example, if there is a test that assesses digital proficiency and if it excels in convergent validity, hypothetically, an employee in a risk management department, such as an organization's risk manager, is likely to score higher than the employees from other departments tested. Discriminant validity can

be seen as a complement to convergent validation. Measuring an unrelated concept in a situation where one attribute is not strongly correlated with another one can assume that the test is discriminatively valid. For example, leadership skills cannot be assumed to be highly correlated with introversion.

Content Validation

Content verification is not to be confused with the term "appearance validity", which can be viewed as a non-scientific judgment, referring to how good a test is likely to be to the person applying it. However, the test must have face validity because, without face validity, it can be assumed that collaboration and inspiration, as well as client and public acceptance, would be problematic (Linn, 1989:610).

Content validation focuses on two issues, namely:

- Does the test contain content of interest? For example, are the items on the math achievement test based on math concepts?
- Is the test right for your participants? For example, is the content consistent with a college math major?

Evaluating content effectiveness is done in one of two ways, namely:

- Subjectively or
- From experience.

The subjective approach involves asking experts to judge the importance of the test items concerning the subject area being assessed. Empirical methods, such as principal component analysis and factor analysis, identify the basic structure of the test items. When measuring the reliability of a questionnaire, the most popular technique is called Cronbach's alpha or coefficient alpha. Cronbach's alpha is a statistical coefficient tool designed to test reliability and internal consistency. It also indicates whether the item in the measurement tool and the subsections of the item are highly correlated. Therefore, Cronbach's alpha (α) is the reliability coefficient of the items in the survey tool, focusing on the quality of the measurements. Cronbach alpha represents how well a statement measures the same underlying concept. Therefore,

it can be assumed that the larger the obtained Cronbach's alpha, the more reliable the scale. This, in turn, means that if similar individual responses are observed for a set of statements, it can be concluded that these statements measure the same structure. It is important to note that values greater than 0.7 should be obtained for reliable items (Farmer, 2010: 53-54).

An example that can be used is a questionnaire, which produces a different score each time it is used and is subject to the same conditions. This will then result in a low-reliability factor.

Values > 0.7 are acceptable.
A value > 0.8 is good (Botha, 2012:53).

The following formula can be used to calculate Cronbach's alpha:

Equation 1: Cronbach's alpha coefficient

$$\boldsymbol{a} = \frac{\boldsymbol{k}}{\boldsymbol{k-1}}\left[\mathbf{1} - \frac{\sum_{\mathbf{1}}^{\boldsymbol{k}} \boldsymbol{Q}_{y_i}^{\mathbf{2}}}{\boldsymbol{\sigma}_{\boldsymbol{x}}^{\mathbf{2}}}\right]$$

Where:

α= Cronbach's alpha coefficient

$\boldsymbol{k}$ = number of items in the construct

$\boldsymbol{Q}_{y_i}^{\mathbf{2}}$= variance of item, i, where i = 1 to $\boldsymbol{k}$

$\boldsymbol{\sigma}_{\boldsymbol{x}}^{\mathbf{2}}$= variance of the observed total item scores

Individual questions were analysed to establish Cronbach's alphas for the study.

The mean as basic descriptive statistics was used in the analysis. A mean can be described as the most common measure to describe trends in a dataset; it is the degree to which all data values are grouped around a central value. The mean is

calculated by adding the variable values for all observations and dividing it by the number of observations (Levine et al., 2008: 97; Farmer, 2010: 53). Variance is calculated by finding the squared difference between an observation and the mean, taking the sum of all cases, and dividing them by the number of observations minus one. It also describes the average dispersion of values around the mean, which in turn indicates the dispersion of the data (Levine et al., 2008: 106; Farmer, 2010: 53). The standard deviation (SD) can be defined as the square root of the variance, which in turn describes the dispersion of the data around the mean (Levine et al., 2008:107; Farmer, 2010:53).

Ethical Consideration

Ethical permission for this study was obtained from the North-West University (NWU) Potchefstroom campus Ethics Committee (ethics number: 00552-18-S4). The study was conducted on employees with a lower degree than a college graduate. Field workers were briefed on the intent and objectives of the study and asked to distribute questionnaires to colleagues and learners in their specific workplaces. The purpose and objectives were detailed in a cover letter accompanying the questionnaire, which was distributed by field staff to all participants. The questionnaire included an introductory section emphasising in writing to each participant that participation was voluntary and anonymous. Participants were not asked at any stage to provide any information that could personally identify them.

RESULTS AND DISCUSSION

Construct Validity

Factor analyses were done individually for Sections C, of the questionnaire. The factor analysis was conducted to reduce data and ensure the validity of constructs.

The results of the factor analysis in section C are as follows.

Table 1: Factor Analysis

Items			Number of factors	% Variance	Cumulative reporting of analysis
Section C	N	MSA	Retained	Explained	Vary between
C1-C12	387	0.95	1	66.59	0.59 and 1.00

The MSA recognises that the sample was adequate (large enough) to perform the factor analysis. The construct validity will have to be confirmed by how the factor analysis group the questions and the Cronbach alpha values for these groupings.

Reliability

Cronbach Alpha values to confirm reliability are reported in the table.

Table 2: Cronbach's Alpha values

Construct	**N**	**C.A**
Ownership	387	0.93

According to Field, all the indicated Cronbach Alpha values are higher than 0.6. thus, indicating that the constructs are reliable (Field, 2014).

Table 3: Do Ownership of Adult Education and OH&S training contribute to fewer accidents and fatalities?

VARIABLE	**N**	**MEAN**
C1	387	3.33
C2	387	3.42
C3	387	3.32
C4	387	3.35
C5	387	3.26
C6	387	3.28

C7	387	3.35
C8	387	3.29
C9	387	3.30
C10	387	3.31
C11	387	3.29
C12	387	3.32

Concerning the Likert scale from 1-4, the midpoint can be considered to be 2.5. For this study, 2.5 was used to determine if Ownership of Adult Education and OH&S training contribute to fewer accidents and fatalities. It can be concluded from the sample that participants tended to agree that Ownership of Adult Education and OH&S training contribute to fewer accidents and fatalities.

Frequency analysis and descriptive statistics

Descriptive Statistics from Response Statements "Can the ownership of AE&T and Occupational Health and Safety practise and behaviours contribute to fewer fatalities and incidents and accidents in the Mining Company?" None of the responses to the statements has a response greater than four. However, most statements scored a mean value greater than the neutral response of 3.00, indicating an inclination towards positive agreement.

Q# C2 affirms that "Bringing back accountability for developing employees" *as* a means of ownership of AE&T and Occupational Health and Safety practises and behaviours contributes to fewer fatalities and incidents, and accidents in the Mining Company scored the highest, with a mean value of 3.42, with a standard deviation of 0.69.

Q# C5 affirms that "Locus of control (Internal and external) as a means of ownership of AE&T and Occupational Health and Safety practises and behaviours contribution to

fewer fatalities and incidents and accidents in the Mining Company scored the lowest, with a mean value of 3.26, with a standard deviation of 0.64.

Table 4: Frequencies: QC1- C12

		R	SD	D	A	SA	MISSING	MEAN	STD DEV
C1	Establishing higher standards for compliance and behaviour.	488	12	13	247	216	34	3.33	0.67
C2	Bringing back accountability for developing employees	486	11	26	200	249	36	3.42	0.69
C3	Role clarification and responsibility.	486	12	14	254	206	36	3.32	0.66
C4	Consequential thinking (understanding consequences)	480	10	16	249	205	42	3.35	0.64
C5	Locus of control (Internal and external).	474	9	23	263	179	48	3.26	0.64
C6	Capacity building.	482	11	22	266	183	40	3.28	0.64
C7	Confidence in ability.	477	10	13	244	210	45	3.35	0.64
C8	Careful reasoning.	487	12	22	263	190	35	3.29	0.65
C9	The use of judgement in assessing information.	485	15	24	247	199	37	3.30	0.70
C10	Achieving predetermined results.	477	13	14	259	191	45	3.31	0.65
C11	Awareness of the implications of proposed actions.	480	12	18	266	184	42	3.29	0.64
C12	Analysis of relationships between previously unrelated sets of information to identify possible future implications and consequences.	476	14	12	252	198	46	3.32	0.67

LEGEND**:** *R - Respondent; SD5 - Strongly Disagree; D - Disagree; A – Agree; SA – Strongly Agree*

The study wanted to know whether ownership of AE&T and occupational health and safety practices and behaviors could help reduce fatalities, accidents, and incidents in mining companies, and the results are shown in the table below.

Table 5: Establishing higher standards for compliance and behaviour.

	Frequency	Percent	Cumulative Percent
Strongly disagree	12	2.4	2.46
Disagree	13	2.66	5.12
Agree	247	50.61	55.74
Strongly agree	216	44.26	100.00
Missing	34	O	
Total	522	100	

The results from table 5 reveal that 44% of the respondents strongly agreed and 51% agreed, 3% disagreed, and 2% strongly disagreed that establishing higher standards for compliance and behaviour contributes to fewer fatalities and incidents and accidents in the Mining Company.

Table 6: Bringing back accountability for developing employees.

	Frequency	Percent	Cumulative Percent
Strongly disagree	11	2.26	2.26
Disagree	26	5.35	7.61
Agree	200	41.15	48.77
Strongly agree	249	51.23	100
Missing	36	0	
Total	522	100	

The study wondered whether restoring accountability to developing employees could help reduce fatalities, accidents and accidents at mining companies. It was observed that 5% disagreed, 2% strongly disagreed, 51% strongly agreed, and 41% agreed to restore a sense of responsibility for developing employees helps reduce fatalities, accidents and accidents for Mining Companies.

Table 7: Role clarification and responsibility.

	Frequency	Percent	Cumulative Percent
Strongly disagree	12	2.47	2.47
Disagree	14	2.88	5.35
Agree	254	52.26	57.61
Strongly agree	206	42.39	100
Missing	36	0	
Total	522	100	

The results from table 7 highlighted that the majority, namely 52% of the respondents agreed and 42% of the respondents strongly agreed, 2% strongly disagreed that and 3% disagreed that role clarification and responsibilities contribute to fewer fatalities and incidents and accidents in the Mining Company.

Table 8: Consequential thinking (understanding consequences).

	Frequency	Percent	Cumulative Percent
Strongly disagree	10	2.08	2.08
Disagree	16	3.33	5.42
Agree	249	51.88	57.29
Strongly agree	205	42.71	100.00
Missing	42	0	
Total	522	100	

The results from table 8 reveal that 43 % of the respondents strongly agreed and 52% agreed, 3% disagreed and 2% strongly disagreed that consequential thinking (understanding consequences) contributes to fewer fatalities and incidents and accidents in the Mining Company.

Table 9: Locus of control (Internal and External).

	Frequency	Percent	Cumulative Percent
Strongly disagree	10	2.08	2.08
Disagree	16	3.33	5.42
Agree	249	51.88	57.29
Strongly agree	205	42.71	100

Missing	42	0	
Total	522	100	

The study wanted to know if the locus of control (Internal and External) could contribute to fewer fatalities, incidents, and accidents in the Mining Company. It was observed that 3.3% disagreed, 2% strongly disagreed, 43% strongly agreed, and 52% agreed that locus of control (Internal and External) contribute to fewer fatalities and incidents and accidents in the Mining Company.

Table 10: Capacity building.

	Frequency	Percent	Cumulative Percent
Strongly disagree	11	2.28	2.28
Disagree	22	4.56	6.85
Agree	266	55.19	62.03
Strongly agree	183	37.97	100
Missing	40	0	
Total	100	100	

The study wanted to know if the capacity building could contribute to fewer fatalities, incidents, and accidents in the Mining Company. It was observed that 5% disagreed, 2% strongly disagreed, 38% of the respondents strongly agreed, and 55% agreed that capacity buildings contribute to fewer fatalities and incidents and accidents in the Mining Company.

Table 11: Confidence in ability.

	Frequency	Percent	Cumulative Percent
Strongly disagree	10	2.10	2.10
Disagree	13	2.73	4.82
Agree	244	51.15	55.97
Strongly agree	210	44.03	100
Missing	45	0	
Total	522	100	

The results from table 11 reveal that 44% of the respondents strongly agreed and 51% agreed, 3% disagreed, and 2% strongly disagreed that confidence in ability contributes to fewer fatalities and incidents and accidents in the Mining Company.

Table 12: Careful reasoning.

	Frequency	Percent	Cumulative Percent
Strongly disagree	12	2.46	2.46
Disagree	22	4.52	6.98
Agree	263	54.00	60.99
Strongly agree	190	39.01	100
Missing	35	0	
Total	522	35	

The results from table 12 reveal that 39 % of the respondents strongly agreed and 54% agreed, 5% disagreed and 2% strongly disagreed that careful reasoning contributes to fewer fatalities and incidents and accidents in the Mining Company.

Table 13: The use of judgement in assessing information.

	Frequency	Percent	Cumulative Percent
Strongly disagree	15	3.09	3.09
Disagree	24	4.95	87.04
Agree	247	50.93	58.97
Strongly agree	199	41.03	100
Missing	37	0	
Total	522	100	

The study wanted to know if using judgement in assessing information contributes to fewer fatalities, incidents, and accidents in the Mining Company. It was observed that 5% of the respondents disagreed, 3% strongly disagreed, 41% strongly agreed, and 51% agreed that the use of judgement in assessing information contributes to fewer fatalities and incidents and accidents in the Mining Company.

Table 14: Achieving predetermined results.

	Frequency	Percent	Cumulative Percent
Strongly disagree	13	2.73	2.73
Disagree	14	2.94	5.66
Agree	259	54.30	59.96
Strongly agree	191	40.04	100
Missing	45	0	
Total	522	100	

The results from table 14 highlighted that the majority of the study, namely 54% of the respondents agreed, 40% strongly agreed, 3% strongly disagreed, and 3% disagreed that achieving predetermined results contribute to fewer fatalities and incidents and accidents in the Mining Company.

Table 15: Awareness of the implications of proposed actions.

	Frequency	Percent	Cumulative Percent
Strongly disagree	12	2.50	2.50
Disagree	18	3.75	6.25
Agree	266	55.42	61.67
Strongly agree	184	38.33	100
Missing	42	0	
Total	522	100	

The results from table 15 reveal that 38% of the respondents strongly agreed, 55% agreed, 4% disagreed, and 3% strongly disagreed that awareness of the implications of proposed actions contributes to fewer fatalities and incidents and accidents in the Mining Company.

Table 16: Analysis of relations between previously unrelated sets of information to identify possible future implications and consequences.

	Frequency	Percent	Cumulative Percent
Strongly disagree	14	2.94	2.94
Disagree	12	2.52	5.46
Agree	252	52.94	58.40
Strongly agree	198	41.60	100
Missing	46	0	
Total	522	100	

The study wanted to know whether analyzing relationships between previously unrelated sets of information to determine likely future impacts and consequences could help reduce fatalities and accidents in the Mining company. It was observed that 3% disagree, 3% strongly disagree, 42% strongly agree, and 53% agreed that analysis of relationships between previously unrelated sets of information to determine possible future impacts and consequences could help reduce fatalities and accidents.

PRACTICAL IMPLICATIONS

The outcomes of the current study have enlarged the prevailing body of knowledge with regard to better planning and provision of Adult Education and Occupational Health and Safety training and the contribution thereof to reduced accidents and fatalities in the Mining Industry**.** Investigating the concepts of ownership and liability will help researchers better understand these concepts and will help mining companies apply some of the fundamental drivers to achieve better safety records.

LIMITATIONS AND RECOMMENDATIONS

A limitation of conducting this research is the apparent lack of research on Adult Education and Training (AE&T) and Occupational Health and Safety (OHS) in mining companies in this research area, so there is a limited number of scientific research resources available for this multidisciplinary study. The fact that the MSA was confirmed to have a construct validity of 0.95 suggests that construct validity can be considered a valuable tool for assessing whether AE&T ownership and occupational health and safety practices and behaviors contribute to mining company fatalities.

CONCLUSION

In conclusion, the study aims to contribute to the mining industry as a whole as the industry can benefit from the practical implementation of some basic concepts of ownership and responsibility as it helps to upskill employees and increase safety achievement. Question two affirms that “Bringing back accountability for developing employees” is a means of ownership of AE&T. The Occupational Health and Safety practises and behaviours contribute to fewer fatalities, incidents, and accidents in the Mining Company, scored the highest and thus indicate that accountability for developing employees’ rests on management's shoulders. Furthermore, the result of the study indicates that role clarification and consequential thinking are factors that the Mining House should consider embedding in its culture. Locus of control could be incorporated in psychometric assessments as a selection tool to ensure a workforce with an internal locus of control instead of an external locus of control. Lastly, building confidence in employees’ capabilities will ensure a productive and stable workforce.

REFERENCES:

African National Congress. 1994. *The reconstruction and development programme: A policy framework.* Johannesburg: Umanayano.

Aiken, L.R. & Groth-Marnat,G 2006. *Psychological testing and assessment*. 12th ed. Boston, MA: Pearson Education.

Anastasi, A. & Urbina, S. 1997. *Psychological testing*. 7th ed. New York, NY: Prentice Hall.

Botha, E. 2012. *Information Technology Governance Framework in higher education in South Africa: A paradigm shift.* Potchefstroom: North-West University. (Mini dissertation – Masters).

Department of Education **see** South Africa. Department of Education.

Dervitsiotis, K.N. (2006). Building trust for excellence in performance and adaption to change. *Total Quality Management*, 17, 795-810.

Chester, E. 2015. 10 Ways to Encourage Employees to Take Ownership in Their Work. https://ericchester.com/10 Ways to Encourage Employees to Take Ownership in Their Work. Date of access: 1 June 2023.

Farmer, R.A. 2010. *Improving Occupational Health and Safety in a petrochemical environment through culture change*. Potchefstroom: North-West University. (Mini-dissertation – Masters).

Field, A. 2009. *Discovering statistics using SPSS*. 3rd ed. London: Sage.

French, E. 1982. *The promotion of literacy in South Africa. A multi-faceted survey at the start of the eighties.* Pretoria: Human Science Research Council.

Green, C. 2012. Why trust is the new core of leadership _ https://www.forbes.com/sites/trustedadvisor/2012/04/03/why-trust-is-the-new-core-of-leadership/ Date of access: 21 March 2023.

Heyens, MM. 2015. *Trust within the work context: Conceptualisation, measure and outcomes.* Potchefstroom: North-West University. (Thesis -PhD).

-Hair, J.R., Anderson, R.E., Tatham, R.L & Black, W.C. 1998. *Multivariate data analysis*. Upper Saddle River, NJ: Prentice Hall.

Larney, R. 2006. *AE&T programmes at community learning centres in Cape. (Mini dissertation the Western Cape*. Cape Town: University of the Western– Masters).

Levine, D. M., Stephen, D. F., Krehbiel, T. C. & Berenson, M. L. 2008. Statistics for managers. 5th ed. Upper Saddle River, NJ: Pearson.

Linn, R.L. 1989. *Educational measurement*. New York, NY: Macmillan.

Nunally, J. & Bernstein, I.H. 1994. *Psychometric theory*. 3rd ed. New York, NY: McGraw-Hill.

Pedhazur, E. & Schmelkin, L. 1991. *Measurement, design and analysis*. Hillsdale, NJ: Erlbaum, 819.

Peterson, D. 2017. *Basic Information on Adult Education*. ThoughtCo. https://www.thoughtco.com Date of access: 28 April 2022.

Reitzes, M. 2009. *The impact of democracy on development: the case of South Africa*. http://www.cps.org.za/cps%20pdf/RR120.pdf Date of access: 16 April 2021.

Rosenthall, R. 1991. *Meta-analytic procedures for social research*. Newbury Park, CA: Sage.

Tabachnick, B.G & Fidell, L.S. 2001. *Using multivariate statistics*. 4th ed. Boston, MA Allyn &Bacon.

Tanner, W. 2017. *Modern Manager*. http://www.heres-how-you-get-employees-totake-ownership-over-their-work-ebe1f7el Date of access:20 June 2020.

Thompson, B. 1994. Guidelines for constructors. *Educational and Psychological Measuremen*t,54:837-847.

CHAPTER 4: RESEARCH ARTICLE 3

COULD BETTER MANAGEMENT, DIRECTION AND LEADERSHIP OF ADULT EDUCATION AND TRAINING AND OCCUPATIONAL HEALTH AND SAFETY CONTRIBUTE TO MORE LITERATE EMPLOYEES AND FEWER FATALITIES, INCIDENTS, AND ACCIDENTS IN THE MINING COMPANY?

The article is prepared for the African Journal of Employee Relations. The specifications, as outlined in the Journal, were followed in the article's writing.

ABSTRACT

Orientation: South African mines are progressively getting deeper due to declining grades at current mining depths and, this subsequently leads to increased labour and energy costs. The cost of providing employees with functional literacy and computing opportunities directly impacts the unit cost of mine production and labour, as input costs subsequently increase. It is clear that the mining industry must explore and implement new methods that will improve profitability and safety performance.

Research Purpose: The purpose of the research is to explore management and leadership concepts and identify the most appropriate models for the mining Company.

Motivation for the study: The leadership challenges facing the mining industry as, Mining companies have adopted a zero-harm concept as a safety goal to protect the well-being of their employees while maintaining high standards of workplace health, safety and environmental management.

Research design, approach and method: A convenience sample of 522 responses was obtained from a survey that was conducted at the Gold and Platinum operations. A total of 522 participants responded to the initial survey, resulting in a convenience sample used in its entirety for the present study.

Main findings: In conclusion, concepts of better management, direction and leadership of AE&T and Occupational Health and Safety practices and behaviors are, according to the study, deeply based on the renewed focus on behavior-based safety training and consequential thinking, with a reintroduced emphasis on hazard identification, risk assessment, health and safety practices, policies, mine standards and assessments.

Practical/managerial implications: One of the most significant limitations to conducting this research is the apparent lack of research on adult education and training (AE&T) and occupational health and safety (OHS) in mining companies in this research area. It must be clearly stated that scientific resources are limited. The research was also limited because it only involved a gold and uranium mining

company. However, the study significantly contributes to new scientific resources in this particular field of study.

Contribution/value added: The research contributions of this study can be found in the results of the studies that have been conducted and subsequent applications and a renewed focus on the concepts of enhanced behavior-based safety training and consequential thinking. One of the main benefits of behavior-based safety is creating a common language and a significant shift from troubleshooting to understanding the facts about risk.

Keywords: Mines, South Africa, cost, safety performance, zero-harm standards, behavioural based safety training (BSST), hazard identification, risk assessments, mine policies, mine standards, summative assessments, management, direction and leadership.

INTRODUCTION

Studies conducted by Deloitte (2014:8; Neser 2014:9) identified five major challenges facing South African mining companies. The challenges identified are profitability and safety performance, as the industry needs to simultaneously secure and increase profits while ensuring that safety achievements are not compromised. Regarding attraction and retention of critical skills, the South African higher education institutions must produce sufficient numbers of graduate's eager to take up jobs in the mining industry. Capital financing is a major obstacle as South African mining operations are cash-constrained due to investors ascribing a risk premium to South African mining investments. The best and most sustainable use of capital as unstable labour conditions increase the operational risks of mining operations, leading to an inherent requirement for companies to increase profitability. Lastly, conflicting stakeholders such as governments, communities, businesses, and organized labour are the most important stakeholders of mining companies.

The NQF as a structure utilizes nationwide accepted standards to promote lifelong learning opportunities (DoE, 1996: 15). The NQF likewise promotes a cohesive system through which mature learners can progress from illiteracy to further and higher education opportunities. The issue of the integration of education and training has given rise to two schools of thought, namely:

- The ANC and organized labour support a more cohesive system that associates basic adult education with more general forms of skills training; and
- On the other hand, the Ministry of Manpower and the Ministry of Education have opted for education and training to coexist in parallel management structures.

This compromise has resulted in a parallel AE&T supply system for those working in adult education. One system is directed by the Department of Labour, and the other by the Department of Education. For all practical purposes, these systems are administered by the NQF by facilitating a collaborative approach between the parties. Common areas of responsibility will include the design of qualifications, review of unit standards, quality assurance and monitoring of qualification implementation (Larney, 2006: 38-39).

The Ministry of National Education is responsible for publishing the policy paper on Adult Education and Training (AE&T) in South Africa. It is currently in its third year of developing the policy. All key patrons representing Adult Education and Training (AE&T) in South Africa are involved in this process through consultations, debates and other processes critical to finalizing the policy document. A key driver of the policy is to support practitioners and providers in implementing, monitoring and evaluating adult education and training (AE&T) practice and, in the process, ensuring that adult education and training (AE&T) takes centre stage in the improvement of the Education and Training System (Adult Education and Training Policy Document, 2003:1).

The main obligation of the policy is to target mature learners in South Africa. Still, the policy also promotes an enabling environment for AE&T practitioners in government and other contributors, such as NGOs in the private sector. NGOs can organize their efforts and collaborate across the sector to ensure continuity. These efforts are expected to generate ample public and private enthusiasm. They will enable a unique South African Adult Education and Training (AE&T) system, in which all parties contribute their own resources and capacities (Policy Document on Adult Education and Training, 2003:1).

The policy document contains the definitions of AE&T:

"*AE&T is seen both as a right (as expressed in the nation's constitution) and as a functional economic necessity in a changing society that requires citizens to participate in a lifelong learning process*".

The policy itself was developed by the broader education policy, embodied in the 1995 White Paper, the National Education Policy Act 1996 and the South African Qualifications Act 1995 (Adult Education and Training Policy Paper, 2003:1). The embellishment of this document is part of a larger curriculum in South Africa that builds the policy framework for all aspects of education and training in the new Democratic South Africa. In the early 1990s, the important corporate narratives mentioned below made the conceptualisation of Adult Education and Training (AE&T) possible namely:

- The National Education Policy Survey (NEPI) is conducted under the auspices of the National Education Coordinating Committee;
- Participatory research project for the South African Trade Union Congress;
- National training strategic enterprise undertaken by the National Training Committee;
- Conference convened in November 1993 by the South African Council for Adult Basic Education (SACABE);
- The Centre developed the Education and Training Implementation Plan for Education Policy Development and the African National Congress before South Africa's first general election in 1994; and
- ANC's Education and Training Policy (1994).

In September 1995, the work mentioned above was advanced through the acceptance of the National Adult Education and Training Framework: Minister of Education Prof. Sibusiso Bengu as interim guidelines for short-term policy. On this basis, the Ministry of Education was able to launch its Ithuteng (Ready to Learn) campaign in 1996 as the first model AE&T scheme in the country. This intervention achieved two key outcomes: a shared dream for adult education and training (AE&T) and agreed curriculum objectives (Policy Document on Adult Education and Training, 2002:5).

LITERATURE REVIEW

Mining operations in South Africa range from small surface excavations, where miners primarily use hand tools, to underground operations using highly sophisticated and mechanized systems that operate at depths of four kilometer’s underground. Quarry and underground operations are considered mines and are, therefore, subject to similar legislation. Several factors, such as the depth of the ore, the geometry of the ore body, the physical properties of the rock being mined, and the resources or technology available, will determine the methods and working conditions employed in mining operations. Therefore, these factors will ultimately decide whether to apply labour and capital concentrated, underground or surface methods to various mining methods. Besides coal, significant mineral extraction in South Africa is labour-

intensive and deep underground compared to mines in Australia and Canada (Tuchten, 2011: 30).

Currently, mining in South Africa:

- Contribution 20% to South Africa's GDP;
- Total annual revenue of approximately R550 billion;
- One of the country's leading employers, with over 1 million people in mining-related occupations; and
- A major contributor to the black economic empowerment economy (South African Mining/Projects IQ, 2015).

Almost all precious metals mined in South Africa, especially gold, occur in tiny particles in a bulk solid quartz matrix, requiring labour-intensive mining methods (Hargrove, 2008:57). Labour-intensive mining techniques provide ample employment opportunities in the country but also subject miners to dangerous working conditions. An estimated 84% of employees work underground in South African gold mines. With a projected 60% of employees working underground in the mining companies, the likelihood of injury to illiterate workers has increased dramatically (DME, 2008: 14; Tuchten, 2011: 30). Mine health and safety literature provide a convincing dissection of hazards and risks. A hazard can be defined as the possibility of causing harm, on the other hand, risk can be referred to as the probability of an injury occurring (Aguis, 2009: 1; Tuchten, 2011: 32).

It can be observed that the main safety concerns of local mines in South Africa are comparable to those listed in Table 1, for the four most significant sectors namely gold, platinum, coal and diamonds. The leading cause of fatal mine accidents is rock falls or ground slumps, which are related to the depth of South African mines. Transportation of people and materials is the second leading cause of mine accidents and deaths (MHSC, 2009a:25; Tuchten, 2011:32-33).

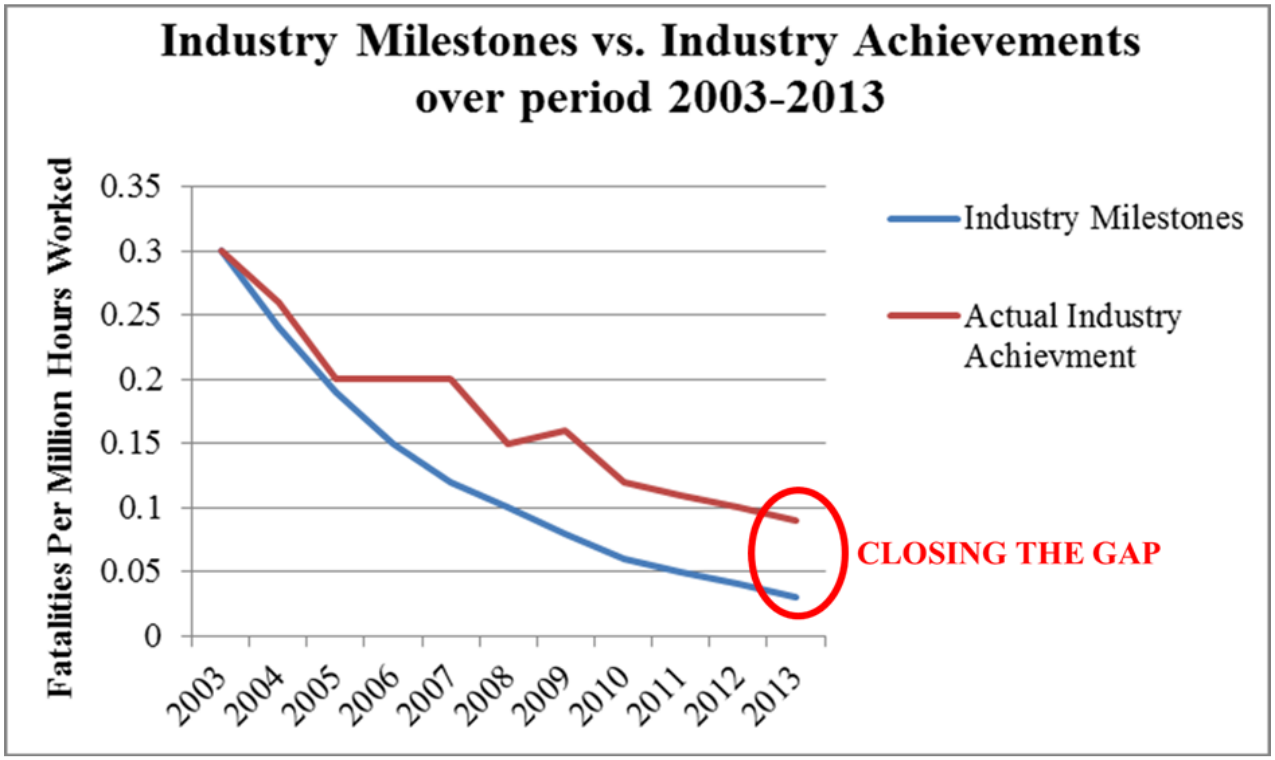
Table 1: Occupational safety hazards in the Gold Mining Industry.

Rock fall/ rock burst due to mining depth;
Machines that come into contact with people in confined spaces;
Falling materials and rolling rocks;
Dirt or gravel inundation;
Exposure to dust, gas, fumes;
Explosion and fire;
Seismicity; and
High temperature (up to 58°C if uncontrolled).

Source: Adapted from Tuchten (2011:32)

In most cases, mine accidents involve low-level operators, such as drillers and winch operators, who make up most of the workforce. Fatalities are more common among miners between the ages of 40 and 49 who have worked underground for long periods. It is concluded that poor health and safety practices are associated with worker illiteracy and numeracy and that most occupational hazards acknowledged in the table above will involve the lives of illiterate employees (Frankl, 2010: 8-9; MHSC, 2009a: 2; Tuchten, 2011: 32-33).

Figure 1: Industry milestones versus Industry achievements: 2003-2013.



Source: Adapted from Neser (2014:12)

The above chart indicates that the number of deaths per million hours worked by South African mining companies have decreased significantly by 66% due to the safety measures and initiatives implemented by different mining companies in South Africa. The safety performance of the South African mining industry has improved significantly compared to Australia, the United States and Canada. These countries can be seen as the most competitive global mining industries and are therefore regarded as international benchmarks (Neser, 2014: 12-13). According to the results presented by Briggs (2014), South Africa's safety performance improved by 66% through safety drivers and initiatives, followed by Australia at 64% and the United States at 47%, Canada saw the least improvement at 23%. The relationship between South Africa, Australia, the United States and Canada can be seen as competitive and dynamic. These countries strive to achieve zero harm in mining companies, an ongoing test of South Africa's benchmark against which they compete. For South Arica, the challenge is to achieve annual milestones to ensure that the gap between milestones and actual

achievements will widen dramatically. From 2010 till now, mining companies have been working non-stop to reach industry milestones. It is fair to say that South African mining companies have reached a tipping point in terms of safety performance, but a fundamental shift is required for South Africa to compete with the world's top mining companies (Neser, 2014: 12-13).

An important part of South African mining companies is the ongoing focus on employee training and development. Learning organizations will be constantly concerned about the external environment, expecting to make proactive adjustments to prolong the business. Internal focus is also critical for leading skills analysis, identifying developmental areas of concern and implementing necessary interventions to close gaps (IAEA, 2002: 13; Farmer, 2010: 31).

Auditing Firm Deloitte (2014) recognizes several approaches that can support mining executives in upgrading the strategies needed to mitigate risks from industry challenges. Table 2 expands on mining companies' strategies to achieve desired outcomes in terms of safety and performance.

Table 2: Tactics which Mining companies need to embrace.

Tools	**Explanation**
Long-term future and scenario planning.	Assume a creative and methodical view of various aspects by amplifying key uncertainties and likely outcomes.
Corporate Portfolio Optimization.	Companies need to go beyond the ranking of financial value metrics and continue to count a project's tangible and intangible assets.
Intense Innovation.	Develops leadership strategies by identifying extraordinary opportunities.

Positive company stakeholder relations.	Develop a complex long-term stakeholder roadmap to find common ground.
Adaptive Cost Management.	Instead of allowing cyclical cost fluctuations, companies should manage overhead cost ratios steadily.

Source: Adapted from Neser (2014:13)

The concept of multidisciplinary research in adult education is not a new trend, especially for adult education on the African continent. Research often requires a multidisciplinary methodology. The research includes a wide range of occupations, such as union activists, nurses and doctors, who clearly focus on their problems and/or issues related to their work. Researchers were asked to actively stand their ground, thus ensuring that their research is good enough globally and emphasizes that researchers should function within the constraints of specific disciplines and related research questions (Tuchten, 2011: 89-90; Chilisa & Preece, 2005: 74-75).

METHODOLOGY

Participants

The study undertook a survey research design and used a convenience sampling technique to select a sample size of 522 respondents from the study's target population. The data was collected through questionnaires and analysed using factor analysis and descriptive statistics with the help of SAS software version 9.4. A convenience sample of 522 responses was obtained from a survey that was conducted at a Gold and Platinum mine in South Africa. A total of 522 participants responded to the preliminary survey, which resulted in a convenient sample used in this study. Respondents' educational backgrounds ranged from lower than matric to university degrees. They were employed by the mining company in unskilled, skilled, middle management, senior management and top management positions. The total

sample (n=522) included 265 (50.77%) participants from the gold operations and 257 (49.23%) participants from the platinum operations. There were 422 males (81.15%) and 98 females (18.85%). The highest age distribution was between 40-49 years (30.06%). In the Gold Operations, most of the participants were from Kloof Mine (23.91%). In Platinum, the Rustenburg Operations had 26.28% participants, with skilled workers at 48.60% being the highest level of participants in the study.

Research procedure

The rationale and intent of the study were detailed in a cover letter and attached to a questionnaire distributed to participants in the gold and platinum Mining Company to obtain initial data. The cover letter indicates that participation in the research is entirely voluntary and anonymous, and the information obtained will be used for research purposes only. The University Ethics Committee approved the use of these data and received an ethical number for this specific purpose.

Measuring instrument

The survey tool used is a questionnaire that can be used when factual information is required and should be designed according to certain rules and standards (Botha, 2012: 43-44). A well-designed questionnaire results from long-term planning of research goals, articulation of questions, and hypotheses. The questionnaire must be carefully curated and designed to increase the reliability and persuasiveness of the data to an acceptable tolerance (Botha, 2012: 43-44). In Parts B to E of the questionnaire, the respondent must express their agreement with "strongly disagree," "disagree," "agree," and "strongly agree." Part B measures the impact of training interventions, enablers, and training methods on reducing the number of accidents and fatalities. Part C measures the impact of training ownership and behavior on reducing accidents and fatalities. Part D measures the impact of enhanced management guidance and leadership on reducing accidents and fatalities. Part E measures the impact of improved communication practices on reducing mining company accidents and fatalities.

Data analysis

To determine whether factor analysis is appropriate, Kaiser's sample adequacy measure (MSA), which indicates the correlation between variables, was calculated (Tabachnick & Fidell, 2001). The index ranges from 0 to 1 and reaches 1 when the others perfectly predict each variable.

The following criteria can explain the measure:

0.80: Active

0.70: Moderate

0.60: mediocre

0 50: Miserable

< 0.50: Unacceptable (Hair et al., 1998).

Reliability of a test refers to the constancy of scores obtained by the same person on different occasions, using a different array of equivalent items, or reassessing the same person under new variable examination conditions (Anastasi & Urbina, 1997: 84). Test validity refers to what the test measures and how well it is performed (Anastasi & Urbina, 1997: 113). If the test is valid, it measures all the effects it is supposed to measure. Since "reliability is a property of the data" (Eason, 1991:84), researchers must pay attention to the effect of participants on the quality of scores in each study. As Thompson (1994: 839) explained, since total score variance is an important component of reliability, the participants in the study themselves will influence score reliability: "The same measure, when applied to a more heterogeneous or homogeneous cohort of participants, a score will be produced as opposed to reliability". In considering the diversity of research participants involved in various fields, and the fact that research designers involving psychological tests must provide reliability coefficients for the scores of the analyzed data. As Pedhazur and Schmeling (1991: 86) argue: "Researchers who take the trouble to report reliability approximations for the instruments they use, in many cases only report reliability guesses contained in the instrument manuals or other researchers stated estimates. Information of this nature may be beneficial for comparative reasons, but it is crucial to know that the applicable reliability estimates are those obtained for the sample used in a particular study, as a similar argument has validity. According to Nunnally and

Bernstein (1994: 84), validity is the degree to which an all-or-nothing entity is related, and authentication is a never-ending practice. All psychometrics must be assessed continually and reassessed to determine whether they have been working. Test validity refers to what the test measures and how well the test is appropriate (Anastasi and Urbina, 1997). Aiken and Groth-Marnat (2006) see the inadequacy of this definition because it implies that the question test has only one validity.

It has been argued that a test may have many opposing validities, depending on the specific reasons for which it was designed, the target sample, the specific conditions and circumstances in which it was performed, and the actual method used to determine its validity. However, Pedhazur and Schmelkin (1991) take a position and reject the idea of an effectiveness type per se but acknowledge that it is suitable for the organization, especially for discussion purposes. For them, the different aspects of effectiveness are not mutually exclusive and end; therefore, there are no different variants. It must always be considered that reliability is only affected by occasional measurement errors. However, the validity of tests is affected by non-systematic and systematic (constant) errors. For this reason, a test may be reliable and not valid, but in no case can it be valid or unreliable.

Facets of Validity

Conceptions are equivalent to conceptual or theoretical formulations whose purpose is to organize and help us understand our environment. Therefore, the main goal is to use the observed variables to illustrate unobservable structures or concepts, such as intelligence or anxiety (Pedhazur & Schmelkin, 1991). Therefore, construct validity can be viewed as the degree to which a test measures theoretical concepts or characteristics, such as attributes such as personality traits and intelligence.

Construct validity may include measures of criterion-related validation, convergence validation, and content validation.

- Standards-Related Validation

- Standards-related validation has two opposing aspects:
  - Concurrent verification
  - Predictive validation.

Predictive validity is an integral part of validation about criteria, for example, criteria measures obtained in the future, usually, months or years after the test scores are reached (Nunnally & Bernstein, 1994). For example, if a test is designed to measure intelligence, it must show that test scores are highly correlated with the results of a recognized intelligence test (Aiken & Groth-Marnat, 2006; Anastasi & Urbina, 1997). In establishing concurrent validity, researchers test a group of participants and associate scores with standard measures indicative of the variable being tested. For example, if a high score on this subtest coincides with a high score in Math, and on the other hand, a low score on this subtest coincides with a low score in Math, the GSAT total subtest score will have predictive validity (3).

Convergent and Discriminant Validation

A construct-validating tool should have a high correlation with measures or methods measuring the same construct (convergent validity) but little correlation with measures of a different construct (Anastasi & Urbina, 1997). Convergence verification is a structurally valid method that indicates that the real test results match the expected results. For example, if there is a test that assesses digital proficiency and if it excels in convergent validity. Hypothetically, an employee in a risk management department, such as an organization's risk manager, is likely to score higher than employees from other departments tested. Discriminant validity can be seen as a complement to convergent validation. Measuring an unrelated concept in a situation where one attribute is not strongly correlated with another one can assume that the test is discriminatively valid. For example, leadership skills cannot be assumed to be highly correlated with introversion.

Content Validation

Content verification is not to be confused with the term "appearance validity", which can be viewed as a non-scientific judgment, referring to how good a test is likely to be to the person applying it. However, the test must have face validity because, without face validity, it can be assumed that collaboration and inspiration, as well as client and public acceptance, would be problematic (Linn, 1989).

Content validation focuses on two issues, namely:

- Does the test contain content of interest? For example, are the items on the math achievement test based on math concepts?
- Is the test right for your participants? For example, is the content consistent with a college math major?

Evaluating content effectiveness is done in one of two ways, namely:

- Subjectively
- From experience.

The subjective approach involves asking experts to judge the importance of the test items in relation to the subject area being assessed. Empirical methods, such as principal component analysis and factor analysis, identify the basic structure of the test items. When measuring the reliability of a questionnaire, the most popular technique is called Cronbach's alpha or coefficient alpha. Cronbach's alpha is a statistical measurement tool designed to test reliability and internal consistency. It also indicates whether the item in the measurement tool and the subsections of the item are highly correlated. Therefore, Cronbach's alpha (α) is the reliability coefficient of the items in the survey tool, focusing on the quality of the measurements.Cronbach alpha represents how well a statement measures the same underlying concept. Therefore, it can be assumed that the larger the obtained Cronbach's alpha, the more reliable the scale. This, in turn, means that if similar individual responses are observed for a set of statements, it can be concluded that these statements measure the same structure. It is important to note that values greater than 0.7 should be obtained for reliable items (Farmer, 2010: 53-54).

An example that can be used is a questionnaire, which produces a different score each time it is used and is subject to the same conditions. This will then result in a low-reliability factor.

Values > 0.7 are acceptable.
A value > 0.8 is good (Botha, 2012:53).

The following formula can be used to calculate Cronbach's alpha:

Equation 1: Cronbach's alpha coefficient

$$\boldsymbol{a} = \frac{\boldsymbol{k}}{\boldsymbol{k-1}}\left[\mathbf{1} - \frac{\sum_{\mathbf{1}}^{\boldsymbol{k}} \boldsymbol{Q}_{y_i}^2}{\boldsymbol{\sigma}_{\boldsymbol{x}}^{\mathbf{2}}}\right]$$

Where:

α= Cronbach's alpha coefficient

$\boldsymbol{k}$ = number of items in the construct

$\boldsymbol{Q}_{y_i}^2$= variance of item, i, where i = 1 to $\boldsymbol{k}$

$\boldsymbol{\sigma}_{\boldsymbol{x}}^{\mathbf{2}}$= variance of the observed total item scores

Individual questions were analysed to calculate the Cronbach alphas for the study. The mean as a basic descriptive statistic was used in the analysis. A mean can be described as the most common measure to describe trends in a dataset, is the degree to which all data values are grouped around a central value. The mean is calculated by adding the variable values for all observations and dividing it by the number of observations (Levine et al., 2008: 97; Farmer, 2010: 53). Variance is calculated by finding the squared difference between an observation and the mean, taking the sum of all cases, and dividing them by the number of observations minus one. It also describes the average dispersion of values around the mean, which in turn indicates

the dispersion of the data (Levine et al., 2008: 106; Farmer, 2010: 53). The standard deviation (SD) can be defined as the square root of the variance, which in turn describes the dispersion of the data around the mean (Levine et al., 2008:107; Farmer, 2010:53).

Ethical Consideration

Ethical permission for this study was obtained from the North-West University (NWU) Potchefstroom campus Ethics Committee (ethics number: 00552-18-S4). Education backgrounds ranged from lower than matric to university degrees. Field workers were briefed on the intent and objectives of the study and asked to distribute questionnaires to colleagues and learners in their specific workplaces. The purpose and objectives were detailed in a cover letter accompanying the questionnaire which was distributed by field staff to all participants. The questionnaire included an introductory section emphasising in writing to each participant that participation was voluntary and anonymous. Participants were not asked at any stage to provide any information that could personally identify them.

RESULTS AND DISCUSSIONS

Construct Validity

Factor analyses were done individually for Sections B, C, D and E of the questionnaire. The factor analysis was conducted to reduce data and ensure the validity of constructs.

The results of the factor analysis in section D are as follows.

Table 3: Factor Analysis

Items			Number of factors	% Variance	Cumulative reporting of analysis
Section C		MSA	Retained	Explained	Vary between
D1-D5	429	0.85	1	0.74	0.62 and 1.00

Recognising that the MSA of 0.85 construct validity was confirmed on the construct.

Cronbach Alpha values to confirm reliability are reported in the table.

Table 4: Cronbach's alpha values

Construct	**N**	**C.A**
Leadership	419	0.87

According to Field, all the indicated Cronbach Alpha values are higher than 0.6. thus, indicating that the constructs are reliable (Field, 2014).

Table 5: Whether better management, direction and leadership in adult education and training and occupational health and safety can help improve employee literacy and reduce fatalities, accidents and incidents in mining the mining company.

Variable	N	Mean
D1	429	3.38
D2	429	3.48
D3	429	3.46
D4	429	3.47
D5	429	3.42

On a Likert scale of 1-4, the midpoint can be considered 2.5. In this study, 2.5 was used to determine whether better adult education and training, and occupational health and safety management, coaching, and leadership would help improve employee literacy and reduce fatalities, accidents, and accidents in mining companies."

The highest average was 3.48, and the midpoint above 2.5, indicating that better management, mentoring, and leadership in adult education and training, and occupational health and safety can help improve employee literacy and reduce fatalities, accidents, and incidents in mining companies.

Table 6: Frequencies: QD1- D5

		R	SD	D	A	SA	MISSING	MEAN	STD DEV
D1	Enhanced behaviour-based safety training and consequential thinking.	478	6	15	248	209	44	3.38	0.58
D2	Renewed focus on hazard identification and risk assessments	468	6	21	190	251	54	3.48	0.60
D3	Reinforcing basic health and safety practises.	464	4	14	209	237	58	3.46	0.60
D4	Revision of Mine policies and processes subject to change	472	7	13	211	241	50	3.47	0.58
D5	Enhanced mine standards summative assessments.	473	13	12	213	235	49	3.42	0.64

LEGEND**:** *R - Respondent; SD - Strongly Disagree; D - Disagree; A – Agree; SA – Strongly Agree*

The study wanted to know whether enhanced behavior-based safety training and consequential thinking can reduce fatalities in the mining company, and the results are shown in the table below.

Table 7: Enhanced behavioural-based safety training and consequential thinking.

	Frequency	Percent	Cumulative Percent
Strongly disagree	6	1.26	1.26
Disagree	15	3.14	4.39
Agree	248	51.88	56.28
Strongly agree	209	43.72	100
Missing	44	0	

Total	522	100	

It was observed that 3% disagree, 1% strongly disagree, 44% strongly agree, and 52% agree that enhanced behavior-based safety training and consequential thinking can help improve the mining company's employee literacy and reduce fatalities. Therefore, the results indicates that 52%, the majortiy agree with the statement that enhanced behavioural-based safety training and consequential thinking contributes to more literate employees and fewer fatalities in the Mining Company.

Table 8: Renewed focus on hazard identification and risk assessments.

	Frequency	Percent	Cumulative Percent
Strongly disagree	6	1.28	1.28
Disagree	21	4.49	5.77
Agree	190	40.60	46.37
Strongly agree	251	53.63	100
Missing	54	0	
Total	522	100	

The results in Table 8 indicated that 54% of respondents strongly agree, 41% agree, 4% disagree, and 1% strongly disagree that a renewed focus on hazard identification and risk assessment improves literacy and reduces fatalities in the mining company.

Table 9: Reinforcing basic health and safety practices.

	Frequency	Percent	Cumulative Percent
Strongly disagree	4	0.86	0.86
Disagree	14	3.02	3.88
Agree	209	45.04	48.92
Strongly agree	237	51.08	100
Missing	58	0	
Total	522	100	

The results from table 9 reveal that 51 % of the respondents strongly agreed and 45% agreed, 3% disagreed, and 1% strongly disagreed that reinforcing basic health and safety practices donates to more literate employees and fewer fatalities in the mining company. Therefore, the results indicates that 51%, the majortiy strongly agree with the statement that reinforcing basic health and safety practices contributes to more literate employees and fewer fatalities in the Mining Company.

Table 10: Revision of Mine policies and processes subject to change.

	Frequency	Percent	Cumulative Percent
Strongly disagree	7	1.48	1.48
Disagree	13	2.75	4.24
Agree	211	44.70	48.94
Strongly agree	241	51.06	100
Missing	50	50	

Total	522	100	

The results in table 10 indicate that 3% disagreed, 1% strongly disagreed, 51% strongly agreed, and 45% agreed that the revision of mine policies and procedures contribute to more literate employees and fewer fatalities in the mining company.

Table 11: Enhanced mine standard summative assessments.

	Frequency	Percent	Cumulative Percent
Strongly disagree	13	2.75	2.75
Disagree	12	2.54	5.29
Agree	213	45.03	50.32
Strongly agree	235	49.68	100
Missing	49	0	
Total	522	100	

The results in Table 11 underscore that 51% of respondents strongly agree, 45% agree, 1% strongly disagree, and 3% disagree that enhanced mine standards summative assessments would help to increase literate employees and reduce the number of fatalities at the mining company.

PRACTICAL IMPLICATIONS

The mining company is indicative of applying the principles of enhanced behavioural-based safety training with the inclusion of consequential thinking as a new training methodology and subsequently to be included in developing new training material. The mining company to apply the principles of enhanced behavior-based safety

training as a new training method, which will subsequently be incorporated into developing new training materials.

LIMITATIONS AND RECOMMENDATIONS

The reason for this study was the apparent lack of research into Adult Education and Training (AE&T) and Occupational Health and Safety (OHS) by mining companies in this research area and, therefore, the limited number of scientific research resources available for this multidisciplinary study. The 0.84 construct validity of the MSA was confirmed, suggesting that construct validity can be considered as a useful tool for assessing whether better management, coaching and leadership of AE&T and occupational health and safety practices and behaviors contribute to the reduction of deaths and accidents at the mining company. Future research could consider additional variables to determine whether better management, coaching, and leadership of AE&T and occupational health and safety practices and behaviors could help reduce fatalities, accidents, and incidents in mining companies. The MSA has a construct validity of 0.84, which suggests that construct validity can be considered a valuable tool for assessing whether better management, coaching, and leadership of AE&T and occupational health and safety practices and behaviors contribute to the reduction of fatalities and accidents. Future research by mining companies could consider other variables that could determine whether better management, coaching, and leadership of AE&T and occupational health and safety practices and behaviors could help reduce fatalities, accidents, and incidents in mining companies.

CONCLUSION

The research contribution of this study can be found in the research that has been conducted and the results of subsequent applications, and a renewed focus on the concepts of increased behavior-based safety training and consequential thinking. One of the main benefits of behavior-based safety training is creating a common language and a major shift from troubleshooting to understanding risk-related facts. In conclusion, concepts of better management, direction and leadership of AE&T and Occupational Health and Safety practices and behaviours are, according to the study,

deeply based on the renewed focus on behaviour-based safety training and consequential thinking, with a renewed focus on hazard identification, risk assessment, health and safety practices, policies, mine standards and assessments.

REFERENCES:

Aguis, R. 2009. Hazards and Risks. *Agruis.com* http://www.agius.com/hew/resource/hazard.htm Date of access: 11 August 2021.

Aiken, L.R. & Groth-Marnat,G 2006. Psychological testing and assessment. 12th ed. Boston: Pearson Education Group, Inc.535 p.

Anastasi, A. & Urbina, S. 1997. *Psychological testing*, 7th ed. New York, NY: Prentice Hall.

Botha, E. 2012. *Information technology governance framework in higher education in South Africa: A paradigm shift*. Potchefstroom: North-West University. (Mini-dissertation – Masters).

Chilisa, B., Preece, J. 2005*. Research methods for adult educators in Africa: African perspective on adult learning.* Cape Town: UNESCO/Pearson Education. http://www.unesdoc.unesco.org/images/0014/001413/141339E.pdf Date of access: 2 May 2021.

Deloitte. 2014. *Tough choices facing the South African mining company*. http://www.deloitteblog.co.za/wp-content/uploads/2013/tough-choices-facing-the-South-African-mining-industry.pdf Date of access: 6 June 2021.

Department of Education **see** South Africa. Department of Education.

Eason, S.J. 1991. Why generalizability theory yields better results than classical test theory: A primer with concrete examples. In Thompson B. (ed). *Advances in educational research: Substantive findings, methodological developments*. Vol.1. Greenwich, CT: JAI Press. pp83-98.

Farmer, R.A. 2010. *Improving Occupational Health and Safety in a petrochemical environment through culture change*. Potchefstroom: North-West University. (Mini-dissertation – Masters).

Frankel, P. 2010. *Falling ground: Human approaches to mine safety in South Africa. Johannesburg: Agency for Social Reconstruction*.

http://www.repository.up.ac.za/bitstream/handle/2263/24196/07references.pdf?8 Date of access: 21 May 2021.

Hair, J.R., Anderson, R.E., Tatham, R.L & Black, W.C. 1998. *Multivariate data analysis*. Upper Saddle River, NJ: Prentice Hall.

Hargrove, J. 2008. Migration, mines and mores: the HIV epidemic in Southern Africa. *South African Journal of Science*, 104:53-61.

IAEA. 2002. Safety culture in nuclear installations: guidance for use in the enhancement of safety culture. *International Atomic Energy Agency*. http://www.china-nea.cn/down-1197.aspx *Date of access:* 2 May 2021.

Larney, R. 2006. *AE&T programmes at community learning centres in Cape.* Cape Town: University of the Western Cape (Dissertation – Masters).

Levine, D. M., Stephen, D. F., Krehbiel, T. C. & Berenson, M. L. 2008. *Statistics for managers*. 5th ed. Upper Saddle River, NJ: Pearson.

Linn, R.L. 1989. *Educational measurement*. New York, NY: Macmillan.

MHSC. 2009. *Mine Health and Safety Tripartite Leadership Summit Agreement in the Mining and Mineral Sector.* Pretoria: Mine Health and Safety Council, Mining Qualifications Authority and the Department of Minerals and Energy Affairs. http://www.energy.gov.za/.../DME%20Annual%20Report%2009_10%20hr.pdf Date of access: 27 October 2021.

Mining in South Africa. 2021. *Projects IQ.* http://www.projectsiq.co.za/mining-in-south-africa.htm Date of access: 10 October 2021.

Neser, M. 2014. *The potential impact of immersive virtual reality applications on the South African Mining Company*. Pretoria: University of Pretoria. (Dissertation-Hons).

Nunnally, J. & Bernstein, I.H. 1994. *Psychometric theory.* 3rd ed. New York, NY: McGraw-Hill.

Pedhazur, E. & Schmelkin, L. 1991. *Measurement, design and analysis*. Hillsdale, NJ: Erlbaum.

Peterson, D. 2017. Basic information on adult education: An Introduction to adult learning. *ThoughtCo*. https://www.thoughtco.com Date of access: 28 April 2021.

Policy Document on Adult Education and Training. 2003. http://www.education.gov.za/LinkClick.aspx?fileticket Date of access: 22 May 2021.

Rosenthall, R. 1991. *Meta-analytic procedures for social research*. Newbury Park: CA: Sage.

Tabachnick, B.G. & Fidell, L.S. 2001. *Using multivariate statistics*. 4th ed. Boston, MA: Allyn &Bacon.

Tuchten, G. 2011. *Concept development for facilitating the health and safety efficacy of South African mine workers*. Pretoria: University of Pretoria. (Thesis – PhD).

CHAPTER 5: RESEARCH ARTICLE 4

COULD IMPROVED COMMUNICATION WITH REGARD TO GUIDELINES, NORMS AND STANDARDS AND INFORMATION DISSEMINATION LEAD TO THE REDUCTION OF ACCIDENTS AND FATALITIES IN SELECTED MINES

The article is prepared for the African Journal of Employee Relations. The specifications, as outlined in the Journal, was followed in the writing of the article.

ABSTRACT

Orientation: The Mining Industry faces numerous communication challenges that stems mainly from disparities in literacy levels and multi-language environments amongst all its stakeholders.

Research purpose: The purpose of the study is to determine the impact of enhanced communication on Occupational Health and Safety performance.

Motivation for the study: Challenges facing the mining industry with regards to inequalities in literacy levels and multi-language milieus among its employees.

Research design, approach and method: A convenience sample of 522 responses was obtained from a survey conducted in the Gold and Platinum Mine in South Africa. A total of 522 participants responded to the initial survey, resulting in a convenience sample used in its entirety for the present study.

Main findings: The implications of improved communication regarding the implementation of revised guidelines, norms, standards and information dissemination are indicative of allowing for more interaction between workers and stakeholders concerning AE&T and H&S training programs. The improved communications model should include the articulations of the method to be used in terms of the engagement process between employees and management on the matter of new learning material and the implementation of new technologies.

Practical/managerial implications: A limitation in conducting this research is the apparent lack of research on Adult Education and Training (AE&T) and Occupational Health and Safety (OHS) in mining companies, in this research area, therefore a limited number of scientific research resources is available for this multidisciplinary study.

Contribution/value-added: The contribution of this study can be found in the research that has been conducted and the results of subsequent applications, and a renewed focus on the notions of improved behavior-based safety training and consequential thinking. One of the main benefits of behavior-based safety training is

creating a common language and a major shift from troubleshooting to understanding risk-related facts.

Keywords: Communication, literacy levels, stakeholders, multi-language environments, guidelines, norms and standards, behavior-based safety training and consequential thinking.

INTRODUCTION

Lack of communication can lead to labour unrest and dangerous work environments and conditions. Worker dissatisfaction can lead to production disruptions, as workers are often unaware of their employment rights, financial benefits and remuneration. Impala Platinum reported to the Revolutionary Communist International Tendency (RCIT) that the number of illiterate miners at Lonmin was not reported. It is estimated that about 43% of the workforce is illiterate. Labour unrest at the Marikana mine in 2012 killed countless people. Increased illiteracy indicates that the workforce cannot read health and safety signs, first aid, health and safety manuals, notices and literature (Booyens, 2013: 1-2; Czernowalow, 2004: 1).

According to the International Finance Corporation (2022:6-9) mining companies face a challenging business environment, with weak prices prompting austerity measures across the board and at the same time trends in resource nationalism and higher environmental and social expectations mean that maintaining a social license to operate is more directly related to the perceived value of the host community/country. The industry is littered with examples of projects stalled, stopped or abandoned because stakeholders were not fully engaged, and trust was weak. The world we live in today, is more transparent and direct, driven by the complex digital communication environment (International Finance Corporation, 2022:6-9). Companies will always have to deal with stakeholders, but the manner in which they manage these complex issues, has of late become more public. In order to achieve a seamless corporate culture and perspective, the need for internal coordination and the communication thereof has become more intense. Most Mining companies have traditionally had a business-to-business mentality around communications, but attitudes appear to be shifting. Although mining companies do not provide a final product to the consumer their communication methods should increasingly be consumer oriented. Effective communication is also propelled by high trust relationships amongst employees and also contributes to higher productivity and increased loyalty in the organisation (Heyns, 2015:1).

LITERATURE REVIEW

With reference to Table 1, the formal education of employees in the mining sector, Adult Education and Training (AE&T) and Mine Health and Safety programs employed in South African mining operations work together in their socio-demographics, as most are disenfranchised migrant workers with little or no formal education. Mining companies have a reputation for employing miners with no formal education due to the physical demands of working underground. The primary purpose of mining health and safety training is to improve worker health and safety effectiveness to perform detailed functions, regardless of the worker's education. Therefore, the health and safety program were conceived to accommodate workers with incomplete educational skills and provide further education and training opportunities. Adult Education and Training (AE&T) and Occupational Health and Safety (OHS) training originate from diverse theoretical and political contexts and customs and persist as two areas of study that have not been unified in mining companies as of now, thus requiring multidisciplinary learning (Tuchten, 2011: 89-90; Chilisa & Preece, 2005: 74-75).

The Mining Qualifications Authority (MQA) records the formal education levels of workers across mining companies, as shown in Table 1.

Table 1: Scholastic and academic qualifications of mine workers.

Year	**2002**	**2009**
Not any schooling	16.3%	15.4%
Pre-AE&T	2.8%	3.0%
Standard 1/Grade 3/ AE&T 1	12.3%	5.0%
Standard 2/Grade 4	7.0%	4.1%
Standard 3/Grade 5/ AE&T 2	6.7%	4.6%
Standard 4/Grade 6	6.0%	4.9%

Standard 5/Grade 7/ AE&T 3	8.2%	6.9%
Standard 6/Grade 8	6.9%	5.0%
Sub-total	**66.2%**	**48.9%**
Standard 7/ Grade 9/ AE&T 4/ NQF 1	5.6%	6.1%
Standard8/ Grade 10	7.9%	8.2%
Standard 9/ Grade 11	4.4%	7.8%
Matric/ Grade 12/ NQF 4	11.5%	19.5%
After-school Qualifications	4.5%	9.5%
Total	**100 %**	**100 %**

Source: MQA (2011:16)

According to Tuchten (2011: 89-90), this provides an opportunity to improve basic educational skills for further training, as basic learning is seen as a starting point for mine workers education and training.

The DME (2008:35) indicated that:

• 15.4% of miners did not attend school;

• 37% of miners did not complete primary education;

• 48.9% of miners left school before completing a level equivalent to NQF 1 (Level 9 or AE&T 4) and therefore did not have an educational qualification for mining or other employment sector registration and skills programmes; and

• 71% of employees did not complete their education, with an estimated 80% for underground workers.

The Chief Executive Officer of the MQA, indicated that more than 67% of miners are illiterate (Chilwane, 2009: n.p; Tuchten 2011: 135). The educational standards that mining companies use to approximate the literacy levels of their employees are skewed because many employees forget what they learned in school while others improve their school learning. Incentivised adult education and training (AE&T) is a strategic incentive by the MQA, as mining companies have seen fewer adult education and training (AE&T) student enrolments over the years. One of the biggest challenges facing adult education and training (AE&T) is its practical implementation, followed by limited reward prospects for further professional development, such as entry into study programmes, employment opportunities and promotion prospects. Table 2 lists the program results.

Table 2: AE&T program results 2009 – 2010.

Levels	**Enlisted**	**Completed**
Level 4	1 668	519
Level 3	3 527	1 288
Level 2	3 966	1 577
Level 1	4 769	1 687
Total	**13 930**	**5 071**

Source: Adapted from Neser (2014:136)

AE&T in the mining industry is not only challenging to implement, but it is also challenging to enroll full-time workers in full-time AE&T courses, as these workers have to be replaced by other workers to complete the job, which leads to further costs not only for the industry but for the workers themselves because they no longer receive bonuses and overtime pay while attending AE&T classes. For learners taking part-time courses, the physical stress of mining can also cause workers to get too tired after a full day's work (Tuchten, 2011: 136). There is also no clear indication of long-term incentives for AE&T: "While the company is optimistic about available career paths and the existing consulting system, union representatives and employees are

rather pessimistic about the system or lack of guidance and counselling" (Tuchten, 2011: 136).

According to the Time Square Chronicles (2020:1), there are numerous communication models that can be adapted for the Mining Industry namely:

The Linear Model

In the linear model, only the sender/communicator sends the message to the receiver. No feedback is received from the receiver, and it can be used in mass communication. This form of communication is referred to as one-way communication.

The Transactional Model

The transactional model refers to a scenario where both the sender and the receiver exchange roles. In all practicality, the sender becomes the receiver, and the receiver becomes the sender at a certain point in the communication process. This particular form of communication is the most customary form used in everyday life and is used for interpersonal communication. A response is given and received from both parties.

The Interactional Model

The interaction model is also called the convergence model, whereby the communicators take turns in the communication process.

An illustration is that the sender sends a message and then awaits a reply from the person on the receiving end. Good examples are as follows:

- Texting through the internet, for example emails;
- Snapchat; and
- Platforms like WhatsApp or Messenger have a delayed response, and the process can become linear if the receiver does not provide feedback.

What is the importance of communication models in education?

- Assists in the conduct of research;

- Assisting the learner in the provision of appropriate flow for example in learning material;
- Assists in recognising the communication intricacies;
- Enables an uncomplicated presentation of ideas; and
- Enhances the degree of understanding by the learner as, at times, learners have an inadequate comprehension of learning material, and students can ask questions to obtain, which means the degree of understanding is elevated (Time Square Chronicles, 2020:1).

METHODOLOGY

Participants

The study undertook a survey research design and used a convenience sampling technique to select a sample size of 522 respondents from the study's target population. The data was collected by means of questionnaires and analysed using factor analysis and descriptive statistics with the help of SAS software version 9.4. A convenience sample of 522 responses was obtained from a survey conducted at a Gold and Platinum mine in South Africa. A total of 522 participants responded to the preliminary survey, which resulted in a convenient sample used in this study. Respondents' educational backgrounds ranged from lower than matric to university degrees and is employed by mining companies in unskilled, skilled, middle management, senior management and top management positions. The total sample (n=522) included 265 (50.77%) participants from the gold operations and 257 (49.23%) participants from the platinum operations. There were 422 males (81.15%) and 98 females (18.85%). The highest age distribution was 40-49 years (30.06%). Most of the Gold Operations participants were from Kloof Mine (23.91%). In Platinum, the Rustenburg Operations had (26.28%) participants, with skilled workers at (48.60%) the highest level of participants in the study.

Research procedure

In an effort to attain the data, the reasoning and purpose of the study were outlined in a cover letter and attached to a questionnaire distributed to gold and platinum employees. The cover letter indicates that participation in the research is entirely voluntary and anonymous, and the information obtained will be used for research purposes only. The University Ethics Committee approved the use of these data and received a permission number for this specific purpose.

Measuring instrument

The survey tool used is a questionnaire that can be used when factual information is required and should be designed according to certain rules and standards. A well-designed questionnaire results from long-term planning of research goals, articulation of questions, and hypotheses. The questionnaire must be carefully curated and designed because it can potentially increase the reliability and persuasiveness of the data to an acceptable tolerance (Botha, 2012: 43-44). In Parts B to E of the questionnaire, the respondent must express their agreement with "strongly disagree," "disagree," "agree," and "strongly agree. "Part B measures the impact of training interventions, enablers, and training methods on reducing the number of accidents and fatalities. Part C measures the impact of training ownership and behavior on reducing accidents and fatalities. Part D measures the impact of enhanced management guidance and leadership on reducing accidents and fatalities. Part E measures the impact of improved communication practices on reducing mining company accidents and fatalities.

Data analysis

To determine whether factor analysis is appropriate, Kaiser's sample adequacy measure (MSA), which indicates the correlation between variables, was calculated (Tabachnick & Fidell, 2001). The index ranges from 0 to 1 and reaches 1 when the others perfectly predict each variable.

The following criteria can explain the measure:

0.80: Active

0.70: Moderate

0.60: Mediocre

0 50: Miserable

< 0.50: Unacceptable (Hair et al., 1998).

Reliability of a test refers to the constancy of scores obtained by the same person on different occasions, using a different array of equivalent items, or reassessing the same person under new variable examination conditions (Anastasi & Urbina, 1997: 84). Test validity refers to what the test measures and how well it is performed (Anastasi & Urbina, 1997: 113). If the test is valid, it measures all the effects it is supposed to measure. Since "reliability is a property of the data" (Eason, 1991:84), researchers must pay attention to the effect of participants on the quality of scores in each study. As Thompson (1994: 839) explained, since total score variance is an important component of reliability, the participants in the study themselves will influence score reliability: "The same measure, when applied to a more heterogeneous or homogeneous, a score will be produced as opposed to reliability".

In considering the diversity of research participants involved in various fields and the fact that research designers involving psychological tests must provide reliability coefficients for the scores of the analyzed data. As Pedhazur and Schmeling (1991: 86) argue: "Researchers who take the trouble to report reliability approximations for the instruments they use, in many cases only report reliability guesses contained in the instrument manuals or other researchers stated estimates. Information of this nature may be beneficial for comparative reasons. Still, it is crucial to know that the applicable reliability estimates are those obtained for the sample used in a particular study as a similar argument has validity. According to Nunnally and Bernstein (1994: 84), validity is the degree to which an all-or-nothing entity is related, and authentication is a never-ending practice. All psychometrics need to be assessed continually and reassessed to determine whether they have been working. Test validity refers to what the test measures and how well the test is appropriate (Anastasi and Urbina, 1997). Aiken and Groth-Marnat (2006) see the inadequacy of this definition because it implies that the question test has only one validity.

It has been argued that a test may have many opposing validities, depending on the specific reasons for which it was designed, the target sample, the specific conditions and circumstances in which it was performed, and the actual method used to determine its validity. However, Pedhazur and Schmelkin (1991) take a position and reject the idea of an effectiveness type per se but acknowledge that it is suitable for the organization, especially for discussion purposes. For them, the different aspects of effectiveness are not mutually exclusive and end; therefore, there are no different variants. It must always be considered that reliability is only affected by occasional measurement errors. However, the validity of tests is affected by both non-systematic and systematic (constant) errors. For this reason, a test may be reliable and not valid, but in no case can it be valid or unreliable.

Facets of Validity

Conceptions are equivalent to conceptual or theoretical formulations that aim to organize and help us understand our environment. Therefore, the main goal is to use the observed variables to illustrate unobservable structures or concepts, such as intelligence or anxiety (Pedhazur & Schmelkin, 1991). Therefore, construct validity can be viewed as the degree to which a test measures theoretical concepts or characteristics, such as attributes such as personality traits and intelligence.

Construct validity may include measures of criterion-related validation, convergence validation, and content validation.

- Standards-Related Validation
- Standards-related validation has two opposing aspects:
    - Concurrent verification and
    - Predictive validation.

Both are built on correlation (Aiken & Groth-Marnat, 2006; Anastasi & Urbina, 1997). For example, suppose a test is designed to measure intelligence. In that case, it must show that test scores are highly correlated with the results of a recognized intelligence test (intelligence standard or scale) (Aiken & Groth-Marnat, 2006; Anastasi & Urbina,

1997). In establishing concurrent validity, researchers test a group of participants and associate scores with standard measures indicative of the tested variable. Predictive validity is an integral part of validation concerning criteria, for example, criteria measures obtained in the future, usually, months or years after the test scores are reached (Nunnally & Bernstein, 1994). For example, if a high score on this subtest coincides with a high score in Math, and on the other hand, a low score on this subtest coincides with a low score in Math, the GSAT total subtest score will have predictive validity (3).

Convergent and Discriminant Validation

A construct-validating tool should have a high correlation with measures or methods measuring the same construct (convergent validity) but little correlation with measures of a different construct (discriminant validity) (Anastasi & Urbina, 1997). Convergence verification is a structurally valid method that indicates that the real test results match the expected results.

For example, if there is a test that assesses digital proficiency and if it excels in convergent validity. Hypothetically an employee in a risk management department, such as an organization's risk manager, is likely to score higher on the following than employees from other departments tested. Discriminant validity can be seen as a complement to convergent validation. Measuring an unrelated concept in a situation where one attribute is not strongly correlated with another one can assume that the test is discriminatively valid. For example, leadership skills cannot be assumed to be highly correlated with introversion etc.

Content Validation

Content verification is not to be confused with the term "appearance validity", which can be viewed as a non-scientific judgment, referring to how good a test is likely to be to the person applying it. However, the test must have face validity because without face validity, it can be assumed that collaboration and inspiration, as well as client and public acceptance, would be problematic (Linn, 1989).

Content validation focuses on two issues, namely:

- Does the test contain content of interest? For example, are the items on the math achievement test based on math concepts?
- Is the test right for your participants? For example, is the content consistent with a college math major?

Evaluating content effectiveness is done in one of two ways, namely:

- Subjectively or.
- From experience.

The subjective approach involves asking experts to judge the importance of the test items about the subject area being assessed. Empirical methods, such as principal component analysis and factor analysis, identify the basic structure of the test items. When measuring the reliability of a questionnaire, the most popular technique is called Cronbach's alpha or coefficient alpha. Cronbach's alpha is a statistical measurement tool designed to test reliability and internal consistency. It also indicates whether the item in the measurement tool and the subsections of the item are highly correlated. Therefore, Cronbach's alpha (α) is the reliability coefficient of the items in the survey tool, focusing on the quality of the measurements. Cronbach alpha represents how well a statement measures the same underlying concept. Therefore, it can be assumed that the larger the obtained Cronbach's alpha, the more reliable the scale. This, in turn, means that if similar individual responses are observed for a set of statements, it can be concluded that these statements measure the same structure. It is important to note that values greater than 0.7 should be obtained for reliable items (Farmer, 2010: 53-54). An example that can be used is a questionnaire, which produces a different score each time it is used and is subject to the same conditions. This will then result in a low-reliability factor values > 0.7 are acceptable. A value > 0.8 is good (Botha, 2012:53).

The following formula can be used to calculate Cronbach's alpha:

Equation 1: Cronbach's alpha coefficient

$$\boldsymbol{a} = \frac{\boldsymbol{k}}{\boldsymbol{k-1}}\left[1 - \frac{\sum_{\boldsymbol{1}}^{\boldsymbol{k}} \boldsymbol{Q}_{y_i}^2}{\boldsymbol{\sigma}_{\boldsymbol{x}}^{\boldsymbol{2}}}\right]$$

Where:

α= Cronbach's alpha coefficient

$\boldsymbol{k}$ = number of items in the construct

$\boldsymbol{Q}_{y_i}^2$= variance of item i, where i = 1 to $\boldsymbol{k}$

$\boldsymbol{\sigma}_{\boldsymbol{x}}^{\boldsymbol{2}}$= variance of the observed total item scores

Individual questions were analysed to establish Cronbach's alphas for the study. The mean was used as a basic descriptive statistic in the analysis. The mean can be described as the most common measure to describe trends in a dataset, and it is the degree to which all data values are grouped around a central value. The mean is calculated by adding the variable values for all observations and dividing it by the number of observations (Levine et al., 2008: 97; Farmer, 2010: 53). Variance is calculated by finding the squared difference between an observation and the mean, taking the sum of all cases, and dividing them by the number of observations minus one. It also describes the average dispersion of values around the mean, which in turn indicates the dispersion of the data (Levine et al., 2008: 106; Farmer, 2010: 53). The standard deviation (SD) can be defined as the square root of the variance, which in turn describes the dispersion of the data around the mean (Levine et al., 2008:107; Farmer, 2010:53).

Ethical Consideration

Ethical permission for this study was obtained from the North-West University (NWU) Potchefstroom campus Ethics Committee (ethics number: 00552-18-S4). The study was conducted on employees with a matric and lower to higher education qualifications. Field workers were briefed on the intent and objectives of the study and

asked to distribute questionnaires to colleagues and learners in their specific workplaces. The purpose and objectives were detailed in a cover letter accompanying the questionnaire, distributed by field staff to all participants. The questionnaire included an introductory section emphasising in writing to each participant that participation was voluntary and anonymous. Participants were not asked at any stage to provide any information that could personally identify them.

RESULTS AND DISCUSSION

Construct Validity

Factor analyses were done individually for Sections B, C, D and E of the questionnaire. The factor analysis was conducted to reduce data and ensure the validity of constructs.

The results of the factor analysis in section E are as follows:

Table 3: Factor Analysis

Items			Number of factors	% Variance	Cumulative reporting of analysis
Section E	N	MSA	Retained	Explained	Vary between
E1-E5	429	0.86	1	0.79	0.67 and 1.00

The MSA (0.86) of construct validity was confirmed on the construct.

Reliability

Cronbach Alpha values to confirm reliability are reported in the table.

Table 4: Cronbach's alpha values

Cronbach Alpha values to confirm reliability are reported in the table.

Construct	N	C.A
Communication	419	0.87

According to Field, all the indicated Cronbach Alpha values are higher than 0.6. thus, meaning that the constructs are reliable (Field, 2014).

Table 5: Do Ownership of Adult Education and OH&S training contributes to fewer accidents and fatalities?

Variable	N	Mean
E1	419	3.34
E2	419	3.38
E3	419	3.35
E4	419	3.31
E5	419	3.36

Concerning the Likert scale from 1- 4, the midpoint can be considered 2.5. For this study, 2.5 was utilised to determine if improved communication about guidelines, norms and standards and information dissemination could decrease accidents and fatalities in the Mining Company.

The highest mean of 3.38 and above the midpoint of 2.5 indicates that communication regarding guidelines, norms and standards and information dissemination leads to a decrease in accidents and fatalities in the Mining Company.

Table 6: Frequencies: QE1- E5

		R	SD	D	A	SA	MISSING	MEAN	STD DEV
E1	Enhanced management communication.	472	12	18	234	208	50	3.34	0.66
E2	AE&T and H&S training programmes to allow for interaction between workers and other stakeholders.	463	10	21	207	225	59	3.38	0.67
E3	It should clearly articulate the methodology to be used (how employees and management should discuss, plan and practise new learning).	463	10	26	231	196	59	3.31	0.67
E4	The communication aspect of the training programmes is to be managed by all stakeholders.	466	9	19	230	208	56	3.36	0.63

LEGEND**:** *R - Respondent; SD - Strongly Disagree; D - Disagree; A – Agree; SA – Strongly Agree*

Table 7: Enhanced management communication contributes to a decrease in accidents and fatalities in the Mining Company.

	Frequency	Percent	Cumulative Percent
Strongly disagree	12	2.54	2.54
Disagree	18	3.81	6.36
Agree	234	49.58	55.93
Strongly agree	208	44.07	100
Missing	50	0	
Total	522	100	

The study wanted to know if enhanced management communication contributes to decreased accidents and fatalities in the Mining Company. It was observed that 4% disagreed, 3% strongly disagreed, 44% of the respondents strongly agreed, and 50% the respondents agreed that enhanced management communication contributes to a decrease in accidents and fatalities in the Mining Company. Therefore, the results indicates that 50%, the majortiy strongly agree with the statement that enhanced management communication contributes to a decrease in accidents and fatalities in the Mining Company and contributes to more literate employees and fewer fatalities in the Mining Company.

Table 8: AE&T and H&S training programs that allow workers to interact with all other stakeholders help reduce accidents and fatalities in the Mining company.

	Frequency	Percent	Cumulative Percent
Strongly disagree	10	2.16	2.16
Disagree	21	4.54	6.70
Agree	207	44.71	51.40

Strongly agree	225	48.60	100
Missing	59	0	
Total	100	100	

The results from table 8 reveal that 49% of the respondents strongly agreed and 45% agreed, 5% disagreed, and 2% strongly disagreed that AE&T and H&S training programs to allow for interaction between workers and all other stakeholders contribute to a decrease in accidents and fatalities in the Mining Company. Therefore, the results indicates that 49%, the majortiy strongly agree with the statement that AE&T and H&S training programs that allow workers to interact with all other stakeholders help reduce accidents and fatalities in the Mining company.

Table 9: Clearly articulating the methodology to be used in the manner of engagement regarding the implementation of new learning on order to decrease accidents and fatalities in the mining company.

	Frequency	Percent	Cumulative Percent
Strongly disagree	10	2.16	2.16
Disagree	26	5.62	7.78
Agree	231	49.89	57.67
Strongly agree	196	42.33	100
Missing	59	0	
Total	522	100	

The results in Table 9 show that 42% of respondents strongly agree, 50% agree, 6% disagree, and 2% strongly disagree that clearly articulating the methods used in engagement modalities regarding the implementation of new learning reduces accidents and fatalities.

Table 10: The communication aspect of the training programmes to be managed by all stakeholders contributes to the decrease in accidents and fatalities in the Mining Company.

	Frequency	Percent	Cumulative Percent
Strongly disagree	9	1.93	1.93
Disagree	19	4.08	6.01
Agree	230	49.36	55.36
Strongly agree	208	44.64	100
Missing	56	0	
Total	522	100	

The study wanted to know whether the communication aspects of training programs administered by all stakeholders could help reduce accidents and fatalities at mining companies. It was observed that 4% disagree, 2% strongly disagree, 45% strongly agree, 49% agreed that the communication aspect of the training program is managed. Therefore, the results indicates that 49%, the majortiy agree with the statement that the communication aspect of the training programmes to be managed by all stakeholders contributes to the decrease in accidents and fatalities in the Mining Company.

PRACTICAL IMPLICATIONS

The implications for improved communication regarding the implementation of revised guidelines, norms, standards and information dissemination are indicative of allowing for more interaction between workers and stakeholders concerning AE&T and H&S training programs. The improved communications model should include the articulations of the method to be used in terms of the engagement process between

employees and management on the matter of new learning material and the implementation of new technologies.

LIMITATIONS AND RECOMMENDATIONS

A limitation of conducting this research is the apparent lack of research on Adult Education and Training (AE&T) and Occupational Health and Safety (OHS) in mining companies in this research area, so there is a limited number of scientific research resources available for this multidisciplinary study. The fact that MSA's 0.86 construct validity was confirmed suggests that construct validity can be considered a useful tool for assessing whether improved communication in terms of guidelines, norms, standards and information dissemination can reduce accidents and fatalities. Future research could consider additional variables that could determine whether improved communication about guidelines, norms, standards and information dissemination could reduce accidents and fatalities at mining companies.

CONCLUSION

The contribution of this study is embedded in the research that has been conducted and the results of subsequent applications, and a renewed focus on the notions of improved behavior-based safety (BSS) training and consequential thinking. One of the main benefits of behavior-based safety (BSS) is creating a common language and a major shift from troubleshooting to understanding risk-related facts. From the results, it is evident that the participants agreed that enhanced communication between all the stakeholders could improve the safety results of the mining Company. The articulation of used methodologies is an opportunity for the Mining Company to formalise the terms of engagement with relevant stakeholders. In conclusion, the concepts of a new and improved communication model should be transparent and approved by all stakeholders. An ongoing consultation process in terms of implementing new learning material and new technologies is proposed to ensure that employees are put at ease and not intimidated by the changes.

REFERENCES:

Aiken, L.R. & Groth-Marnat,G 2006. *Psychological testing and assessment*. 12th ed. Boston, MA: Pearson Education Group.

Anastasi, A. & Urbina, S. 1997. Psychological testing, 7th ed. New York, NY: Prentice Hall.

Booyens, Y. 2013. *Company assisting semi-literate mineworkers to increase.* http://www.miningweekly.com/.../company-assisting-semi-literate-mineworker Date of access: 7 May 2022.

Botha, E. 2012. *Information Technology Governance Framework in higher education in South Africa: A paradigm shift*. Potchefstroom: North-West University. (Minidissertation – Masters).

Changing-the-game-communications-and-sustainability-in-the-mining-industry.pdf (commdev.org) https://www.commdev.org/wp-content/uploads/pdf/publications/Changing-the-game-communications-and-sustainability-in-the-mining-industry.pdf Date of Access: 10 October 2022.

Chilis, B. & Preece, J. 2005. *Research methods for adult educators in Africa: African perspective on adult learning.* Cape Town: UNESCO/Pearson Education. http://www.*unesdoc.*unesco.org/images/0014/001413/141339E.pd Date of access: 15 April 2022.

Cohen, J. 1988. *Statistical power analysis for the behaviour sciences*. 2nd ed. Hillsdale, NJ: Erlbaum.

Czernowalow, M. 2004. *Engineering News – SA Mining Company gets NQF Level 1*. http://www.engineeringnews.co.za/.../sa-mining-industry-gets-nqf-level-1-qualifi... Date of access: 14 June 2022.

Department of Education **see** South Africa. Department of Education.

Eason, S.J. 1991. Why generalizability theory yields better results than classical test theory: A primer with concrete examples. In Thompson B. (ed). *Advances in educational research: Substantive findings, methodological developments*. Vol.1. Greenwich, CT: JAI Press.

Farmer, R.A. 2010. *Improving Occupational Health and Safety in a petrochemical environment through culture change*. Potchefstroom: North-West University. (Mini-dissertation – Masters).

Hair, J.R., Anderson, R.E., Tatham, R.L & Black, W.C. 1998. *Multivariate data analysis*. Upper Saddle River, NY: Prentice Hall.

Heyns, MM. 2015. *Trust within the work context: Conceptualisation, measure and outcomes.* Potchefstroom: North-West University. (Thesis -PhD).

International Finance Corporation. 2020*. Sustainable and Responsible Mining in Africa*.https://www.ifc.org/wps/wcm/connect/14d1fb8c-8d63-47c9-acb7-35b20a488ff2/Sustainable+Mining+in+Africa.pdf?MOD=AJPERES&CVID=knWL6Rr. Date of access: 27 July 2022.

Levine, D.M., Stephen, D.F., Krehbiel, T.C. & Berenson, M.L. 2008. *Statistics for managers*. 5th ed. Upper Saddle Riiver, NJ: Pearson.

Linn, R.L. 1989. *Educational measurement*. New York, NY: Macmillan.

Nunally, J. & Bernstein, I.H. 1994. *Psychometric theory*. 3rd ed. New York, NY: McGraw-Hill.

Pedhazur, E. & Schmelkin, L. 1991. *Measurement, design and analysis*. Hillsdale, NJ: Erlbaum.

Rosenthall, R. 1991. *Meta-analytic procedures for social research*. Newbury Park: CA. Sage.

Tabachnick, B.G & Fidell, L.S. 2001. *Using multivariate statistics*. 4th ed. Boston, MA: Allyn &Bacon.

The Importance of Communication Models in Education. 2022. *Times Square Chronicles.* http://t2conline.com/the-importance-of-communication-models-in-education/ Date of access: 30 June 2022.

Thompson, B. 1994. Guidelines for constructors. *Educational and Psychological Measurements*, 54:837-847.

CHAPTER 6

CONCLUSIONS, LIMITATIONS, RECOMMENDATIONS AND CONTRIBUTION OF THE STUDY (CONCEPTUAL MODEL).

This chapter aims to draw conclusions from the four articles that form part of the current study. The conclusions reached align with this study's specific research objectives. Recommendations were made to the organization, a proposed framework was designed for the specific research questions, and the study's limitations were discussed. In conclusion, suggestions and recommendations are made for possible future research.

6.1 CONCLUSIONS

With the swift conversion to remote working, multi-generational workforces, and technology booms, learning and development had to adjust to numerous transformations in the last decades. The learning and development environment is continually emerging, and it is expected that employers be proactive and ensure they apply the best methodologies and strategies. A robust learning and development strategy is crucial for organizational success as it defines how to develop people's capabilities, skills and competencies (Lynn 2022:1). The main objective is to bestow employees with the required skills and apparatuses to complete their jobs to the obligatory standards and meet the organisation's requirements. The process should commence with an in-depth knowledge of the organization's internal and external inspirations. This could be inclusive of the industry, the organisation itself and the factors that underwrite the overall business strategy. It is important for employees to feel esteemed and invested (Lynn 2022:1).

Learning and Development also contribute to the organisation's bottom line and ensure that the workforce is happy and motivated (McCandless 2022:1).

McCandless stipulates the following reasons for Learning and Development in an organisation namely:

- **Improved team member retention.**

Learning and Development are valued by employees in that a majority select to stay longer in organisations where investments are made into Learning and Development initiatives. This could lead to the retention of top talent and contribute to more motivated employees that are high performers overall.

- **Future-proof your Organisation.**

  Organizations with long-term company goals and strategies in place, combined with a well-designed team member management plan, will be able to conduct a skills gap analysis to identify employee development areas.

- **Save time and money.**

  Recruiting new employees can be more costly compared to training the existing workforce.

The conceptual model was developed for adult education and occupational health and safety training. The study was motivated by the observation that there is a need in the organisation to improve its workers' capacity, specifically with an emphasis on the modernisation of learning and development. It is an irrefutable fact that, of late, organisations have come to realise the importance of the role of Training and Development as it upsurges the organisation's staff efficiency, skills and productivity. The following recommendations are made to realise the full advantage of training initiatives as well as development programs:

- Training needs analysis to be conducted more professionally with all stakeholders involved;
- Agreement to be reached on what training is required; and
- Employees' knowledge of technology is to be determined so as to avoid embarrassment (Engetou, 2017:22).

The study aimed to develop a conceptual model for adult education and occupational health and safety training for miners at a mining company. Four main objectives are

formulated to achieve the main objectives, and intern is associated with four articles in the research. The specific content of the outline is summarized as follows. The study's first goal was to conduct a theoretical study to determine whether better planning and provision of adult education and training, occupational health and safety could reduce mine-related accidents and fatalities. Article 1 addresses this issue by investigating whether better planning and provision of adult education and training and occupational health and safety can reduce mine-related accidents and fatalities. The following specific research questions were addressed:

6.2 ARTICLE 1: COULD THE BETTER PLANNING AND PROVISION OF ADULT EDUCATION TRAINING AND OCCUPATIONAL HEALTH AND SAFETY BY MEANS OF THE FOLLOWING LEAD TO A REDUCTION IN MINE-RELATED ACCIDENTS AND FATALITIES?

1. The enhancement of the quality of training and learning material and the reduction of wastage.
2. The establishment and reinforcement of a culture of learning.
3. The removal of learning barriers and creative capacity to send people for H&S training as well as AE&T training.
4. The implementation of proactive training (virtual reality and simulation training).
5. The increase in informal training.
6. The enablement of peer teaching.
7. Greater focus on the retention of knowledge of standards.
8. Proper learning design regarding mine standards and unit standards.
9. The quality of facilitation.
10. High standard assessment.

11. On job coaching.
12. Specific skills courses.
13. Specialised capacity-building courses.
14. Formal practical courses under coaching.
15. Formal exposure under supervision.
16. Supervisory and leadership development.

Statistical analysis and discussion are deliberated on in Article 1, pp. 43-58. Results from the main objective of research question 1, support a conceptual model that confirms that better planning and delivery of adult education and occupational health and safety training can reduce mine-related accidents and fatalities.

Two concepts derived from the study, training intervention enablers and training methods, should be considered as future interventions to enhance better planning and delivery of adult education and occupational health and safety training to reduce mine-related accidents and fatalities.

The following Training Interventions Enabler and Training methodologies could be considered, namely:

- Gamification
- Virtual Reality

Microlearning units can have a significant impact on the organisation as each has a unique instructional design and is available in different formats, for example, videos, infographics, games, and audio bytes. Depending on the desired outcomes, the various microlearning options can be woven together to form a tailored learning path or be utilised as a plug-and-play option. Game-based learning can contribute to a design immersive experience, enhance long-term habit forming, expedite behavioural

changes, and inspire investigative learning. Game-based solutions can also be utilised for values training, instilling an in-depth grasp of the corporate code of conduct and revitalising mindfulness of workplace compliance regulations (Khan, 2022:1).

In conclusion, two concepts derived from the research, namely training intervention enablers and training methods, should be considered as future interventions to enhance better planning and delivery of adult education and occupational health and safety training to reduce mine-related accidents and fatalities.

The second goal was to determine whether ownership of occupational health and safety practices and behaviors contributes to reducing the mining companies' fatalities, accidents and incidents. Article 2 addresses this issue by investigating whether ownership of occupational health and safety practices and behaviors reduces mining companies' fatalities, accidents, and incidents.

6.3 ARTICLE 2: COULD THE OWNERSHIP OF OCCUPATIONAL HEALTH AND SAFETY PRACTICES AND BEHAVIOURS CONTRIBUTE TO FEWER FATALITIES AND INCIDENTS AND ACCIDENTS IN THE MINING COMPANY BY THE FOLLOWING MEANS?

1. Establishing higher standards for compliance and behaviour.
2. Bringing back accountability for developing employees.
3. Role clarification and responsibility.
4. Consequential thinking – understanding consequences.
5. Locus of control.
6. Capacity building.
7. Confidence in ability.
8. Careful reasoning.
9. The use of judgement in assessing information.
10. Achieving predetermined results.
11. Awareness of the implications of proposed actions.

12. Analysis of relationships between previously unrelated sets of information to identify possible future implications and consequences.

Statistical analysis and discussion can be found in Article 2, pp. 81-92. The results of the main objective of Research Question 2 support the following conceptual model: Ownership of occupational health and safety practices and behaviors contributes to reducing fatalities, accidents and incidents in mining companies.

Companies must take full responsibility and ownership for their workforce training if they want to achieve health and safety targets and reduce the number of accidents and fatalities. The accountability for developing employees is the responsibility of Management and employees alike.

According to the Mine Health and Safety Act, 1996 (Act No. 29 of 1996:17) and Regulations the following:

6.3.1 Employer to provide health and safety training.

(1) As far as reasonably practicable, every employer must-

(a) provide employees with any information, instruction, training or supervision that is necessary to enable them to perform their work safely and without risk to health; and

(b) ensure that every team member becomes familiar with work-related hazards and risks and the measures that must be taken to eliminate, control and minimise those hazards and risks.

(2) As far as reasonably practicable, every employer must ensure that every employee is properly trained-

(a) to deal with every risk to the employee's health or safety that-

(i). is associated with any work that the employee has to perform; and

(ii). has been recorded in terms of section 11;

(b) in the measures necessary to eliminate, control and minimise those risks to health or safety;

(c) in the procedures to be followed to perform that employee's work; and
(d) in relevant emergency procedures.
Mine Health and Safety Act, 1996 (Act No. 29 of 1996) and Regulations (3) In respect of every employee, the provisions of subsection (2) must be complied with-
(a) before that employee first starts work;
(b) at intervals determined by the employer after consulting the health and safety committee;
(c) before significant changes are introduced to procedures, mining and ventilation layouts, mining methods, plant or equipment and material; and
(d) before significant changes are made to the nature of that employee's occupation or work.
(4) The employer must keep a record of all formal training provided in respect of each employee in terms of subsection (2).

The third objective was to determine and analyse global and international trends and perspectives concerning management with specific reference to Adult Education and Training (AE&T) and Health and Safety Management. This was addressed in Article 3 by investigating whether better management, direction and leadership of Adult Education and Occupational Health and Safety training could contribute to fewer accidents and fatalities in the Mining Company.

The third objective is to identify and analyze global and international trends and perspectives on management concepts, particularly adult education and training (AE&T) and health and safety management. Article 3 addresses this issue by investigating whether better management, direction, and leadership in adult education and occupational health and safety training can help reduce accidents and fatalities in mining companies.

6.4 ARTICLE 3: COULD BETTER MANAGEMENT, DIRECTION AND LEADERSHIP OF ADULT EDUCATION AND OCCUPATIONAL HEALTH AND SAFETY TRAINING CONTRIBUTE TO FEWER ACCIDENTS AND FATALITIES IN THE MINING COMPANY BY MEANS OF?

1. Enhanced behavioural-based safety training and consequential thinking.
2. Renewed focus on hazard identification and risk assessments.
3. Reinforcing basic health and safety practices.
4. Revision of Mine policies and processes subject to change.
5. Enhanced Mine standards summative Assessments.

Statistical analysis and discussion can be found in Article 3, pp.113-118. The outcomes of the main objective of Research Question 3 support the conceptual model as better management, direction and leadership of adult education and occupational health and safety training can help reduce accidents and fatalities in the Mining company.

In order to identify the role of increased behavior-based safety training and consequential thinking, according to Timmins (2021:1). Whenever a team member resumes their duties after a period of absence for whatever reason, the individual will have to be re-trained due to changes in the physical environment, new team member and the way of thinking, as well as the way of work. Not considering these factors could lead to increased turnover of staff and potentially high rates of accidents, incidents and fatalities. Behavioural-based Safety training was developed in the late 1970s and has progressed to such an extent that it now includes the essential building blocks of supervisory development, leadership training, team building and cross-level collaboration. There are, however, certain outdated schools of thought regarding behavioural-based safety training, but it remains a very acceptable approach across disciplines. Behavioural-based safety training was constructed on William Edwards

Deming's doctrines of continuous improvement Timmins (2021:1). The main focus is on frontline employees with the propensity to be injured. Behavioural-based safety training also offers knowledge and behavioural strategies for regulating exposures while simultaneously equipping employees with the ability to stop work and obtain support and advice in instances where a risk is identified. Behavioural-based safety training is the added benefit in that the exposure and or risk can, for ease of reference, be addressed more adequately with team members and supervisors, creating a common language and redirecting the conversation from fault-finding to facts. Over time Behavioural-based safety training has evolved considerably and includes a focus on the exposure that includes behaviours, hazards and processes. Deming believed that employers would increase productivity and market share by improving quality. His theory of total quality improvement consists of four areas, all of which are part of the fundamentals of behavioural-based safety training, with specific reference to the following:

- Recognise explicit dangerous safety exposures and describe them to the distinctive work of the organization. Fashion communication concerning what it takes to protect people;
- Collect data to fathom frequency issues, as well as a qualitative perception of the reason why critical exposures are controlled (safe) or not (exposed);
- Give feedback to all participants, including frontline employees to manage their exposure and to frontline supervisors for supporting and understanding the exposure of employees and for the manager to create a safe space for employees to work in; and
- The data can be utilised to ensure continuous improvement by including the data collected and understandings that eliminate physical, process-related or cultural barriers to safe work (Timmins 2021:1).

According to Timmins (2021:1). Behavioural-based safety training can be regarded as a vehicle for reconciling frontline employees, leaders and managers through a shared language. Behavioural-based safety training assists all concerned in achieving shared responsibilities in protecting employees and creating a reality of safety excellence.

There has also been shifting to developing safety leaders, as we are more conscious of the fact that brilliant results emanate from a company culture that:

- values safety;
- safety leaders that are credible and committed; and
- by means of engaged frontline employees, understand and know what course of action to follow when challenged with potential hazards and risks.

Revitalised emphasis on hazard identification and risk assessments. The Mine Health and Safety Act, 1996 (Act No. 29 of 1996:21) and its Regulations refer to:

6.4.1 Employer to conduct occupational hygiene measurements.

(1) The employer must engage the part-time or full-time services of a person qualified in occupational hygiene techniques to measure levels of exposure to hazards at the mine-

(a) if required to do so by regulation or a notice in the Gazette; or

(b) if, after assessing risks in terms of section 11 (1), it is necessary to do so.

(2) Every system of occupational hygiene measurements must-

(a) be appropriate, considering the hazards to which the employees are or may be exposed; and

(b) be designed so that it provides information that the employer can use in determining measures to eliminate, control and minimise the health risks and hazards to which employees are or may be exposed.

(3) The employer must keep a record of all occupational hygiene measurements in terms of subsection (1) in a manner that can be linked as far as practicable to each team member's record of medical surveillance.

Strengthen basic health and safety practices, revise mine policies and procedures that may change, and strengthen summative assessments of mine standards in

accordance with the Mines Health and Safety Act 1996 (Act 29 of 1996) and the following provisions:

6.4.2 The employer must establish a health and safety policy.

(1) Every employer must prepare a document that-

(a) describes the organisation of work;

(b) establishes a policy concerning the protection of employees' health and safety at work;

(c) establishes a policy concerning the protection of persons who are not employees who may be directly affected by the activities at the mine;

(d) substituted by s.8 of Act 72 of 1997 (with effect from 15 January 1998); and

(e) outlines the arrangements for carrying out and reviewing policies.

(2) The employer must consult with the health and safety committee on the preparation or revision of the document and policies referred to in subsection (1).

(3) The employer must-

(a) prominently and conspicuously display a copy of the document referred to in subsection (1) for employees to read; and

(b) give each health and safety representative a copy of the document.

6.5 ARTICLE 4 COMMUNICATION

The fourth objective was to investigate the impact of enhanced communication on Occupational Health and Safety (OHS) performances.

The article addressed the issue by investigating whether improved communication regarding guidelines, norms and standards and information dissemination could reduce accidents and fatalities.

ARTICLE 4: Could improved communication with regards to guidelines, norms and standards and information dissemination result in the reduction of accidents and fatalities by means of:

1. Enhanced management communication.
2. AE&T and H&S training programs to allow for interaction between workers and all other stakeholders.
3. Plainly articulating the practice to be used in the manner of engagement regarding the implementation of new learning in order to decrease accidents and fatalities in mining companies.
4. The communication component of the training programmes is to be overseen by all stakeholders.

The statistical analysis and discussions were addressed in Article 4 pages 138-143. The results for the main objectives of research question 4 offer confirmation for a conceptual model in that improved communication with regards to guidelines, norms and standards and information dissemination results in the reduction of accidents and fatalities.

According to the Time Square Chronicles (2020:1), communication has always been regarded as an essential part of the education sector. All sectors related to education and training should have a well-designed communication model to facilitate the process and ensure proper execution thereof. A communication model can be the pictorial visualization of the communication process in its totality. The main objective of the communication model is to advance communication skills and increase its effectiveness between the students and teachers. The message, in essence, streams from the communicator to the receiver to respond. Also included in this process is encoding the message and the medium used. However, in between is the message

encoding, which acts as the receiver's vehicle to decipher the message and in turn, he or she provides feedback.

6.6 LIMITATIONS

It is important to note possible areas for further research when considering the conclusions and recommendations made in the study. Considering also that the study participants were from a mining company's gold and platinum divisions, the findings in this report cannot be generalized to the entire South African sample of mining companies due to the use of a non-probabilistic facility. Another limitation of this study is that the empirical research focuses only on adult education and occupational health and safety training in mining companies, with limited attention to behavioral aspects and other industries. The lack of citations to the same or related studies forces researchers to switch to current and older sources. The researcher's contribution to the research body consists of providing new information to the research question. As part of the analysis, several inadequacies were also identified that indicate improvements in adult education and occupational health and safety training, and the organisation assessed must strive to reach the preferred maturity stage in adult education and occupational health and safety training. Despite these limitations, this study adds to empirical research on adult education and occupational health and safety training in mining companies.

6.7 RECOMMENDATIONS

A comprehensive analysis will need to be conducted to determine the organisation's current learning and development needs to facilitate a process of enhanced planning, development and provision of learning and development for Adult Education and Occupational Health and Safety. The programmes presently in place are to be categorised and a proper framework for establishing which programmes in the organisation needs to be redesigned is to be ascertained and aligned to adult learning principles.

The Company is to be mindful of the fact that the learning programmes that are considered to be redesigned, to preferably include principles of adult self-learning, with

specific reference to capacity building that enables employees to attune to the coming changes. As soon as finality has been reached regarding the programmes, the organisation has to demarcate the standards by which it will rank programmes that must be redesigned. Once that has been established a criterion needs to be established for ranking programmes that have the highest impact. The company's training facilities must have the required infrastructure and apparatus to support the new modernised learning technologies. Furthermore, suitable technologies are to be sourced from external providers, businesses and partners and the selection thereof should support the envisaged outcomes and must therefore be appropriately identified, prioritised and selected.

The organisation will also be required to have Learning and Development staff in place that is competent enough to modernise learning at the correct levels. For consideration could be the integration of cutting-edge practices, for example, practical assessments, simulated training, audio-visual, filmed and cinematic format interventions. The organisation will also need to have the required support staff, such as ICT, Human Resources and Learning and Development in place.

The company to ensure that competent implementors are in place that are conversant in the following:

- blended learning approach;
- systems thinking;
- mental models; and
- coaching and idea-sharing.

The organisation to arrange for *train the trainer* workshops to develop the implementors in order to assist them with planning, delivery and excellent learner outcomes, based on adult learning principles. From a cost perspective, the dependence on external providers should be decreased over time, and the capacity to develop modernised training programmes in-house needs to be established. Resource requirements must be established, and gap analysis must be done to comprehend the required skills.

The necessary skills Development programmes for staff are to be designed and rolled out. Should the company not have adequate resources in- house, the required resources will have to be recruited from externally. Once the required technologies have been identified, the providers and IT specialists will be required to coach the training staff on the technologies that are being implemented. A gap analysis will have to be conducted on each area's current and future skills.

Before implementation, the following aspects should be considered namely:

- An applicable performance criterion to form part of the summative competency assessments.

- An effectual communication model and framework to be established concerning training needs, learner progress and learner achievements /outcomes in line with the necessary systems requirements.

- Should it be deemed necessary for the providers to form part of the final evaluation framework for established performance criteria.

6.7.1 Survey:

- Surveys are to be conducted to establish the best learning fit and/or preferences for employees in terms of a possible blended approach.
- Rollout of customer surveys.
- Analysis of data and feedback to management.

The Company needs to align with future skills requirements to ensure that enhancement of the quality of training programmes is in line with future technological requirements. The development interventions and programs should be in line with future career progression. A comprehensive impact analysis should be conducted on the impact of the interventions.

6.8 CONTRIBUTIONS OF THE STUDY (CONCEPTUAL MODEL)

From the research conducted and the outcomes obtained, the following Conceptual Model as indicated in Table 1, is proposed for Adult Education and Occupational Health and Safety training of mineworkers in the Mining company.

Table 1: A conceptual Model for the Adult Education and Occupational Health and Safety training of mineworkers in the Mining Company.

A comprehensive needs analysis of Adult Education and Occupational Health and safety training requirements.
Establish which programmes need to be re-designed to ensure quality learning material.
Model to include the principles of adult self-learning.
Ranking of programmes that need to be re-designed based on impact.
Training facilities to have the required infrastructure and apparatus.
New technologies to be sourced (Virtual reality, simulation and augmented learning).
Appropriate training staff and support staff are in place.
Implementors are conversant in training methodologies.
Train the trainer workshops.
The necessary skills development programmes for staff.
Consider applicable performance criteria to form part of summative competency assessments.
Effective communications model. The communication aspect of the training programmes is to be managed by all stakeholders.
Evaluation framework.

Survey to measure:

- Preference of employees.

- Data analysis and feedback to Management.

- Alignment with future skills requirements.

- Impact analysis.

Change model:

Removing learning barriers generates the ability to send employees for training.

Create urgency for change and get buy-in from key stakeholders.

Conduct “As Is” Analysis against the leading practice.

Design frameworks against which to operate.

Identify Quick Wins to “Adopt or Discard” & remove obstacles.

Proper learning design regarding mine standards and Unit standards.

Roll-out to the organisation for implementation.

Provide ongoing coaching, advice & support.

Continuous Improvement - monitor and evaluate to close gaps.

Anchor changes in Company Culture and continually reinforce a culture of learning.

Desired outcomes:

To create Social Learning platforms for employees and Managers where anyone in the organization can have access to:

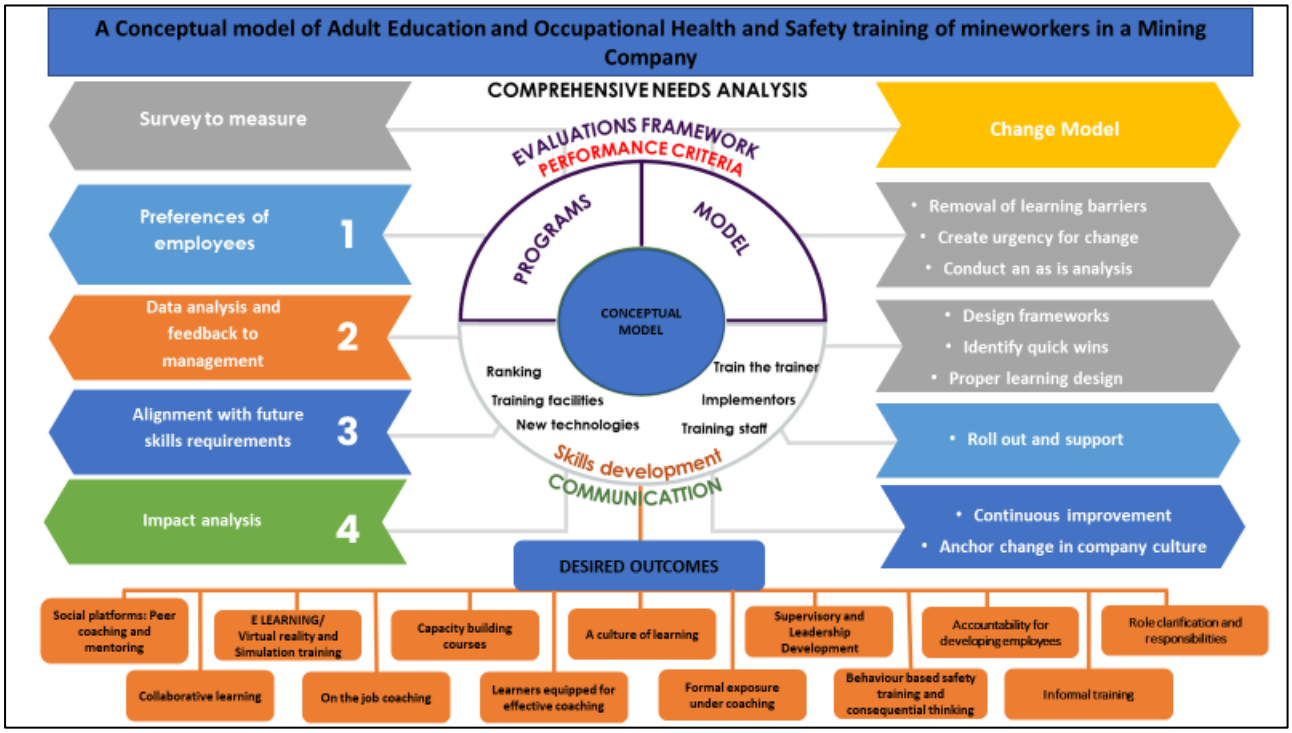
- **Peer feedback and teaching.**
- **Peer coaching and mentoring.**
- **Collaborative Learning.**

E-Learning.

Informal training.

On-job coaching.
Fit for purpose capability-building courses.
Formal practical courses under coaching.
Learners are equipped for effective coaching of other team members.
Supervised formal exposure.
Supervisory and leadership development.
Reinforcing accountability for developing employees.
Role clarification and responsibility.
Consequential thinking training initiatives.
Investigation of the relationship between previously unrelated sets of information to identify possible future implications and consequences.
Enhanced behavioural-based safety training and consequential thinking.
Renewed focus on hazard identification and risk assessment.
Strengthen basic health and safety practices.

Figure 1: A conceptual Model for the Adult Education and Occupational Health and Safety training of mineworkers in the Mining Company



Source: Botma (2022)

Health and safety training of underground miners requires education in new topics or content within the framework of continuous technological development. The lack of formal education results in limited knowledge in relevant disciplines and related fields such as adult learning. The implementation of unit standards and their impact depends on the quality of adult education and training (AE&T) as an established discipline that has the potential to contribute not only to research, but also to the body of existing literature, with specific reference to Adult Learning. However, there is an issue with the quality of training in the industry that the Mining Qualifications Authority is currently addressing (Frankel, 2010: 44; MQA, 2010: 62; MQA, 2011: 91; Tuchten, 2011: 191).

One component of Adult Education and Training (AE&T) should be the focus on the following namely:

- Quality and effectiveness of Adult Education and Occupational Health and Safety training programmes;

- Incorporation of health and safety electives into the Adult Education and Training (AE&T) curriculum for AE&T Levels 1-4;
- Conduct more research on the correlation between adult learning and experience; and
- Health and safety learning in the form of new content, skills, insights and/or behavioral changes Tuchten (2011:191).

The most significant contribution of the study, and with specific reference to training interventions enabler and training methodologies, is the new proposed blended approach with regards to the modernisation of learning and the use of games and, simulated training material in the form of videos and virtual sessions. To ensure learning programmes are inclusive of the principles of adult self-learning, capacity building, and the enablement of employees to adapt to change. Also, to ensure that competent facilitators effectively apply a blended learning approach, systems thinking, mental models, coaching and ideas sharing. To provide for shared social learning space/library for facilitators and employees where anyone in the organization can access peer feedback, peer coaching and mentoring and collaborative learning and trainee/learner-centred facilitation methodology.

By establishing higher, practical, measurable standards of compliance and conduct, mining companies can benefit from implementing some basic concepts of ownership and responsibility as contributors to more skilled employees and improved safety achievements. The responsibility for developing employees should rest firmly on the shoulders of the company and its employees. The role of all stakeholders must be respected to achieve training and safety goals together. The principle of consequential thinking and its implementation should be reconsidered as a significant theme for workers to understand the consequences of their actions.

Assessments of workers to determine their locus of control, whether internal or external, should be implemented to ensure that the majority of the workforce has ownership over their actions and behavior. Capacity building of workers will ultimately ensure that they have confidence in their abilities, which will lead to cautious thinking

and the application of wisdom when evaluating information. Another contribution of this study can be found in the research that has been conducted and the results of subsequent applications, and a renewed focus on the concepts of enhanced behavior-based safety training and consequential thinking. One of the main benefits of behavior-based safety is creating a common language and a major shift from troubleshooting to understanding risk-related facts. The concept of new and improved communication models should be transparent and endorsed by all stakeholders. Ongoing consultation on implementing new learning materials and new technologies is recommended to ensure staff are reassured and not intimidated by the changes. A public regulatory framework or set of guidelines is recommended for mandatory occupational health and safety (OHS) training or preparation for miners with limited formal education. It is also recommended that a mandatory Occupational Health and Safety (OHS) skills program be implemented for all post-adult education and training (AE&T) Level 4 mine employees. Finally, policies and directives originating from the mining, education and training sectors were identified to make occupational health and safety (OHS) training a priority intervention in the mining sector (Tuchten, 2011:205-208).

6.9 FINAL CONCLUSION

The study provides a leading conceptual model for adult education and occupational health and safety training for miners in the Mining Company. This model's results could be used as input for decisions making, regarding the appropriate allocation of resources to implement the proposed model. It confirms that better planning, provision, ownership, management, direction, leadership and communication of adult education and occupational health and safety training can help reduce incidents, accidents and fatalities in the mining Company. In conclusion, this study provides important information on the “how” and “by what” means to achieve these goals and can serve as a guideline for implementation. Therefore, it is reasonable to conclude that this research has theoretical and practical value as it reveals unequivocal instruments for better planning, provision, ownership, management, direction, leadership and communication of adult education, and how and by what means occupational health and safety training can contribute to the achievement of the Company's strategic goals and objectives.

REFERENCES:

Engetou, E. 2017. *The impact of Training and Development on Organizational Performance.* Kokkola: Central University of Applied Science. (Thesis – Business Management).

Frankel, P. 2010*. Falling ground: Human approaches to mine safety in South Africa*. Johannesburg: Agency for Social Reconstruction. http://www.repository.up.ac.za/bitstream/handle/2263/24196/07references.pdf?8 Date of access: 10 July 2022.

Khan, A. 2022. *Time to onboard the great learning modernization.* http://elearningindustry.com/time-onboard-great-learning-modernization Date of access: 7 August 2022.

Lynn, K. 2022. *How to develop an effective learning and development strategy*. http://www.learnupon.com/blog/learning-and-development-strategy/ Date of Access: 6 August 2022.

McCandless, K. 2022. *5 Strategies for Employee Training and Development in 2022*. http://www.fool.com/the-ascent/small-business/human-resources/articles/training-and-development/ Date of access: 6 August 2022.

MQA. 2010. *Annual Report of the Mining Qualifications Authority (MQA) for the financial year 1 April 2009 to 31 March 2010.* Johannesburg: Department Higher Education and Training and MQA.

MQA. 2011. *Mining Qualifications Authority. Sector Skills Plan for the Mining and Mineral Sector. Submitted by the Mining Qualifications Authority (MQA) to the Department of Higher Education and Training, 16 February 2011*. Johannesburg: MQA.

South Africa. 1996. *Mine Health and Safety Act No.29 of 1996 and Regulations*. http://www.mhsc.org.za/sites/default/files/public/publications/Mine%20Health%20and%20Safety%20Act%2029%20of%201996%20and%20Regulations%20Final%20Booklet.pdf Date of access: 29 June 2022.

Timmins, R. 2022. *Safety Leadership: Behaviour-based safety is needed now more than ever.* http://www.safetyandhealthmagazine.com/articles/21849-safety-leadership-behavior-based-safety-is-needed-now-more-than-ever Date of access: 30 June 2022.

Tuchten, G. 2011. *Concept development for facilitating the health and safety efficacy of South African mine workers*. Pretoria: University of Pretoria (Thesis – PhD).

Times Square Chronicles. 2020. *The Importance of Communication Models in Education. http://t2conline.com/the-importance-of-communication-models-in-education/* Date of access: 30 June 2022.

APPENDIX A: LETTER FROM LANGUAGE EDITOR

Dynamic Language & Translation Specialists

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Thursday, 17 November 2022

To whom it may concern

Re: Confirmation of language edit

The MBA dissertation "**A conceptual model of Adult Education and Occupational Health and Safety training of mineworkers in a Mining Company**" by **A. Botma** (21722544) was edited for language precision.

Final, last-minute corrections remain the responsibility of the author.

Antoinette Bisschoff

BA Languages (UPE – now NMU); MBA (PU for CHE – now NWU); Translation and Linguistic Studies (NWU)

Officially approved language editor of the NWU since 1998
Member of SA Translators Institute (no. 100181)

Precision ... to the last letter

APPENDIX B: QUESTIONNAIRE

Adult Education and Occupational Health and Safety Training Questionnaire

Thank you for taking time to answer this questionnaire. The research aims to identify the areas of opportunity for improving Adult Education and Training (AE&T) in order to improve Occupational Health and Safety (OHS) performances in the Mining Industry.

Your participation in this study is completely voluntary and there are no foreseeable risks associated with it. All questionnaire responses will be strictly confidential and data from this research will be used as part of my PhD dissertation.

The questionnaire consists of statements associated with safety related aspects in your daily work environment and the role of Adult Education and Training (AE&T) in the workplace. It will take approximately 15 minutes to complete.

Ethical clearance has been obtained from the NWU Potchefstroom School of Business and Governance: NWU – 00552-18-S4 as well as from Sibanye-Stillwater in terms of the Companies confidentiality and copyright agreement and requirements.

Will you please be so kind as to fill in the questionnaire at your earliest convenience?

Kind regards

Researcher:	**Supervisor:**
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PhD: MWU, Potchefstroom School of Business and Governance

Please reflect your honest opinion of the statement to ensure an

accurate measure

Please select which of the following applies to you:

SECTION A

The following information is needed to help with the statistical analysis of the data for comparisons among different interest groups. All your responses will be treated confidentially. I appreciate your help in providing this important information.

Mark the applicable block with a cross (X). Complete the applicable information.

1.	What is your gender?	**Male**	**1**	**Female**		**2**
2.	In which age group do you fall?	**18 – 29|1**	**30-39|2**	**40-49|3**	**50 – 59|4**	**60+|5**
3.	Race	**White|1**	**Black|2**	**Coloured|3**	**Indian|4**	**Other|5**
4.	Qualifications	**Lower than matric|1**	**Matric|2**	**Certificate|3**	**Diploma|4**	**University degree|5**

5.	Operation	**Beatrix|1**	**Kloof|2**	**Driefontein|3**	**Kroondal |4**	**Rustenburg Platinum mines |5**
6.	Please state your position in the Organisation	**Top Management|1**	**Senior Management| 2**	**Middle Management| 3**	**Skilled employees |4**	**Unskilled employee|5**

SECTION B

The following statement concerns your opinion of whether better planning and provision of Adult Education and Occupational Health and Safety Training could contribute to less accidents and fatalities by means of:

Please rate the extent to which you agree or disagree with the following statement by making an "X" over the appropriate number on the 1 to 5 point scale next to your statement.

		1= Strongly disagree	*2= Disagree*	*3= Agree*	*4 = Strongly agree*	*5= Prefer not to say*
	STATEMENT					
B1	Quality of training and learning material leads to better AE&T OHS training.	1	2	3	4	5
B2	Reinforcement of a culture of learning.	1	2	3	4	5
B3	The removal of learning barriers by means of creating capacity to send people for H&S training as well as AE&T training.	1	2	3	4	5

B4	The implementation of proactive training (Virtual Reality and Simulation Training).	1	2	3	4	5
B5	The increase in informal training.	1	2	3	4	5
B6	The enablement of peer teaching.	1	2	3	4	5
B7	Greater focus on the retention of knowledge of standards.	1	2	3	4	5
B8	A proper learning design regarding mine standards and unit standards.	1	2	3	4	5
B9	Quality of facilitations.	1	2	3	4	5
B10	High standard assessment.	1	2	3	4	5
B11	On job coaching.	1	2	3	4	5
B12	Specific skills courses.	1	2	3	4	5
B13	Specialised capacity building courses.	1	2	3	4	5
B14	Formal practical courses under coaching.	1	2	3	4	5

B15	Formal exposure under supervision	1	2	3	4	5
B16	Supervisory and leadership development.	1	2	3	4	5

	SECTION C					
	The following statement concerns your opinion of whether Ownership of Adult Education and Occupational Health and Safety Training practices and behaviours could contribute to less accidents and fatalities by means of:					
	Please rate the extent to which you agree or disagree with the following statement by making an "X" over the appropriate number on the 1 to 5 point scale next to your statement.					
		1= Strongly disagree	*2= Disagree*	*3= Agree*	*4 = Strongly agree*	*5= Prefer not to say*
	STATEMENT					
C1	Establishing higher standards for compliance and behaviour	1	2	3	4	5
C2	Bringing back accountability for developing employees	1	2	3	4	5
C3	Role clarification and responsibility.	1	2	3	4	5
C4	Consequential thinking (understanding consequences).	1	2	3	4	5

C5	Locus of control (Internal and external)	1	2	3	4	5
C6	Capacity building.	1	2	3	4	5
C7	Confidence in ability.	1	2	3	4	5
C8	Careful reasoning.	1	2	3	4	5
C9	The use of judgement in assessing information.	1	2	3	4	5
C10	Achieving predetermined results.	1	2	3	4	5
C11	Awareness of the implications of proposed actions.	1	2	3	4	5
C12	Analysis of relationships between previously unrelated sets of information to identify possible future implications and consequences.	1	2	3	4	5

SECTION D

The following statement concerns your opinion of whether better Management, Direction and Leadership of Adult Education and Occupational Health and Safety Training could contribute to less accidents and fatalities by means of:

Please rate the extent to which you agree or disagree with the following statement by making an "X" over the appropriate number on the 1 to 5 point scale next to your statement.

		1= Strongly disagree	*2= Disagree*	*3= Agree*	*4 = Strongly agree*	*5= Prefer not to say*
	STATEMENT					
D1	Enhanced behavioural based safety training and consequential thinking.	1	2	3	4	5
D2	Renewed focus on hazard identification and risk assessments.	1	2	3	4	5
D3	Reinforcing basic health and safety practices.	1	2	3	4	5
D4	Revision of Mine policies and processes subject to change.	1	2	3	4	5
D5	Enhanced Mine standards Summative Assessments	1	2	3	4	5

	SECTION E
	The following statement concerns your opinion of whether improved communication with regards to guidelines, norms and standards and information dissemination could result in the reduction of accidents and fatalities in the mining Industry by means of:
	Please rate the extent to which you agree or disagree with the following statement by making an "X" over the appropriate number on the 1 to 5 point scale next to your statement.

		1= Strongly disagree	*2= Disagree*	*3= Agree*	*4 = Strongly agree*	*5= Prefer not to say*
	STATEMENT					
E1	Enhanced management communication	1	2	3	4	5
E2	AE&T and H&S training programs to allow for interaction between workers and all other stakeholders.	1	2	3	4	5
E3	AE&T and H&S training programs to allow for interaction between workers and all other stakeholders.	1	2	3	4	5
E4	It should clearly articulate the methodology to be used (how employees and management should discuss, plan and practise new learning).	1	2	3	4	5
E5	The communication aspects of the training programmes to be managed by all stakeholders.	1	2	3	4	5

Thank you for completing this questionnaire