Education. Innovation. Diversity
Vol. 1, No. 12 (2026)
ISSN 2661-5401

https://doi.org/10.17770/eid2026.1.82

Making a Case for the Use of Problem-based Learning to Develop the Multiple Intelligences of Accounting Students: A Pedagogical Perspective

Medson Mapuya

Faculty of Education, Department of Human Sciences Teaching,
Sol Plaatje University, Kimberley, South Africa

Abstract. Accounting demands students to engage in critical thinking and problem solving and challenges them to tap into their analytical, application, evaluation, practical and creative skills. Among others, the accounting equation, preparation and analysis of financial statements and budgeting require students to have a sound command of the above cognitive skills. Drawing from the pedagogical submissions of social constructivism and guided by the theoretical assumptions of multiple intelligences, this quantitative study makes a case for the use of problem-based learning to develop the Multiple Intelligences of first year Accounting Student teachers. A phenomenological research design and the interpretivist paradigm informed data collection using a Likert Scale questionnaire with eighteen statements while descriptive statistics were used for data analysis. The findings presented a compelling synopsis to advocate for the use of scaffolding to promote the multiple intelligences of students. This was ascribed to the congruity between scaffolding and problem-based learning in developing multiple intelligences. It is recommended that students be given teaching and learning activities that are underpinned by the cognitive and assessment provisions of multiple intelligences and social constructivism. Lecturers are thus discouraged from completely relying on textbook assessments. Instead, they should adopt a creative stance to integrate the cognitive constructs of multiple intelligences in their lesson presentations and assessments to develop the students' analytical, creative thinking, evaluating and problem-solving skills. The cognitive requirements of multiple intelligences and social constructivism, in conjunction with the higher order level functions of bloom taxonomy need to find expression in all pedagogical practices and assessments.

Keywords: multiple intelligences; problem-based learning; social constructivism; social constructivist learning; self-regulated learning.

Introduction

The teaching and learning of accounting involve the purposeful, sequential, logical, accurate and systematic selection and recording of transactions and financial information together with the preparation, interpretation and communication of managerial reports and financial statements (Department of Basic Education, 2014). This requires students to engage in active and purposeful learning and to use their analytical, application, evaluation, practical and creative abilities. Underscoring the significance of these cognitive and academic skills, the Department of Basic Education (2024:19) cautions that *"the accounting curriculum has also been strengthened in other areas in recent years…."*. To this effect, lecturers need to present the subject content and structure teaching and learning using pedagogies that enable students to develop and demonstrate these cognitive attributes successfully, which all find expression in the educational concept of multiple intelligences. Supporting the above submissions, recommendations by the Department of Basic Education (2024) to improve learners'

Corresponding author Medson Mapuya. E-mail: medson.mapuya@spu.ac.za

ORCID
Medson Mapuya https://orcid.org/0000-0002-7331-5113

performance in problematic grade 12 accounting topics also point to the use of problem-based learning. This brings into the spotlight student-centred pedagogical practices in accounting education.

In making a case for the use of problem-based learning, it is important to highlight that within the context of the South African basic education system, learners who write the Grade 12 accounting examination tend to struggle on questions based on topics that require problem-solving skills. To corroborate the above submission, an analysis of the diagnostic report on learners' performance shows poor performance on questions such as financial statements (Department of Basic Education, 2024). After a rigorous analysis of Grade 12 accounting learner's performance on the Statement of Comprehensive Income (SOCI, the Statement of Financial Position (SOFP), and the Cash Flow Statement (CFS), in the 2023 end of year examination, the Department of Basic Education (2023:23) laments that: *"It is, therefore, very disappointing that a large number of candidates are still not able to master even the most basic entries required in constructing these statements".*

Research on student-centred pedagogies, social constructivism and multiple intelligences suggest that lecturers have a variety of teaching strategies and approaches which they can choose to achieve the above and empower students to be independent, autonomous, and self-regulated and ignite their curiosity and interest in accounting. However, this paper advocates for the use of problem-based learning because of its pedagogical assumptions and underlying guiding principles which support and advance the fundamental subject aims of accounting, which among others are to produce learners that can:

"…record, analyse and interpret financial and other relevant data in order to make informed decisions, apply principles to solve problems in a judicious and systematic manner in familiar and unfamiliar situations, thus developing the ability to identify and solve problems in the context of the various fields of Accounting and to develop critical, logical, and analytical abilities and thought processes to enable learners to apply skills to current and new situations…" (Department of Basic Education, 2014:8-9).

Problem-based learning is an educational concept whose theoretical foundations and pedagogical ideologies are rooted in the social constructivist school of thought (Department of Basic Education, 2022; Sebatana & Dudu, 2022, Vygotsky, 1978; Owen, 2019; Seibert, 2021; Yew & Goh, 2016) which emphasizes the active, logical and purposeful application of ideas to find solutions to academic tasks. Empirical evidence from recent studies demonstrates convincingly the educational value of problem-based learning in dealing with complex content and assessment activities (Mapuya, 2023, 2022; Cancelllere & Mokwena, 2022; Morcowitz & Worthington-Smith, 2022).

These empirical findings have some significant implications in the teaching and learning of accounting. This submission is made in view of the fact that contrary to the provisions of the examination guidelines in accounting education which emphasise compliance to the bloom taxonomy in terms of the cognitive complexity and cognitive requirements of formal assessments, many students still struggle to engage in teaching and learning activities that are cognitively demanding and that require them to engage in higher order thinking (Seibert, 2021). In the same breadth, the idea of quality teaching and learning maintains that students must be exposed to teaching and learning activities that result in the stimulation, promotion and development of their higher order thinking skills (Ali, 2019; Department of Higher Education and Training, 2015; Horsthemke et al., 2013; Jacobs, 2016; Jonassen & Hung, 2015; Savery, 2015; Seibert, 2021; Wijnia et al., 2019).

Significantly, for students to be effective global citizens who can independently thrive and function in the current dynamic landscape of higher education, and make some meaningful contributions to society, it is imperative that they engage in critical, creative thinking and problem solving (Worthington-Smith & Ramsaroop, 2022; Seibert, 2021; Yew & Goh, 2016

and Zhou, 2018). This is also one of the fundamental aims which the subject of accounting seeks to achieve (Department of Basic Education, 2014). Noting the above and appreciating and acknowledging the importance of creative intelligence in promoting the higher order cognitive functions of students, it is therefore imperative to investigate the effectiveness of problem-based learning in promoting and developing this creative intelligence of students. It is also important to ventilate that as a learning strategy, problem-based learning has been highly advocated for and praised for its promise of effective and meaningful student learning (Yew & Goh, 2016; Zhou, 2018).

Background to the Study

Recent literature perspectives on the current higher education landscape point to a new learning dispensation and a learning environment which emphasises autonomous and self-regulated learning (Gallagher and Savage,2020; Seibert 2021 and Mapuya, 2023). Calls for students to adopt learning strategies that promote and develop their resilience, creative and critical thinking abilities have also become consistently evident in these discourses (Doulougeri et al., 2021; Lima Filho, Lima, & Bruni, 2020). Contrary to this reality, the education fraternity has expressed some serious concern about the inability of students to engage in higher order thinking, creative and critical thinking (Dolmans et al., 2016; Seibert, 2021).

Adding to this is the concern on the students' propensity to shy away from learning tasks and content which is cognitively demanding as observed by Seibert (2021). This challenges lecturers to expose students to pedagogical practices and learning strategies which fundamentally promote and develop their creative and critical thinking abilities and engrave in them a deep sense of resilience and determination in their studies. To this effect, problem-based learning has been adopted and embraced globally in a host of educational settings to promote and develop critical and creative thinking in original learning contexts, with real life activities (Seibert, 2021 and Yew & Goh, 2016).

In advancing the above school of thought, the dearth of available research evidence supporting and advocating for the use of problem-based learning in education attests to the amount of overwhelming research attention which it has enjoyed over the years (Sebatana & Dudu, 2022; Dolmans et al., 2016; Vygotsky, 1978; Yew & Goh, 2016 and Zhou, 2018). Educational researchers, practitioners and psychologists concur that problem-based learning culminates in meaningful and effective long-lasting learning. Some of these studies have also found a positive association between problem-based learning and ability to engage in higher level cognitive thinking and academic performance Seibert (2021).

A recent study by Cancelllere and Mokwena, (2022) corroborates the earlier findings of Lombard and Themane, (2015) which reported improved critical and creative thinking, better communication, and intrinsic motivation for students. Most importantly, Cancelllere and Mokwena (2022) found that problem-based learning prepared students for the complex real world because it takes them out of their comfort zone and allows them to handle uncertainty. Another study conducted by Sebatana and Dudu (2022) established that problem-based learning significantly improved the creative and critical thinking of students and their analytical and interpretative aspects of critical thinking.

Corroborating the above findings, a study by Salari et al. (2018) found problem-based learning to be highly effective in prompting students to engage meaningfully in the application of knowledge, its analysis, synthesis, and evaluation. While most of these studies only report on the educational, cognitive, and pedagogical gain of problem-based learning, a study by Seibert (2021) produced evidence to suggest that there are times when problem-based learning is detrimental to students and their learning and overall academic development. This study by

Seibert (2021) found that the initial stages of problem-based learning are associated with anxiety as students are concerned about their ability to successfully engage in it.

As a mitigation strategy to prevent students from experiencing such negative experiences, this paper suggests that lecturers should use scaffolding during the initial stages of the teaching and learning process. This submission is also consistent with the views of Salari et al., (2018) which suggest that students require purposefully structured and guided learning when they are exposed to new content. Miner-Romanoff et al., (2019) argue that this provides students with the much-needed self-efficacy which they need to engage in problem-based learning and creative thinking (Yew & Goh, 2016; Zhou, 2018). These discourses endorse the earlier position of Vygotsky (1978) on the importance of the knowledgeable other and guided instruction in the teaching and learning process.

The above introduction and background to the study informed the aim of the study which is presented below.

Aim of the Study

Against the above exposition, the aim of this study was to advocate for the use of problem-based learning to develop the multiple intelligences of first year accounting student teachers, with special focus on creative intelligence. Out of the three types of multiple intelligences, creative intelligence was chosen because it is the highest form of intelligence which students can only achieve and demonstrate after mastering the lower forms of intelligence. Critics may argue that the study's focus on multiple intelligences might oversimplify the diverse forms of intellectual capabilities and undervalue the importance of contextual factors and individual differences in learning. However, while the study advocates for developing multiple intelligences through problem-based learning, it does not dismiss the complexity of intelligence but rather proposes a structured approach to cater to diverse learning styles and cognitive strengths.

In line with the above aim of the study, the research questions below were investigated:

- How does problem-based learning promote and advance the creative intelligence of first year accounting student teachers in accounting education?
- What are the typical teaching and learning activities that lecturers can use to promote the creative intelligence of first year accounting student teachers?

Literature Review

The following section of the paper discusses the theoretical framework in which the study was grounded as well as some of the major discourses in literature perspectives on the phenomena under investigation.

Theoretical Framework

This study is underpinned by the theoretical orientations of the theory of social constructivism as advanced by Vygotsky (1978). The principles and application guidelines of problem-based learning are compatible with the theory of social constructivism as submitted by Vygotsky (1978). Social constructivism provides a useful framework to structure and initiate learning and assessment in a social context. Within the broad agenda of learning in a social context, Vygotsky (1978) explains active participation as a significant aspect of the teaching and learning process which helps students to manage learning tasks and understand the content. Agreeing with the above, Creswell (2014) argues that social constructivism thrives on the assumption that human beings seek to understand the world in which they live by developing subjective views of their interactions and experiences with reality.

For Mertens (2010), these subjective views are socially and historically negotiated and not simply imposed on individuals. Like social constructivists, this paper argues that problem-based learning makes learning more meaningful and purposeful when students are presented with problems whose solutions lie in previously learned knowledge which they can relate to and apply to arrive at new conclusions. Thus, in making a case for the use of problem-based learning to develop the Multiple Intelligences of Accounting Students, this paper submits that presenting learners with problems for them to solve and arrive at new conclusions results in the active creation of new knowledge, which is one of the theoretical submissions of social constructivism.

Creative Intelligence and its implications in Accounting Education

In the perspectives of Sternberg, (2003) and Sternberg, Grigorenko, and Zhang (2008) creative intelligence is concerned with an individual's ability to invent, develop, and produce original and interesting ideas beyond that which is given. Salari et al. (2018) also subscribes to this view and goes on to define creative intelligence as the process of initiating and introducing something totally new into existence. Doulougeri et al. (2021) concur with Sternberg and Grigorenko's, (2007) view on creative intelligence as well and add that the underlying philosophy of creative intelligence is the analysis, imagination, and supposition of ideas within the confines of contemporary encounters and experiences.

This line of thought is consistent with the views of Sternberg and Grigorenko (2007) and Sternberg, Grigorenko, and Zhang (2008) regarding the development and promotion of creative intelligence. From the above perspectives, it can be convincingly concluded that creative intelligence is rooted in experiential and discovery learning, which is one of the central fundamental pedagogical assumptions of constructivist learning as advanced by social constructivist (Miner-Romanoff et al., 2019). Deliberating on creative intelligence, Sternberg and Grigorenko (2007) argue that the most cardinal and distinctive characteristic of creative intelligence is one's ability to engage in creative thinking and respond to new situations with higher levels of efficiency and creativity.

In the recent work of Doulougeri et al. (2021) students who are creatively intelligent can engage in learning new abstract subject content and figure out how to handle new learning activities very easily. Consistent with the ideas of self-regulated learning, creatively intelligent students can identify, adapt, and modify their learning methods and how they deal with challenges. Doulougeri et al. (2021) endorse the earlier views of Sternberg and Grigorenko, (2007) that the way in which students perceive the connections and relationships between the internal world and external reality is the experiential aspect of creative intelligence. Correspondingly, this assertion is compatible with the assumptions of social constructivist learning because in the views of social constructivists, students experience meaningful and effective learning when they are inveigled to arrive at new conclusions regarding the subject content (Miner-Romanoff et al., 2019). Of particular importance to this argument is that knowledge retention and remembrance is very high when students have discovered this knowledge for themselves.

The implication of these views on accounting education is that any teaching and learning which falls short of promoting and developing the creative intelligence of students is not likely to lead to meaningful long-lasting learning. Premised on the foregoing submission, it therefore follows that lecturers need to create enough opportunities for students to demonstrate how their internal world, which is what they learn in accounting, is related, and connected to the external world of reality. Furthermore, to satisfy the discovery learning notion of creative intelligence, students must be given opportunities to use their prior knowledge and prior learning experiences to arrive at new ideas and conclusions. This is based on the argument that the creative ability of students relies heavily on prior learning and related previous learning experiences (Sternberg,

Grigorenko, and Zhang, 2008). For Miner-Romanoff et al. (2019), in cases where learning activities are task oriented, it remains the ultimate responsibility of the lecturers to always encourage individual problem-solving skills.

In the expert views of Sternberg and Grigorenko (2007) and Sternberg, Grigorenko, and Zhang (2008) the idea of creative intelligence supports teaching and learning activities which are divergent in which students respond to scientific problems, develop artworks, design advertisements for products which are not attractive and writing short stories. When viewed in the immediate context of accounting education, this would mean that students should be given activities in which they generate effective solutions and ideas for a business which is running at a loss, invent internal control measures to deal with stock theft or cash shortages in the till register, make recommendations on how to improve cash flows, draw a cash budget or financial statements using given information, making adjustments and posting to the general ledger.

Articulating the implications of creative intelligence in accounting education, Sternberg, Grigorenko, and Zhang (2008) submit that promoting and developing the creative intelligence of students requires lecturers to administer learning activities in which students create, discover, invent, suppose, predict, and make some imaginations. For Owen (2019) to promote and develop the creative intelligence of students, lecturers do not need to stick to a typical lesson plan, but rather ask students open-ended questions to obtain divergent responses from them. Subscribing to these sentiments, Tan (2021) argues that this will ignite the imagination of students and motivate them to think creatively towards new perspectives and dimensions.

Another important position advanced by Salari et al. (2018) in this regard is that in trying to promote and develop the creative intelligence of students, it is imperative for lecturers to create adequate opportunities for students to show their unbiased views, embrace different views on subject content and learning activities. Thus, promoting and developing the creative intelligence requires lecturers to accept and encourage the idea of multiple perspectives to reality and the truth, which is one of the ontological and epistemological convictions of constructivists, relativists, interpretivists, and phenomenologists, which all embrace the idea of creative intelligence and critical thinking and problem-solving.

Narrowing down the focus into accounting education, the above perspectives imply that students can be given a learning task to formulate their own transactions which increases assets as one of the components of the accounting equation and then show the effect of such a transaction has on the entire accounting equation. This is in line with the collective views of Lombard and Themane (2015) and Seibert (2021) who concur that problem-based learning activities must be typical, practical and real-life based activities and complex case studies that do not call for straight forward responses. Complex case studies demand students to embark on self-regulated information search and the analysis of learning resources Seibert (2021), which is one of the central ideas of problem-based learning and creative intelligence.

Such a learning activity requires students to imagine, create, suppose, and invent their own authentic transactions, with imaginary dates and contexts for the transactions, imaginary business names and monetary values of the transactions. For students to be able to engage in this learning task meaningfully and successfully, they need to have a comprehensive understanding of the accounting equation and how the various transactions affect it, which is prior knowledge. Another relevant example in accounting education will be giving students a learning activity in which they have to practically exemplify the Generally Accepted Accounting Principles (GAAP). In this way, they are challenged to think creatively to come up with a practical demonstration or scenario based on an abstract concept of a Generally Accepted Accounting Principle.

Problem-based learning

Lombard and Themane (2015), Seibert (2021) and Zhou (2018) submit that problem-based learning is grounded in constructivist assumptions that enhance and facilitate the application of previous learning, participative engagement, and collaborative learning. Cancelllere and Mokwena (2022) view problem-based learning as a pedagogical strategy of learning which empowers students to learn while participatively engaging in meaningful authentic problems. As far as Seibert (2021) and Yew and Goh (2016) are concerned, the underlying assumption of problem-based learning is that learning is regarded as a self-directed, contextual, and collaborative and constructive learning set up. Subscribing to the above sentiments, Cancelllere and Mokwena (2022) and Zhou (2018) concur that most importantly, problem-based learning is grounded in constructivist learning which positions and regards students as active agents in knowledge acquisition and as co-creators of meaning and understanding.

This justifies why the idea of problem-based learning has been embraced and adopted very widely in various learning contexts and fields to stimulate, promote, and develop creative, critical thinking and problem-solving in original contexts (Dolmans, Loyens, Marcq, & Gijbels, 2016; Seibert, 2021; Lombard & Themane, 2015). With the above in consideration, Sebatana, and Dudu (2022), Gravett (2022), Cancelllere and Mokwena, (2022) and Morcowitz and Worthington-Smith (2022) submit that problem-based learning has attracted much research attention, specifically on its efficiency in providing students with quality learning experiences as well as the extent to which it can develop self-directed learning, sound interdisciplinary knowledge, and problem-solving skills. In this regard, although casual studies are conclusive on the efficiency of problem-based learning in promoting and developing the critical and creative thinking of students, there is currently no studies on which constructs of creative intelligence are most and least promoted and developed by problem-based learning.

Studies conducted by Sebatana and Dudu (2022), Gravett (2022) Cancelllere and Mokwena (2022), Morcowitz and Worthington-Smith (2022) Sari, Utomo, and Astina (2021), Seibert (2021) and Yew and Goh (2016) produced very persuasive empirical evidence to further justify calls for the intensified use of problem-based learning in accounting education. A dominant finding which has frequently emerged from these studies is that problem-based learning has been found to be an effective strategy that can be used to promote the perseverance, creative and critical thinking abilities of students (Gravett, 2022; Sternberg, 2006; Sternberg, & Grigorenko, 2008; Yew & Goh, 2016).

In such a learning set-up, the lecturer becomes an enabling and facilitating agent of learning when students engage in problem-based learning, and among other things, encourages the students and provides them with regular feedback. Salari, et al, (2018) and Miner-Romanoff et al. (2019) argue that in this role, the lecturer directs the students' exploration, scaffolds information, prompts creative and critical thinking, reinforces their understanding of complex concepts and provides them with the necessary cognitive resources and learning tools (Sebatana & Dudu, 2022; Gravett, 2022; Cancelllere & Mokwena, 2022; Morcowitz & Worthington-Smith, 2022; Yew & Goh, 2016).

In concluding this section on theory and literature perspectives, the study acknowledges that one may contend that the study places excessive emphasis on cognitive skills, potentially overlooking the importance of experiential learning, real-world application, and interpersonal competencies in accounting education. This is a valid claim, however, while the study highlights the cognitive demands of accounting education, it also acknowledges the need for a holistic approach that integrates various skills, including communication, teamwork, and adaptability, essential for accounting student teachers. Nevertheless, these complementary skills fall outside the scope of this study and focusing on them will therefore not add much value to the study.

Research Methodology

In its quest to investigate the effectiveness of problem-based learning in promoting all the cognitive constructs of the creative intelligence of first year accounting student teachers, the study employed a quantitative research approach following a phenomenological research design. Typical of phenomenology and interpretivism, the students had to reflect on and interpret their phenomenological learning experiences with problem-based learning and express these interpretations quantitatively into the numerical scale and then decide the score for each statement posed in the questionnaire. Being a quantitative study, measures of central tendency were then used to analyze the scores of students.

The researcher acknowledges that some critics may challenge the study's quantitative approach, questioning the depth of insights gained through Likert Scale questionnaires and descriptive statistics in capturing the complex development of multiple intelligences by problem-solving. Such a criticism will support the shared views of Creswell (2014) Creswell and Creswell (2017) and Weyant (2022) who describe phenomenological research design as having very close philosophical underpinnings, thereby typically involving the use of interviews. However, the use of Likert Scale questionnaires, though limited in scope, provided valuable quantitative data that complements the study's focus on the effectiveness of problem-based learning in developing the multiple intelligences in accounting students. Thus, despite the limitations of the research design, the study provides valuable insights into the effectiveness of problem-based learning in enhancing students' multiple intelligences, offering a practical framework for lecturers to optimize teaching strategies and student learning.

Participants

The population of this study was all the one hundred and twenty-one first year accounting student teachers at a University of Technology in South Africa. This was also the study sample since all the students participated in the study. It must be noted that some experts may critique the study for its focus on a specific population of first-year accounting student teachers at a single university, suggesting that the findings may not be generalizable to a broader context.

By focusing on a specific and homogeneous sample, the study allows for a detailed examination of the impact of problem-based learning on creative intelligence within a defined academic setting, enabling targeted interventions and insights tailored to this group to be developed and adopted. This is also consistent with the philosophical assumptions of phenomenology, which targets a group of people who would have all experienced the phenomena being investigated (Creswell, 2014; Creswell & Creswell, 2017). It is therefore hypothetically submitted that all these first-year students had experienced problem-based learning in the accounting learning environment.

Research Instruments and Data Collection

A questionnaire with eighteen statements based on the cognitive constructs on how to promote and develop creative intelligence as suggested by Tan (2021); Salari et al. (2018), Sternberg & Grigorenko (2007) and Sternberg, Grigorenko, and Zhang (2008) was developed. Each of these statements had Likert Scale which students used to rate them, from 1 (never) to 7 (always) based on their phenomenological learning experiences with problem-based learning and creative intelligence.

NEVER					ALWAYS	
1	2	3	4	5	6	7

Presentation of Results

The following section deals with the presentation of the quantitative results of the study, which will culminate in the discussion of these results. Based in these results, the study will arrive at some findings on problem-based learning and creative intelligence as well as their implications on assessment, teaching and learning in accounting education.

Table 1. ***Descriptive Statistics***

Descriptive Statistics on the Creative Intelligence Construct of Create						
Statistics					***Create***	
		C2. Problem based learning helps me to come up with something new in accounting.	C7. Problem based learning helps me to engage in accounting learning tasks that require me to be creative.	C12. Problem based learning helps me to unlock my creative ability in accounting content.		
N	Valid	121	121	121		
	Missing	0	0	0		
Mean		3.7438	5.1322	4.7851	13.6612	4.553719
Median		4.0000	5.0000	5.0000	14.0000	4.666667
Std. Deviation		1.73459	1.37806	1.43298	4.54563	1.515211
Minimum		1.00	1.00	1.00		
Maximum		7.00	7.00	7.00		
Descriptive Statistics on the Creative Intelligence Construct of Invent						
Statistics					***Invent***	
		C5. Problem based learning makes me enjoy doing accounting tasks that test my inventive skills.	C8. Problem based learning helps me to believe in my inventive skills in accounting.	C11. Problem based learning helps me to engage in accounting learning tasks that require me to design and produce new things.		
N	Valid	121	121	121		
	Missing	0	0	0		
Mean		5.5289	4.9835	4.3719	14.8843	4.961433
Median		6.0000	5.0000	4.0000	15.0000	5
Std. Deviation		1.42053	1.48315	1.68391	4.58758	1.529194
Minimum		1.00	1.00	1.00		
Maximum		7.00	7.00	7.00		
Descriptive Statistics on the Creative Intelligence Construct of Discover						
Statistics					***Discover***	
		C10. Problem based learning helps me to engage in accounting learning tasks that require me to discover new knowledge	C14. Problem based learning helps me to use my prior knowledge to discover new knowledge in accounting.	C17. Problem based learning empowers me to engage in accounting learning tasks that require me to arrive at new knowledge and conclusions.		
N	Valid	121	121	121		
	Missing	0	0	0		
Mean		5.1405	5.1736	5.0331	15.3471	5.115702
Median		5.0000	5.0000	5.0000	15.0000	5
Std. Deviation		1.54005	1.44728	1.67796	4.66530	1.5551
Minimum		1.00	1.00	1.00		
Maximum		7.00	7.00	7.00		

Descriptive Statistics on the Creative Intelligence Construct of Predict						
Statistics					***Predict***	
		C3. Problem based learning helps me to engage in learning tasks that require me to make some predictions in accounting	C15. Problem based learning helps me to make some correct and accurate predictions in accounting.	C18. Problem based learning improves my ability to make correct and accurate predictions in accounting.		
N	Valid	121	121	121		
	Missing	0	0	0		
Mean		4.6612	4.8843	4.6116	14.1570	4.719008
Median		5.0000	5.0000	5.0000	15.0000	5
Std. Deviation		1.51961	1.50660	1.55119	4.57740	1.525801
Minimum		1.00	1.00	1.00		
Maximum		7.00	7.00	7.00		

Descriptive Statistics on the Creative Intelligence Construct of Imagine if..						
Statistics					***Imagine if…***	
		C6. Problem based learning gives me the confidence to trust in my academic imaginations to be correct and relevant in accounting.	C13. Problem based learning helps me to make academically correct and relevant imaginations in accounting.	C16. Problem based learning helps me to engage in learning tasks that require me to use my own imagination ability in accounting.		
N	Valid	121	121	121		
	Missing	0	0	0		
Mean		4.9917	4.7190	5.0579	14.7686	4.922865
Median		5.0000	5.0000	5.0000	15.0000	5
Std. Deviation		1.55186	1.54501	1.41007	4.50694	1.502312
Minimum		1.00	1.00	1.00		
Maximum		7.00	7.00	7.00		

Descriptive Statistics on the Creative Intelligence Construct of Suppose that..						
Statistics					***Suppose that…***	
		C1. Problem based learning helps me to create different scenarios from which I make possible correct suppositions in accounting.	C4. Problem based learning helps me to engage in accounting learning tasks that require me to make suppositions.	C9. Problem based learning helps me to make correct suppositions in accounting.		
N	Valid	121	121	121		
	Missing	0	0	0		
Mean		4.3884	4.5207	4.4959	13.4050	4.46832
Median		4.0000	5.0000	4.0000	13.0000	4.333333
Std. Deviation		1.55656	1.46685	1.48394	4.50734	1.502448
Minimum		1.00	1.00	1.00		
Maximum		7.00	7.00	7.00		

Summary of Quantitative Findings on the Effectiveness of Problem-Based learning in Promoting and Developing the Constructs of Creative Intelligence

	CREATIVE INTELLIGENCE CONSTRUCT	***MEAN***	***MEDIAN***	***Std***
1	Discover	**5.12**	**5.00**	**1.56**
2	Invent	**4.96**	**5.00**	**1.53**
3	Imagine if…	**4.92**	**5**	**1.50**
4	Predict	**4.72**	**5**	**1.53**
5	Create	**4.55**	**4.67**	**1.51**
6	Suppose that…	**4.47**	**4.33**	**1.50**

Discussion of Results and Findings

In discussing and interpreting the quantitative findings on the constructs of creative intelligence and problem-based learning, it is necessary to present them in the descending order of their means, starting with the highest mean to the lowest one. Ideally, the highest mean implies that students found that specific construct of creative intelligence to be the one most promoted and developed by problem-based learning. Conversely, the lowest mean would translate to a construct which was found to be least promoted and developed by problem-based learning. Nevertheless, a major finding coming out very strongly from these findings is the overall compatibility between problem-based learning and all the constructs of creative intelligence.

The statistical variance in the scores as demonstrated by the standard deviation ranging from 1.50 to 1.56 across the six constructs is not only significant in understanding the phenomena under investigation, but rather underscores the consistency and concurrence of the students' scores on problem-based learning and creative intelligence. Thus, with an average standard deviation of 1.5 this quantitative finding demonstrates that the one hundred and twenty-one students who participated in this study significantly concur with each other that problem-based learning promotes and develops their creative intelligence very effectively.

In relation to the main research question investigated by this study, the perspective emerging from the quantitative data in this regard is that problem-based learning is highly effective in promoting the creative intelligence of students. This discovery finds support and expression in the means for all the statements on each of the six cognitive constructs of creative intelligence which are all above 4.40. With the means for the cognitive constructs ranging from 4.47 to 5.12, the reality highlighted by these descriptive statistics is that problem-based learning presents itself to the education fraternity as a viable and very effective learning strategy to promote and develop the creative intelligence of students. Expressed as a probability out of 100%, there is a 64 % to 73 % probability that the creative intelligence of students is developed and promoted every time they engage in problem-based learning. While this statistical finding cannot be taken as a reliable indicator to predict the promotion and development of the students' creative intelligence, it provides a sound justification to advocate for the use of problem-based learning across the curriculum.

A further analysis of this finding revealed that problem-based learning was scored by students to be more effective in promoting and developing the discover and invent constructs of creative intelligence, which is their ability to discover new knowledge and arrive at new conclusions (Salari, et al, 2018, and Seibert, 2021). A justification for this finding which is documented in literature and educational psychology is that when engaged in problem-based learning, students engage in mental functions and cognitive processes that are consistent with the overall cognitive demands of creative intelligence (Morcowitz & Worthington-Smith, 2022; Seibert, 2021; Vygotsky, 1978; Yew & Goh, 2016).

This explains why all these means are above 4.46. By requiring students to make some predictions and suppositions to arrive at new conclusions and new knowledge, problem-based learning does not only promote and develop the creative intelligence of students, but it also inspires them to make some discoveries of new knowledge on subject matter, the reality and on life itself. An average mean of 4.05 of the cognitive constructs of create supports the earlier sentiments of Seibert (2021) and Yew & Goh, (2016) that problem-based learning naturally requires students to engage in creative thinking, analytical analysis of information and making of predictions.

In response to the second research question investigated by this study, the quantitative findings corroborate the sufficient and well documented evidence in literature verdicts that authentic, complex, real-life activities are the ideal teaching and learning activities which

lecturers can use to promote the creative intelligence of first year accounting student teachers (Lombard & Themane, 2015; Seibert, 2021, Vygotsky, 1978; Yew & Goh, 2016; Zhou, 2018). In support of this finding, reference can be made to the mean for the creative intelligence constructs of discover and invent, which are 5.12 and 4.96 respectively. In interpreting this finding, it is also important to highlight that the statements which students score alluded to problem-based learning in light of original, creative, imaginative, and thought-provoking learning contexts.

The study further validates the suitability, efficacy and applicability of the cognitive constructs suggested by Sternberg, (2006) and Sternberg and Grigorenko, (2008) to be used in promoting and developing the creative intelligence of students. While Sternberg and Grigorenko (2008) did not provide their followers with typical examples of assessment activities which can be used to promote and develop the creative intelligence of students, the findings of this study suggest that constructivist learning activities ignite and sustain the imaginative creative thinking and problem-solving abilities of students.

For demonstration and practical purposes, an example of such a learning activity which is supported by teacher-generated scaffolding, the following context-based activity and guidelines can be considered (Table 2).

Table 2. ***Context-based activity and guidelines***

Teaching and Learning activity supported by teacher-generated scaffolding for a Grade 10 Accounting class on Fixed Assets: Calculation and recording of Depreciation		
LEADING QUESTION 1 CONTEXT BASED	Teacher:	Suppose you paid R850 000 to purchase a brand new delivery vehicle for your business on 01 January 2020. After five years using the delivery vehicle in your business, will you still be willing to repurchase the same delivery vehicle for R850 000, that is on 31 December 2024?
	Expected response from learners:	No! [Note: A YES response will indicate serious deficiencies in the respondent's prior knowledge on depreciation and asset disposal]
Question 2 below is based on learners' response to question 1 above		
FOLLOW UP QUESTION 2	Teacher:	Why will you not be willing to pay the same amount for the same delivery vehicle after five years?
	Expected response from learners:	Because the delivery vehicle would have lost its value over these five years or because it is now a secondhand delivery vehicle. It is no longer worth what it was worth on the first of January 2020 when it was brand new.
Question 3 below is based on learners' response to question 2 above		
FOLLOW UP QUESTION 3	Teacher:	Why will the vehicle lose its value over these five years? Why will the vehicle not worth what it was worth on the first of January 2020?
	Expected response from learners:	Because of wear and tear or because it has been used over a period of five years.
Question 4 below is based on learners' response to question 3 above		
FOLLOW UP QUESTION 4	Teacher:	What do you call this loss of the value of an asset as a result of wear and tear?
	Expected response from learners:	Depreciation
Question 5 below is based on learners' response to question 4 above		
FOLLOW UP QUESTION 5	Teacher:	How can you determine the delivery vehicle's loss of value annually?
	Expected response from learners:	Expected response from learners: Any of the methods of calculating depreciation. (Note: Some learners may indicate that with the purchase price of the delivery vehicle alone and the period within which the delivery vehicle has been in use, it is impossible to determine the delivery vehicle's loss of value annually).
Question 6 below is based on learners' response to question 5 above		

FOLLOW UP QUESTION 6	Teacher:	Given the purchase price of the delivery vehicle of R850 000 on 01 January in 2024, calculate the annual depreciation for the past five years using a depreciation rate of 20%.pa (The teacher should provide learners with a specific method of calculating depreciation which all learners must use)
	Expected response from learners:	Learners should be able to use the given information correctly to accurately calculate the annual depreciation of the delivery vehicle
Question 7 below is based on learners' response to question 6 above		
FOLLOW UP QUESTION 7	Teacher:	Calculate the carrying value of this delivery vehicle on 31 December 2024.
	Expected response from learners:	Using the annual depreciation of the delivery that would have been calculated above in question 6, learners should be able to calculate the carrying value of this delivery vehicle on 31 December 2024
Building on the above as a foundation, questions which require higher order thinking skills such as advanced analytical skills, evaluation, creative thinking and problem-solving (evaluating and creating) can be posed to learners based on the above context and building on question 7, depending on the teacher' discretion and the cognitive composition of the class.		
For instance, the following scenario can be added:	You have attended a workshop on fleet management and have learned that uncontrolled/ unmonitored use of company vehicles can lead to excessively high depreciation thereby increasing operating costs and reducing your income. With the above in mind, suggest practical strategies which you can implement to curb uncontrolled/ unmonitored use of company vehicles (This requires learner to tap into their knowledge on internal control measures as well as their creative thinking and problem-solving abilities)	

Limitations of the Study

As already acknowledged under research methodology, one of the limitations of this study is quantitative bias. It may be argued that the reliance on quantitative data analysis limits the depth of understanding of student teachers' phenomenological learning experiences with problem-based learning, potentially overlooking nuanced qualitative insights. In addition, it overlooks the nuances and complexities of student teachers' reflections on their learning experiences. However, the study acknowledges that while qualitative data could provide richer contextual understanding, quantitative analysis offers valuable statistical insights into the effectiveness of problem-based learning in promoting creative intelligence among accounting student teachers.

In addition, critics may question the study's assumption that the Likert Scale ratings accurately capture the promotion and development of creative intelligence, emphasizing the potential influence of external factors on student teachers' responses. However, by grounding the questionnaire statements in established cognitive constructs proposed by Salari et al. (2018), Sternberg and Grigorenko (2007), and Tan (2021), among others, the study aligns with existing theoretical frameworks to assess students' cognitive development within a structured framework.

Recommendations for Future Research

Since the current study prioritizes quantitative measures for data analysis, incorporating qualitative data collection methods, such as interviews or open-ended questions, could complement the findings and provide a more comprehensive understanding of student teachers' perceptions and experiences. It is therefore recommended that future research on the phenomenon investigated must include interviews and open-ended questions.

Conclusion

In conclusion, while potential criticisms challenge the study's focus on cognitive skills, research design limitations, and the complexity of intelligence, the study has potential and offers a valuable framework for lecturers to enhance students' multiple intelligences through problem-based learning and scaffolding strategies in accounting education. Emphasizing the integration of cognitive constructs with social constructivism principles and diverse pedagogical practices can enrich students' analytical, creative, and evaluative skills essential for success in the accounting profession. Future research should investigate the specific constructs of creative intelligence that are most and least promoted and developed by problem-based learning.

The theoretical submissions advanced by multiple intelligences and social constructivist learning make a valuable contribution to the lecturers' comprehension of how to promote the creative intelligence of students in their teaching and learning activities. For this reason, it is the researcher's position that the underlying assumptions of these educational and psychological theories must always inform and underpin all teaching and learning activities to promote the creative intelligence of students. It is therefore highly recommended that the preparation of teaching and learning and the subsequent assessment activities should be informed by the cognitive prescripts of creative intelligence, social constructivist learning and problem-based learning. This culminates in deep understanding of the subject content and ultimately, in the creation and discovery of new knowledge, which is the overarching underlying assumption of creative intelligence and social constructivist learning.

To achieve this, lecturers need to adapt and modify the generic assessment activities in the prescribed textbooks for their modules to conform to the provisions and assumptions of creative intelligence and social constructivism. To this end, emphasis should be placed on the use the relevant cognitive verbs and constructs that promote and develop the creative intelligence of students. Nothing the above findings and that problem-based learning is fundamentally oriented in the pedagogical assumptions of social constructivist learning, this study therefore recommends that to promote and develop the creative intelligence of students, lecturers should encourage students to complement problem-based learning with other learning strategies such as discovery learning.

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