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Editor's Note

Welcome to Kotebe Journal of Education. As we sail into the edition of the journal, I would like to convey my feelings to you who are involved throughout the process. I congratulate to all the members of the editorial board, authors, reviewers and fellow education specialists. As a team with the mission of disseminating the wisdom of education, where idea leads as a matter of fact, the journal's journey is to reach every corner and spot of the world. Hence, it is our objective to provide scholars in the field of education a world class platform to put forward their scientific work and research and reach out their research work throughout the globe. With this commitment and determination, the journal will serve its cause and goal to promote and spread scientific research information in the field of education available to all.

This issue of the Journal has incorporated insightful research article on issues of Education. In an effort to present articles of broader significance, and to incorporate pressing educational issues of intellectual engagement into the Journal, works of different authors coming from different spheres of education were included. The managing editor and the associate editors of the Journal have gone through each article for their thematic relevance, quality, rigor and scope. The subject area reviewers of the articles have critically reviewed the articles from the vantage point of their own disciplinary perspectives. The review process of each manuscript was rigor since the aim was not to just publish. The review process considered the idea of creative dialogue instead of criticism of the original article. The reviewers were inclined more to the development and further analysis of the articles' ideas – as deem fit- rather than mere criticism and demeaning. As a result of the team endeavor by the reviewers, editors and authors, very interesting insights are incorporated in the different articles included in this issue. We hope that discussion of the widely-distributed phenomenon of scholarly interest will be shared not only among the educators but also anybody interested in education in general.

As the editor-in-chief of the journal, it is my wish that all fellow scholars in the field of education across the globe will benefit from the platform. We are counting on researchers' participation to ensure the scale up of the status of the journal. I thank all the scientific community who participated as authors, reviewers, editors and the prospective readers of the issue for their support and encouragement.

The Editor-in-Chief

Kotebe Journal of Education (KJE)

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Original Article **http://doi.org/10.61489/30053447.1.1**

The Effects of Language Supportive Pedagogy (LSP) in Students' Writing Skills in the Entomology Course at Kotebe University of Education

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Abstract

This paper reports on small scale action research conducted with students in the final year of their degree at Kotebe University of Education. We found that students majoring in biology expressed their content knowledge in the form of lists and avoided composing coherent sentences - much less complete paragraphs. We designed an intervention that explicitly guided the students to compose short pieces of academic writing within four scientific genres: description, comparison, components and classification. The intervention was evaluated using pretest, posttest and a student focused group discussion involving around one third of the class. The results show that after six weeks, all the students were able to write coherent, well-organized paragraphs using appropriate scientific language. Students attributed their improvement to the formative feedback they received throughout the six-week intervention. This small scale study suggests that cross-curricular language support has considerable potential for developing pre-service teachers' writing skills. However, realizing this potential requires collaboration between language and other subject teachers. We relate the findings to previous research in Tanzania, which focused on developing pre-service teachers' pedagogic skills for supporting learners through language transition. The policy implications of using home language as the medium of instruction in higher education institutions where English is the language of instruction should be considered for science teachers. Moreover, we concluded by arguing for a joined up approach to teacher education for multilingual education systems and suggested some priorities for further research.

Key words*:* Language Supportive Pedagogy, Multilingual Education, Professional Collaboration Science Education

1. Introduction

English Medium Instruction (EMI), as part of basic education in under-resourced and postcolonial education systems, is highly controversial (Milligan & Tikly 2016 cited in Bowden et al, 2022). Research in educational linguistics is now challenging the efficacy of monolingual approaches that often dominate educational practices in multilingual settings. Creese and Blackledge (2010) explain that monolingual instructional practices have dominated language teaching for a long time. As a result, most teachers have developed a monolingual mindset. The classroom pedagogy also reflects a pseudo-immersion exercise that does not ensure grammatical competence and does not ensure development of originality and creative use of English (Boruah, 2015).

Subtractive Multilingual Education (SMLE) models which take away learners' previous language of instruction (L1) and replace with L2 as the Language of Learning and Teaching (LOLT) could be a major contributor for the students' academic achievement. It has been often noted that subtractive transitions undermine the development of students' literacy in their existing languages, and their achievement across the curricula (Bowden & Barrett, 2022; May, 2017; Thomas & Collier, 2002). This indicated that the use of learners' home language in the classroom has the potential to make learners involved in the learning process, increase students' involvement in education and speed up the development of basic literacy. However, there is no a single country in sub-Saharan Africa that uses an African language as the language of instruction at secondary or tertiary level except South Africa's use of Afrikaans in some universities (Brock -Utne, 2015). Large-scale, longitudinal studies repeatedly show the benefits of additive models of multilingual education over subtractive models on language and subject learning (Bowden et al, 2022).

Both early-exit and late-exit which refer to the point at which English language is being used as medium of instruction could also be another factor determining the success of the students. In putting a clear distinction between early-exit and late exist, Bowden and Barrett (2022) stated that Early-exit transitions occurs when an additional European language of instruction is used in the first four years of primary (lower primary) school and late-exit transitions takes place between primary and secondary school, or during the secondary phase. The 'switch' to an additional European language of instruction at an early age or later age is a bone of contention among scholars in the area. Unfortunately, if we consider the models of educational language use in policy and practice in African contexts, the overwhelming majority would be considered early exit transitional (Benson, 2015). In summarizing the point, Bowden & Barrett (2022) noted that both early and

late-exit subtractive models are seen as weak, compared to additive and flexible models which promote the progressive development of two or more languages in the classroom. Considering English as an international language, Rao (2015) suggested that English needs to be learnt well but learnt additively (not subtractively at the expense of the other languages of the learner) and English must remain a part (but only a part) of the country's multilingual ecology.

Many research studies have compared the academic achievement of children studying in MLE and non-MLE schools, and they have found that children in MLE schools performed significantly better than their non-MLE counterparts in curricular areas like mathematics, environmental studies and language (Manocha & Panda, 2015). Furthermore, Seid (2019) found out that L1 based-MLE in Ethiopia increases the likelihood of enrolment in primary school and of attending the right grade for age. In a similar manner, Ramachandran (2017) reported that L1 instruction in the early grades leads to an additional half year of completed schooling and a five percent increased chance of finishing primary school.

This indicated that the switch from mother-tongue to English instruction is a major barrier for students' academic achievement. That is, subtractive policies restrict the ease with which teachers and learners interact and reinforce practices such as rote learning, memorization and copying written texts from the board (Bowden & Barrett; 2022).In addition to this, subtractive MLE (basic education) at tertiary could exacerbate the matter. Furthering the discussion, Bowden and Barrett (2022) argued that subtractive MLE undermines classroom communication. That is, learning in students' mother tongue is also crucial in enhancing communication skills among students population. Students enjoy school more; they tend to have increased self-esteem and they feel more at home when they employ the home language in the classroom discussion.

The poor performance of the students might be due to the impoverished learning environment, and the regrettable language command of teachers. In this regard, Yonas's (2008) subjects kept saying that their [the teachers' deficiency] own deficiency in spoken English prevented them from applying communicative language learning methods in their classroom. Most graduates lack basic communication skills. To worsen matters, students graduated in foreign language (English) were unable to use the language for communication purpose with their students (Yonas, 2008). Sharing the Tanzanian experience, Mtana and O-saki (2015) noted that the English language is poorly taught in public primary schools (due to a lack of adequately qualified English teachers at that level), while access outside the classroom is almost non-existent. The same experience has been

observed in India. Boruah (2015) stated that not all teachers in EMI schools are themselves proficient in English.

The act of calling a dominant language the medium of instruction does not make it a valid language of classroom communication, nor does it miraculously make learners fluent (Benson, 2015). English should not be deemed as a hallmark of excellence, competence, and the benchmark of a genius. The foreign language obsession syndrome would pave the way to overlook the major goals of education. At times, the overwhelming desire for a dominant language like English or French may make them forget about other important goals of education like learning to read and write, developing critical thinking and building knowledge across the curriculum (Benson,2015). After all, the sole motive of language is to communicate, not to subjugate which is a reflection of intellectual backwardness. This shows the inadequacy of many western language learning theories when applied to the African continent and the necessity of working for a paradigm shift in the thinking on bilingual/multilingual education in Africa *(*Brock-Utne, 2015*).*

In view of the above, the use of two or more languages in schooling is valuable in the transition period but it is also widely seen to have general educational value beyond that (Clegg & Simpson, 2016). For example, the dropout rate has fallen as students are more interested to remain in school when their own language is used as a medium of instruction (Kadel, 2015). In addition to this, the use of the students' first language as medium of instruction could promote a smooth transition between home and school. Moreover, when students use their own language, they are able to develop a wealth of oral skills that could have a positive transfer to second/foreign language acquisition.

As a multilingual country, various languages are spoken in Ethiopia. Cognizant of the pedagogical advantage of the child in learning in a mother tongue and the rights of nationalities to promote the use of their languages, primary education is given in nationality languages(MoE, 1994). Since 1994, over 20 languages have been used as mediums of instruction for up to grades 4, 6, or 8 depending on the real conditions in each region (MoE, 2002). That is, local languages in their respective areas are used as medium of instruction from grades 1– 6 or 1-4 and thereafter English takes over up to tertiary level. Despite this, the students' command of English has been extremely poor. The standard of competence in English is low among both teachers and students (Bekalu, 2011; Yonas, 2008). Most graduates lack basic English communication skills and the quality of English use among the student population is poor.

The introduction of MLE has been indispensable so as to address the needs of the linguistically and culturally diverse students. MLE has been understood to mean the use of two or more languages as media of instruction in subjects other than the languages themselves (Anderson & Boyer, 1978). But its introduction in Ethiopia has been politicized and it has been considered as the rights of nationalities to promote the use of their languages instead of considering the pedagogical advantage of children in learning in mother tongue. Ethiopia does the best job of using mother tongues to promote literacy and learning, but misses opportunities to use bi- or multilingual methodologies and to maximize the effectiveness of L2 Amharic (Benson, 2010).

English only medium instruction could limit the performance, participation and knowledge production on the part of the students. The national Grade 8 assessment score (from 2000, 2004 and 2008) indicated that students taught and assessed in their L1 for eight years outperformed those taught and assessed in English (L3) (Benson,2015). Furthering the discussion, sharing the experiences from India, Boruah (2015) further noted that classrooms are not conducive to learner-generated language; the culture of the classroom is mainly focused on students listening attentively to the teacher and responding only when asked to; the situation is ritualistic and the pedagogy limits the use of English to question answer routines.

It is the convection of the researchers that classroom transactions need to be hybridized and there is also unrestricted use of non-English languages in the teaching of science subjects. To this end, pedagogical strategies that necessitate language supportive pedagogy, code switching, and trans-languaging should be taken into consideration. Owing to this, this study tries to examine the effects of using more than one language as a medium of instruction in teaching vocabulary and writing in Biology classes. A switch to English as the medium of instruction in secondary and tertiary education could deter students from exploiting their potential and may deny multilingual spaces in their classroom. Owing to this, this study will try to assess the effect of creating multilingual spaces on the performance of biology students on writing tasks. In the Ethiopian context, few studies have been done in the area of language policy but not in the area of multilingual pedagogy. Cohen (2010) questioned the level of equity shown in the process of introducing different languages. Daniel and Abebayehu (2006) discussed language planning and changing whereas Küspert (2014) analyzed language policy and social identity in the light of socio-political changes in Ethiopia. None of these studies did empirical analysis of the language of instruction in Ethiopia. Therefore this study fills in this research gap.

The general objective of this study is to examine the effects of Language Supportive Pedagogy (LSP) in students' writing skills in the Entomology course at KUE. In light of this general objective, the specific objectives of the study are to:

- evaluate students' skills for writing within a specific Entomology course;
- examine the benefits of the intervention in students' writing skill within the specific genre.

2. Methodology

A quasi-experimental design was used as a research design and the sample of the population of the study was third year Biology students at Kotebe University of Education (KUE). One class of students (sixteen in number) was used for the study (pre and post-tests were given). The aim of the study was to examine the effects of the pedagogical strategies that necessitate language supportive pedagogy, code switching, and trans-languaging that support the use of additional language in the classroom in students' writing skills into the Entomology course at KUE. The course 'Entomology', the study of insects, was selected because one of the researchers taught the course 'Entomology' by the time the study was being done. Owing to this, this study tried to examine the effects of using more than one language as a medium of instruction in teaching vocabulary and writing in biology classes.

After introducing LSP, both language teachers and biology teachers planned the teaching session together. During the intervention, the researchers (both English and biology teachers) identified sub-topics for vocabulary learning and subgenre writing for the course Entomology. Next, the pre-test was carried out first; and students were reminded the vocabulary taught in the Entomology course. Later, an English teacher, a member of the research team, taught the planned session. A total of six weeks was used for the intervention classes. The intervention was made in the regular class schedule. The subject matter biology teacher who was a member of the research team briefed the students about the importance of the intervention class for the course he had been teaching. After six weeks, the post-test was administrated. Both tests were administered to the same group of students (one before the intervention and other after the intervention).

To get further insights, a post session focus group discussion with students and interview with teachers were carried out. For the FGD, the group was heterogeneous; that is, all the subjects had different background in terms of age and gender. Regarding the number of participants in a group, a total of six students took part in the FGD. In the process of data collection, the nature of the

intervention class, the advantages of using two languages in the teaching learning process, the skills that students developed during the intervention class and related issues were thoroughly examined. The researchers followed a non-directive style of moderating. We tried to exclude any inhibiting impact and subjects did not refrain themselves from entering into the discussion. Two biology teachers at KUE took part in a semi-structured interview with the researcher. The interviewees were selected based on gender so that a representative sample of participants could be surveyed. In the semi-structured interview, the participants were asked about Language Supportive Pedagogy (LSP) and their experiences in the teaching of biology. The interview was used to triangulate the data. The interview was audio recorded and transcribed. Again the interview was carried out in Amharic.

Data collected from respondents through pre- and post- tests, interview and FGD were processed thoroughly to check for completeness, accuracy and uniformity of the gathered data. For the pre- and post-test analysis, the analytical framework for genre analysis was adopted from (Polias, 2016). Both pre-test and posttest assessments were conducted so as to evaluate genre-writing skills. The contents of the lesson were Entomology course and students were assessed for each genre (description, comparison, components and classification).

For the purpose of the analysis, the achievement of the students was grouped into three (high, medium, low achievers). These students' writings were assessed in terms of grammar and course-specific vocabulary. These students were evaluated for each genre (one paragraph for each genre) and the results of the tests were marked based on marking rubric for genre writing. Ethical research protocol was followed and all the participants willingly took part in the study. Students were told that their names would be masked from the analysis and from the data by assigning pseudonyms.

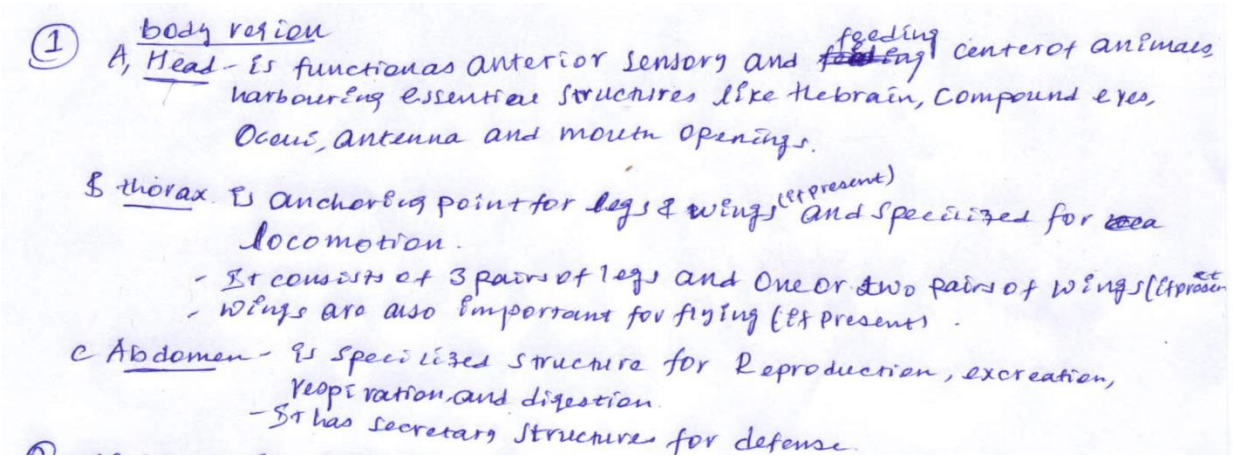
3. Results and Discussion

Findings from the pre- and post- tests

As it can be seen from the students' writings given below, students showed a lot of improvements in their writings. As a representative sample, let us examine the pre- and the post- tests results of the students.

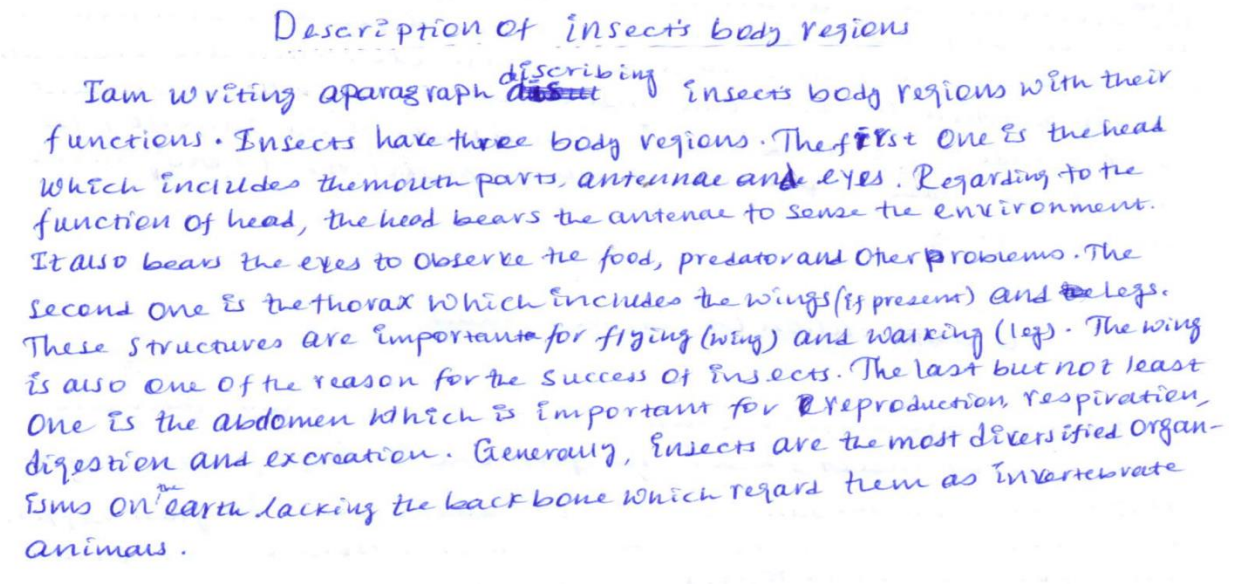
Genre type-Description

Pre-test /top-level student/



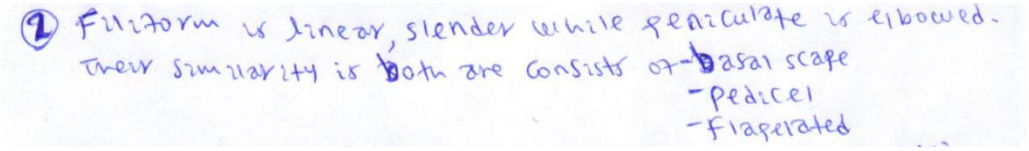
Genre type-Description

Post-test/top-level student/



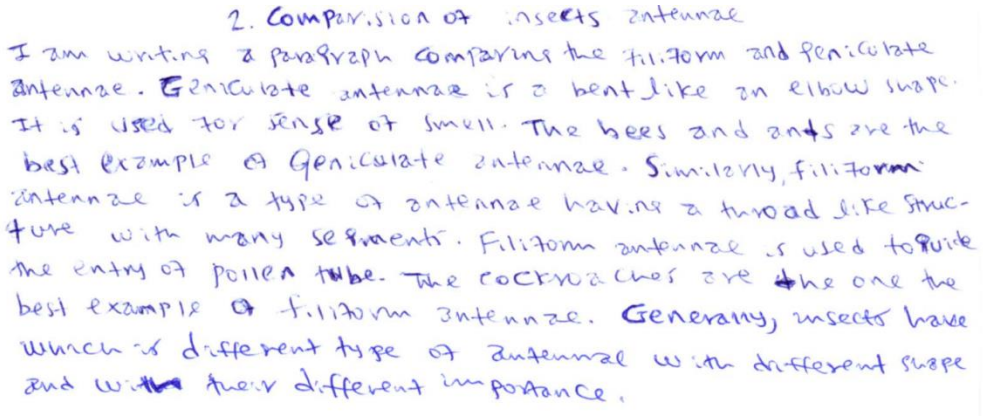
Genre type-Comparison

Pre-test/average-level student/



Genre type-Comparison

Post-test/average-level student/

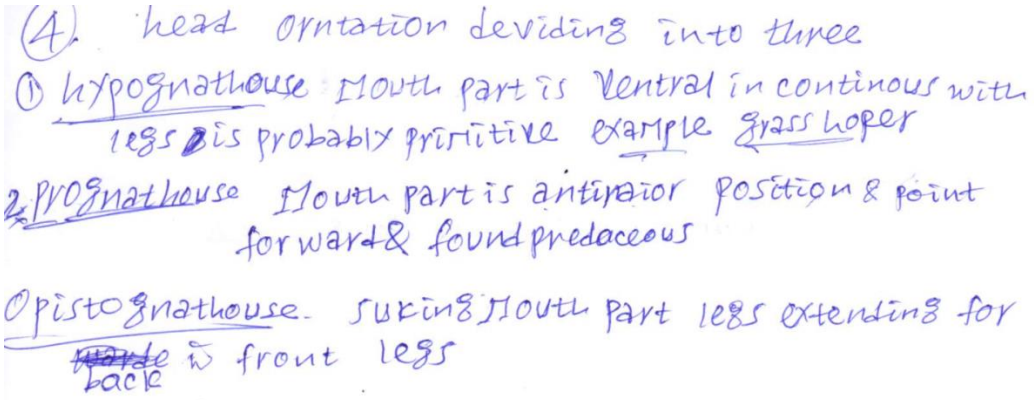


2. Comparision of insects antennae

I am writing a paragraph comparing the filiform and geniculate antennae. Geniculate antennae is a bent like an elbow shape. It is used for sense of smell. The bees and ants are the best example of Geniculate antennae. Similarly, filiform antennae is a type of antennae having a thread like structure with many segments. Filiform antennae is used to guide the entry of pollen tube. The cockroaches are the one the best example of filiform antennae. Generally, insects have which is different type of antennal with different shape and with their different importance.

Genre type-Classification

Pre-test/low-level student/



(4) head orntation deviding into three

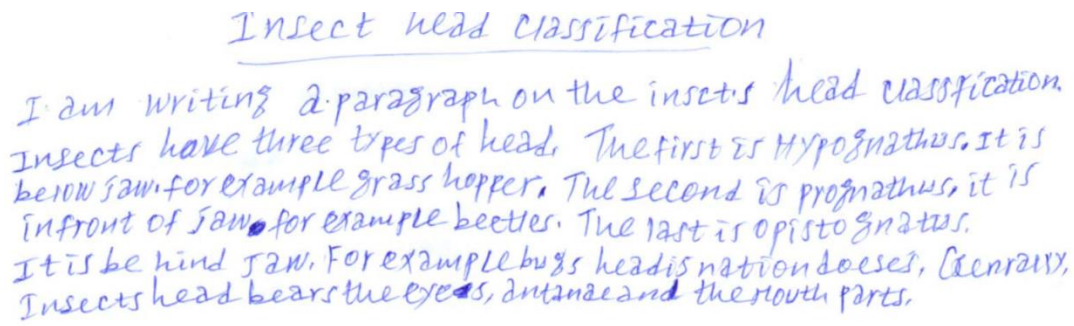
① hypognathouse Mouth part is ventral in continous with legs is probably primitive example grass hoper

② prognathouse Mouth part is antiraior position & point forward & found predaceous

Opistognathouse. suking Mouth part legs extending for back is front legs

Genre type-Classification

Post-test/low-level student/



Insect head classification

I am writing a paragraph on the insects head classification. Insects have three types of head. The first is Hypognathus. It is below jaw. for example grass hopper. The second is prognathus, it is infront of jaw. for example beetles. The last is opisto gnatus. It is be hind jaw. For example bugs head is nation doeses, Generally, Insects head bears the eyes, antanae and the mouth parts.

As indicated in the sample descriptions above, there is an enormous difference between the pretest and the posttest results of the students. In the pretest assessment, students produced discrete phrases and words that did not really describe the aim of the piece of writing. However, in the posttest assessment, students were able to produce organized ideas presented in a form of a paragraph. This finding was corroborated with the findings of the qualitative data. Both the FGD

and the interview were good testaments. The following representative excerpts exemplify this issue further.

Haimanot in the FGD has addressed the following points

> *Before this section, I did not know the rules to write a paragraph; so, my paragraph writing skill was poor. But now, I know the steps to write a good paragraph like topic sentences, developer statement and a conclusion sentence that summarizes the topic. I have a good skill on how to write a paragraph that are organized, coherent, and are all related to a single topic.*

Alem in the FGD session noted:

> *The intervention class has helped us a lot in developing our writing skill. We developed a good understating on how to use organized ideas in a paragraph form.*

Similarly, Dawit has the following to say:

> *We usually write phrases or issues by using dot, not in a sentence form. We did not have such type of lesson before. Within a short period of time, we developed a solid understanding on how a paragraph is being organized and written.*

As per the data above, students showed progress in their writing. The reasonable explanation for students producing such paragraphs could be the nature of the strategies that the teacher used. In the teaching-learning process, the teacher embraced more flexible language use. That is, during the intervention class, students and the teacher communicated by switching between English and Amharic and this could enable students to understand the contents of the lesson. Regarding the importance of creating multilingual space in the classroom, Melkamu, in the FGD, has noted the points below:

> *Using home language (Amharic) together with English helped me to develop conceptual understanding and basic learning skills and in short, it leads to a better educational outcome. In addition, I believe teachers may also address the lesson and teach more effectively when they use native language to elaborate some new concepts. We like classes where we use both languages since those classes are more interactive.*

Furthermore, Belay participating in the FGD has addressed the points below:

> *In the intervention class, we easily understood the lesson when the teacher used our home language. But there are some teachers who do not use Amharic and we do not understand the concept.*

In a similar manner, Roman, a teacher, who took part in the interview, has addressed the points below:

> *I believe using local language especially when introducing a new concepts and vocabulary to students is important. Because I have to make sure that they understand what the new topic is dealing about. In addition it may help them to associate the new lesson with their already existing knowledge.*

As shown in the data above, the reason for the students' progress has been attributed to the strategies used by the teacher. This further indicated that multilingual strategies seemed to have immense potential for the academic progress of the students. These studies, among others, suggest a need for opening up multilingual spaces in classrooms for epistemic access and effective learning (Kiramba, 2018). That is, teachers who can support students to learn the contents of the lesson need to create multilingual spaces in the classrooms. Sharing the experience of India, Rao (2015) noted that English-medium teaching makes learning difficult for most Indian students and a mother-tongue medium education facilitates learning.

It was learnt that only-English medium instruction could silence students' engagement in learning. Sara, a teacher who participated in the interview session addressed the following point:

> *In most of my classes I have observed that most students hold back from engaging in classroom discussions if they are not able to transfer such knowledge into the language of instruction.*

In relation to this, Hanna during the FGD noted the points below:

> *We do not participate and listen attentively when the lesson is delivered totally in English because there are a lot of new vocabularies. Thus, I believe it is a good approach to translate those words to local language because this approach helps us to understand the contents of the lesson without difficulty and develops our listening skill.*

As it can be seen from the responses of Sara and Hanna, using English as a medium of instruction could limit student participation in the classroom and this further restricts knowledge production. Children learn by participating in activities but it is difficult for a student to participate in classroom discourse until and unless he/she understands and relates to the concepts embedded in the discourse (Manocha & Panda, 2015). The dialogic nature of the classroom discourses, use of children's language and examples from everyday life created an inter-subjective space for discussions on the

topic under consideration (Durairajan, 2015). The plausible explanation for students not participating in the classroom discussion could be the language barrier. That is, the teaching learning process does not use the children's linguistic resources and knowledge. Owing to this, a large number of disadvantaged children, whose parents aspire for a better future for their children through the emancipatory effects of education in English, end up with poor English and low academic competence (Mohanty, 2015).

Learning achievement has increased as students are able to openly share their ideas with their teachers and their classmates when using additional language as a medium of instruction (Kadel, 2015). Teaching the student in his/her mother tongue facilitates better comprehension and helps the student to relate to the classroom discourse. In other words, English only environment which may impact learning may not help students to conceptualize what the science teacher teaches. Thus, in some cases, it is important to use either code switching or language supportive pedagogy which is a classroom strategy that supports the learning of content through an additional language (Bowden & Barrett, 2022).

In view of the above, it is a good idea to take an in-depth look at the advantages of using home language in the classroom when necessary; this is because, only-English medium instruction has resulted in a high failure rate of the students. Thus, teachers can be encouraged to use the first language to tap existing capability, this is because the first language can also be used as the language of thinking and reflection for planning and organizing what needs to be said or written in English (Durairajan, 2015). The use of the students' home language as medium of instruction could make students involved in the learning process and it speeds up learning, innovation and creativity.

4. Conclusion

This article reports on small scale action research conducted with students in the final year of their degree at Kotebe University of Education. We found that students majoring in biology produced paragraphs in the form of lists and avoided composing coherent sentences: much less complete paragraphs. We designed an intervention that explicitly guided the students to compose short pieces of academic writing within four scientific genres: description, comparison, components and classification. The intervention was evaluated using pre- and post-tests, focus group discussion and interview. The results show that after six weeks, all the students were able to write coherent,

well-organized paragraphs using appropriate scientific language. Students attributed their improvement to the formative feedbacks they had received throughout the six-week intervention. As the findings reveal, there was a marked difference in students' writing in the pretest and posttest results. That is, giving bilingual space in the classroom during discussions favored student. This further indicated that the use of Language Supportive Pedagogy (LSP) for science student teachers is very important to strengthen the mastery of the subject content. This implied that bilingual classroom instructions may potentially support students' understanding of the subject content by fostering classroom interactions.

5. Implications

English only environment may not help students conceptualize the fundamental contents of the science subject that the science teachers teach. Thus, the use of the students' home language as medium of instruction through code switching or language supportive pedagogy could make students involved in the learning process and it speeds up learning, innovation and creativity. The policy implications of using home language as the medium of instruction in HEIs where English is the language of instruction should be considered for science teachers.

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Conflicts of Interest: "The authors declare no conflict of interest."

Authors' contribution

All authors contributed equally.

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Effects of Computer-Assisted Multiple-representations on Problem Solving and Experimentation Abilities in Learning General Physics at Arba Minch University

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Abstract

This study was designed to test the effectiveness of Computer-Assisted Multiple Representations (CAMR) in tutorial and laboratory classes. The experimental group consisted of 34 physics students, and the control group contained 45 chemistry students for design one (i.e. pre-test and post-test control group design) targeting the problem-solving ability as one dependent variable. In addition, the same 34 physics students were selected for design two (one group only pretest and posttest design) targeting experimentation ability as the other dependent variable. The result in design one showed a statistically significant mean difference in favor of the experimental group that was obtained based on a performance test. The result was also indicated that male students performed better than the female students. Design two indicated a significant mean difference between the simulation performed by CAMR, and conventional physical experiments that were obtained based on the practical test. However, no significant difference was observed between male and female students with respect to CAMR and conventional physical experiments. With regard to correlation, performance tests and assessment scores were significantly correlated under design one, but not under design two. The quantitative results were also supported by the evidence from qualitative analysis. The study finding implies that teaching organized knowledge assisted by computers is essential for the effective performance of problem-solving and experimentation tasks and activities.

Key words: Computer-Assisted, Multiple representations, basic models

1. Introduction

Developing conceptual understanding and procedural fluency are two important competencies in learning mathematics and science (Laswadi *et al*, 2016). However, students who learn to recite

definitions and formulas that are common in traditional instruction (TI), show limited proficiency in solving problems and understanding situations in experimentation in which those concepts and procedures could be used. Currently, the main focus of research attention is a shift from a novice problem solver to an expert problem solver/a physicist/ to acquire competence in interpreting and using different representations, and in coordinating multiple representations such as a graph, a picture, a free-body diagram, and a formula (Walsh, Howard, & Bowe, 2007; Cock, 2012). What hinders students' competence in problem-solving and experimentation mainly depends on students' prior knowledge (Heuvelen, 1991; Trumper, 2003) which plays a role in developing conceptual understanding and procedural fluency.

Hestenes (1996) suggested that to address misconceptions directly models and models with multiple representations provide students with conceptual tools for diagnostic and eliciting purpose and create an environment of activities and discourse to think and reason critically about physical phenomena. According to Wetzels, Kester, & Van Merriënboer (2010) engaging the learner to actively build external representations might promote organization and integration processes that foster the development of mental models. Constructivist views contend that students learn best in tasks, building comprehension with relevance to their own interests and prior knowledge (Rapp, 2005). Constructivist learning environments, including CAMR, are designed to provide students with opportunities to construct conceptual understandings and abilities in activities of problem-solving and experiments.

The theoretical basis of the current research which tries to effectively change existing practices in physics classrooms is cognitive schema theory which receives special attention as an important theoretical perspective. Kotsaro & Smyrnaiou (2017) discussed such association between constructionism and modeling approaches through performing computer-assisted multiple representations. Finally, they recommended that it would be helpful to integrate other theoretical approaches of new technologies in teaching science starts from kindergarten and secondary schools, even in higher education. Beyzen, Bayrak, & Aykutlu (2017) pointed out that physics is generally considered to be difficult and teaching in a physics classroom should be carried out in accordance with the constructivist teaching approach. Moreover, students' previous knowledge and the incorrect information they acquire during the teaching of the subject results in misconceptions (Kubsch *et al.,* 2020), in order to prevent this and provide meaningful and

permanent learning, students' previous notions (such as misconceptions) should be questioned and addressed.

Regarding what is required for effective problem solving are beliefs centered on one's learning and knowledge (Reddy, 2019). As teachers, we should choose appropriate tools to fulfill the needs and interests of individual students. Computer application in problem-solving and experimentation activities through virtual reality allows the expression of abstract reality, the presentation of abstract visual experiences that can induce students' imagination and enhance the creative concepts to develop various feasible, unique, and novel creative concepts (Hu, Wu, & Shieh, 2016). In this regard, Kaymakci (2016) has investigated the reasoning learning model so that the number of the analogical in the textbooks should be increased to enrich meaningful learning for students' transition levels between concrete and abstract operational terms.

Park (2016) reported that engaging learners in model-based learning through doing computer-assisted multiple representations can help them develop their scientific literacy-deepening their scientific knowledge through generating, evaluating, and revising their thinking. Hakyolu & Bekiroglu (2016) elucidated the role of collaborative interaction in the knowledge-argumentation association. The result of the investigation (Duran, 2016) about the student-centered approach made suggestions which become relevant for the current study. When students are given enough time and encouragement, most students ask questions and try to answer questions asked of them. Hence teachers should encourage their students to ask questions and allow sufficient time for them to think about questions posed. What is important in student-centered learning is that all students should be able to think about the question and express their opinions, Students opinions should be respected and if mistakes are committed appropriate feedback should be given. There has been an increasing movement towards the introduction of student-centered, however, students find it challenging when there is a sudden transition from traditional didactic practicals to full student-centered learning activities (King *et al*, 2016).

Several researchers (McDermott, 1998; 2013; diSassa, 1998; Hammer, 1996; 2000; Minstrell, 1992; and Redish, 1994; 1999) indicated students rarely express their conceptual knowledge explicitly in problem-solving and experimentation activities performed in a teacher-dominated approach characterized by the presentation of facts and skills, with the assumption of that students will see the underlying structures in the content.

On the basis of the research literature (Degene, 2007) added traditional methods and instructional strategies of teaching science are not compatible with attaining conceptual learning. It can be implied that cognitive skills such as problem-solving and experimentation will be affected in the same way. These setbacks in our classroom practices could be the reasons for lower achievement results obtained by students who sat for the Ethiopian secondary school leaving certificate examination administered and reported in 2022 by the Ministry of Education (MoE). Therefore, the problems to be addressed in this study were:

- unsuccessful association of physics concepts/principles in doing problem solving and experimentation, and
- Skill gaps in problem solving and experimentation (Heuvelen, 1991; Trumper, 2003) observed for the first year physics students as it also was evident in our existing instructional practice as a member of Arba Minch University.

Thus, the following research questions were posed to guide the study.

1. Will students being taught by CAMR score a statistically significant result in problem-solving and experimentation in mechanics compared to students being taught by TI?
2. Will CAMR bring statistically significant results for female students in problem solving and experimentation in a mechanics course compared to other students?
3. Will formative assessment results of classroom activities correlate with achievement test results?

CAMR is a student-centered method that would be helpful to encourage students to practice problem-solving and experimentation based on basic models in mechanics through doing multiple representations for effective interactive engagement.

2. Methodology

This study employed a non-equivalent pre-test and post-test control group in design one targeting problem-solving as a dependent variable and within one group comparison in design two targeting experimentation ability as the second dependent variable. Quantitative data were collected by performance tests for problem-solving and experimentation. Qualitative data were collected by conceptual test activities and focus group interviews.

The participants were first-year physics students (N = 34, M = 10, and F = 24) as experimental group, and first-year chemistry students (N = 45, M = 13 and F = 32) as control group were used in design one and the same experimental group was used in design two. It was unfortunate to get a second section in physics which was why I was forced to select chemistry students who were registered for the course. Two teachers for the experimental and control groups participated in design one and the researcher and laboratory assistant in design two.

The current study focuses on CAMR that was employed in teaching Newtonian mechanics courses along with distinct stage-by-stage cyclic learning episodes as shown in Fig 1.

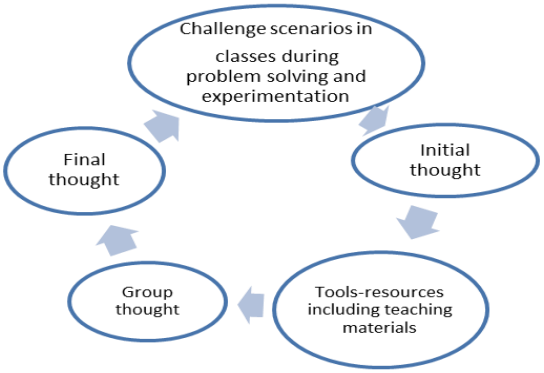


Figure 1: Stage-by-stage episodes of CAMR and each arrow corresponds with assessment and feedback (Adopted and modified from Al-arfaj, 2011)

The illustration depicts stepwise or stage by stage instructional process.

Stage 1 Challenging scenario focuses on topics about fundamental principles in mechanics.

Stage 2 The initial thought focuses on abstraction/idealization of the real world model building during problem-solving and experimentation. The process consists of creating models in different forms such as (i) conceptual (ii) assumption based propositions (includes estimate quantities and make assumptions and approximations) (iii) graphical (v) mathematical;

Stage 3 Tools (computer modeling), resources and teaching materials help to realize creating models;

Stage 4 The group thought focuses on generating hypothesis and generalizations. This process consists of model building with multiple representations in a small group discussion;

Stage 5 The final thought focuses on using models to construct meaning. The process consists of reflection and evaluation to make concrete the explanation and prediction made about real physical phenomena in the system and checking for connections, revising hypotheses, and generalizations.

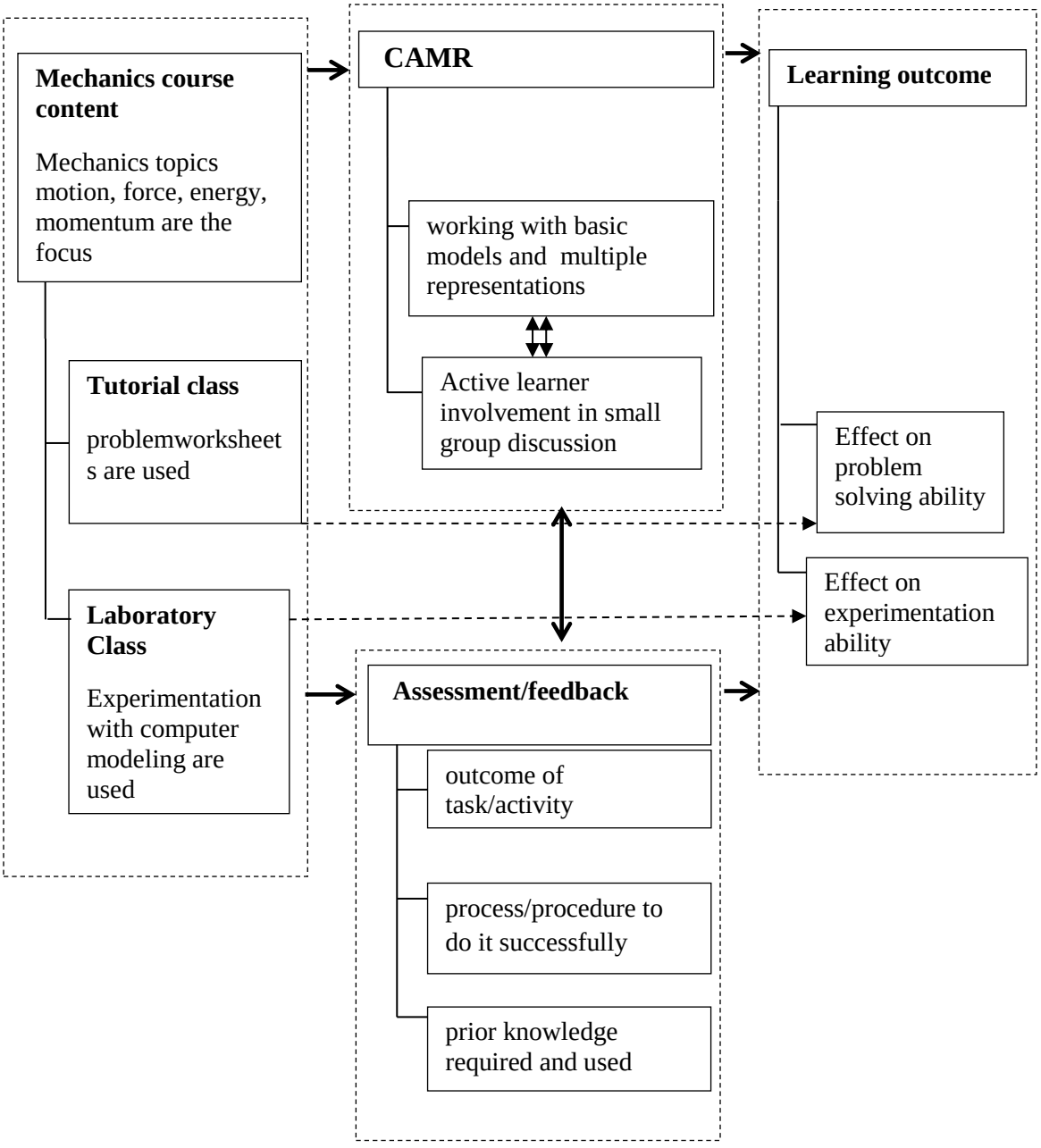


Figure 2: Conceptual framework

The function of each part of the conceptual framework in Fig. 2 arises from the curriculum itself, but more integration and organization of the parts is sought in this study. The sequence of chapters goes first with motion and followed by force, energy, momentum and extra that shows the learning

progression in mechanic course. The projections of the real world in topics like motion, force, energy, and momentum within mechanics are possible with the help of basic models. Basic models can be expressed and defined with multiple representations such as scale models (show spatial relationships), conceptual models (symbolic representation with underlying structures), analogue models (a physical system as a model for another) and extra. Formative assessment and feedback help both teachers and students monitor progress and remedial measure on the identified errors, and mistakes committed and misconceptions will be subjected to more clarification and explanation.

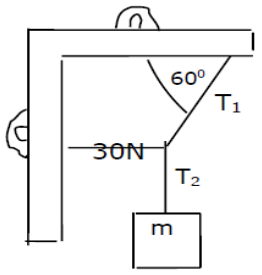
Sample lesson I

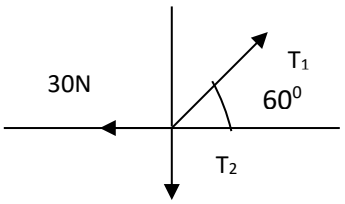
The lesson focuses on the given problem solving activity in the worksheet to be performed by CAMR stage-by-stage episodes. This activity was set for students to challenge their knowledge base on the first condition of equilibrium that they learned it in the lesson of Newton's first law. The problem-solving format (displayed in sample examples) guided the learner forward looking model-based strategies. Learners were guided to build models (predicted relations of variables) in different representations to describe events and processes in the context of the problem with the knowledge of basic models in mechanics.

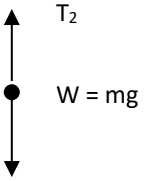
The instructors of both the experimental and control groups set chapter-based problem worksheets. The problems for the treatment group were selected with the potential to engage the learner in a thoughtful course of actions through undertaking multiple representations based on basic models in mechanics.

Scientific argumentation and meaningful learning could be attained at the end of the CAMR cyclic stages. The assessment and feedback were practiced based on prescribed scoring procedures to come to the conclusion of the cyclic stages of CAMR.

Table 1: CAMR applied in problem solving activities

<table>
<tr><td>Question: For the systems to be in equilibrium, find the unknown tensions and masses.
 

(1) Pictorial Representation
__Coordinate axes : x & y coordinate axes
__Symbols for quantities: T-tension; W-weight</td><td>List of known information:
F = 30N
θ = 60⁰
Identify unknown: T_1 = ?; T_2 = ? & m = ?</td></tr>
<tr><td colspan="2">(2) Physical representation:
2.1 object description
-The block can be represented by point mass (center of mass = C.M)
-The strings are ideal ones since they are massless & inexpensive
-The weight is a force vector through the C.M.
2.2 Force diagram: For the junction point of the three strings and for the block.
 

(i)
 

(ii)</td></tr>
<tr><td colspan="2">(3) Conceptual model: The system under several forces model
Conceptual model was the system with balanced interaction forces. Students in small group applied 1st condition of equilibrium using force diagrams above where both $\sum F_x = 0$ and $\sum F_y = 0$ holds true for every part of the system.</td></tr>
<tr><td colspan="2">(4) Mathematical Representations & Solution: Mathematical model was used as part of modeling in order to identify variables, formulate equations, and analyze possibilities.
Step 1 for the junction point, $\sum F_x = 0 \rightarrow 30N = T_1 \cos 60^0 \rightarrow T_1 = 60N$,
$\sum F_y = 0 \rightarrow T_2 = T_1 \sin 60^0 = (60N)(0.87) = 52N$
Step 2 for the block, $\sum F_y = 0 \rightarrow W = T_2 = 52N \rightarrow mg = 52N \rightarrow m = 5.2\ kg$
This was the solution for the first question and the same problem solving strategy was utilized for the rest two questions.</td></tr>
<tr><td colspan="2">(5) Evaluation: Answer sheets of small group of students for these homework questions were assessed according to the scoring rubrics to check the correctness of the answers.</td></tr>
</table>

Sample lesson II

The lesson focuses on the given experiment on friction to be performed based on CAMR stage-by-stage episode. The lesson objective is for students to be able to: (i) mention the physical

principles used in the experiment; (ii) to deal with basic models; (iii) use physical principles and basic models to explain the experiment; and (iv) refine the modeling when it is needed.

For the first twenty minutes of the laboratory session, conceptual test activities were set to challenge students' knowledge base about friction in the work sheet. One of the conceptual questions was the following. The same constant force (P) is applied to three identical boxes that are sliding across the floor. The forces are in different directions, as shown in the diagram given below:

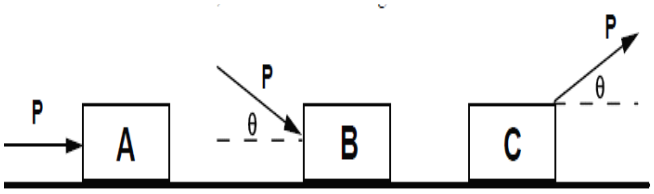


Figure 3: Forces in Different Directions

On which of the three boxes is the frictional force the largest or smallest? Or, is the frictional on each box the same? Explain using appropriate free-body diagrams and Newton's second law. The instructor as well as the technical assistant has to give timely feedback on the performance of students and corrections are made based on the feedback until the conceptual understanding is up to the required level for them to perform the experiment effectively. Once again, CAMR is used to perform simulation experiments with the help of built-in instructions for computer simulations available in the software package and softcopy of the detail manual for the computer simulations was also available. Model building was the process in which the learner used a large number of different representations to describe events and processes in the simulated situations with the knowledge of basic models in mechanics.

The students in small groups were working interactively through discussion over the experimental investigation as part of the group thought activity. The degree of interactivity of the learner in simulation experimental activities was maximized through the available instruments and teaching materials such as written lab manuals, handouts, computers, and lab reporting format. The investigation was performed by doing multiple representations using computer software. Finally, they should check the value of the coefficient of static friction is greater than the coefficient of kinetic friction.

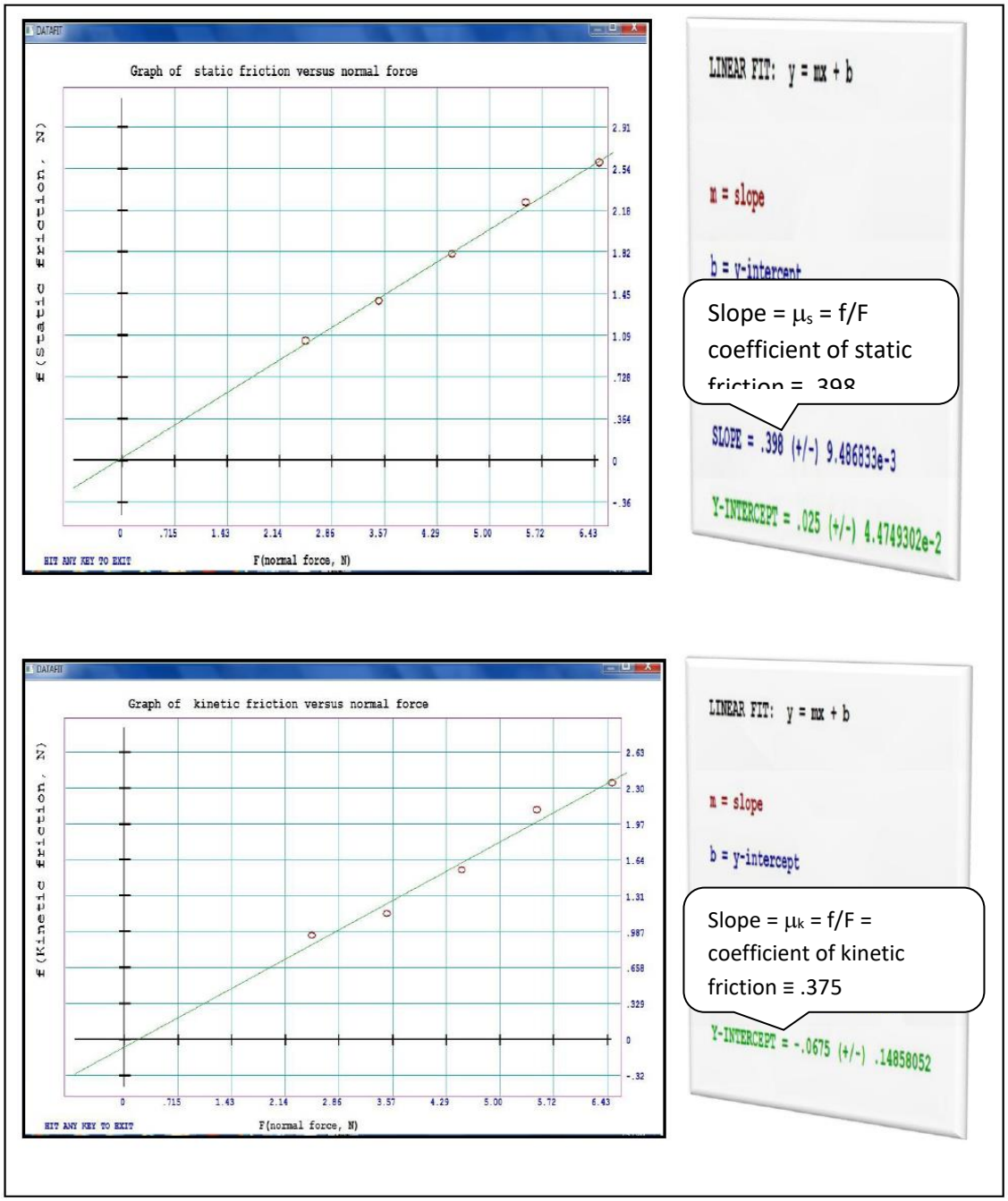


Figure 4: Graphical results for determination of coefficients of static & kinetic friction

The instruments for data collection are: (i) performance test to measure both dependent variables, namely problem-solving and experimentation. The performance test for problem-solving contained items scored out of 48 points of experimental performance on six simulation and physics experiments, separately each scored out of 18 points in line with scoring rubrics prepared for such purpose. (ii) conceptual questions (with 4 items) during problem-solving (iii) follow-up interview

during experimentation was recorded (iv) written documents for certain worksheet questions and laboratory reports as part of the assessment and feedback were considered.

During the first week of the intervention period, inter-rater correlation coefficients were calculated in order to establish the reliability of the scoring rubrics for problem-solving and experimental performance. Based on scores from two assessors, the researcher, and an experienced staff member, the problem-solving had a calculated value of Kandull's tau .64, and the experimental got a calculated value of Kandull's tau .741. Both turned out to be significant at p=0.01 level indicating stability of the scoring rubrics. The performance tests for both problem-solving and experimentation were administered at post-test. Content validity as an indicator of the relevance of performance assessment tests in problem-solving and experimentation was established through decisions made together with subject instructors. Basically, the problems were taken from standard books and the experiments were standard experiments known worldwide. The researcher and the experienced teacher rated the test and there were inter-rater reliability between the two scores with calculated values of Pearson's correlation (r) equal to .78 and .809, respectively. Conceptual test activities were also used to collect data during tutorial and experimentation laboratory classes which were also taken from the text book. Moreover, focus group interview was also used to obtain qualitative data.

3. Results of the study

The teaching method and gender as factors of the independent variable and the interaction between them were found to have a statistically significant effect on the dependent variable known to be the problem-solving performance post-test (α = .05).

Table 2: Two-Way Analysis of Variance (Two-Way ANOVA) on problem solving performance test

Source	Sum of squares	df	Mean Square	F	Sig.	η^2
Method	809.649	1	809.649	22.271	.000	.236
Gender	540.067	1	540.067	14.856	.000	.171
Interaction	307.243	1	307.243	8.451	.005	.105
Error	2617.507	72	36.354			

The result of the *ANOVA* analysis in Table 2 indicates there was a statistically significant main effect for the teaching method, $F(1,72) = 22.27$, $p < .05$, indicating that the intervention was

effective. The actual difference in mean scores between the groups was large (partial eta-squared = .236 = 23.6 % of the variability of the subjects' scores in the problem-solving performance test can be accounted for teaching method). Thus, the CAMR teaching method produced more learning improvement (M = 8.47) than traditional lecture teaching method (M = 3.66). There was a statistically significant main effect for gender, $F(1,72) = 14.86$, $p < .05$. The actual difference in mean scores between the gender groups was large (partial eta-squared = .171 = 17.1% of the variability of the subjects' scores in the problem-solving performance can be accounted for gender). The interaction effect between method and gender was statistically significant, $F(1,72) = 8.45$, $p < .05$. The effect size was medium (partial eta-squared = .105). The third significant factor which is labeled "interaction" means that the effect of the teaching method was not the same for female and male students. The independent *t*-test revealed a statistically significant difference between the mean performance test score for male students (M = 17.8) and female students (M = 6.3) in the CAMR group, $t = 3.39$, $df = 30$, and $p = .002 < .05$.

Table 3: Two-Way Analysis of Variance (Two-Way ANOVA) on experimentation performance test scores

Source	Sum of Squares	df	Mean Square	F	Sig.	η^2
Method	40.33	1	40.33	10.89	.002	.266
Gender	$1.8X10^5$	1	$1.8X10^5$	.00	.998	.000
Interaction	.075	1	.075	.02	.89	.001
Error	111	30	3.7			

In the same way, for design two, the result of the *ANOVA* analysis in Table 3 showed the main effect of the teaching method which was statistically significant $F(1,30) = 10.89$, $p < .05$. Thus, the CAMR teaching method applied to simulation experiments produced more learning advantage (M = 16.41) than traditional lecture method applied on the conventional physics experiments (M = 13.76). Partial η^2-eta squared was .266 (26.6 % of the variability of the subjects' scores in the experiment can be accounted for teaching method and considered large in magnitude). Gender was not the main effect, $F(1,30) = .00$, $p > .05$ and the interaction effect was not statistically significant, $F(1, 30) = .02$, $p > .05$. Therefore, there was no statistically significant difference observed by gender for experimentation ability which could be due to the application in the small groups.

As shown in Table 3, there was no significant correlation between scores of problem activities and post-test scores, r = -.256 and p = .156< .05. The problem-solving activities were not always subjected to a timely formative assessment and feedback. There was a statistically significant correlation between scores of experimentation performance test and scores of assessment of experimentation activities with p = .028 < .05. It means, there is dependence of experimentation performance post-test scores on scores of the lab reports as one increased the other increased too.

The correlation coefficients between the post-test scores and formative assessment scores of problem-solving and experimental activities were also calculated. Correlations between the post-test and scores of problem-solving activities were found as r = -.256 and p-value .156. On the other hand, the correlations between post-test and scores of experimentation activities were found as r = .531* and p-value .028.

When we see the excerpt of the record of a small group of students, who were engaged to solve the following question taken from the textbook, we describe constant-acceleration motion with the variables and parameters v_{xi}, v_{xf}, a_x, t and $x_f - x_i$ of the equations:

(i) $v_{xf} = v_{xi} + a_x t$

(ii) $x_f - x_i = \frac{1}{2}(v_{xi} + v)$

(iii) $x_f - x_i = v_{xi}t + \frac{1}{2}a_x t^2$

(iv) $v^2_{xf} = v^2_{xi} + 2a_x(x_f - x_i)$

The first doesn't involve $x_f - x_i$, the second does not contain a_x, the third omits v_{xf}, and the last leaves out t. So to complete the set there should be an equation not involving v_{xi}, but it is derived from the others. Students of the small group were engaged to solve the problem. They searched the set of equations from (i) to (iv) as mentioned in the question somewhere in the textbook. According to the records of the discussions which were going on among students along with the teacher, students finally understood the problem and obtained additional equations not involving v_{xi}.

$$x_f - x_i = v_{xf}t - \frac{1}{2}at^2 \quad (1)$$

This new equation was found important to solve the previous question students were in charge in a simple way. To consolidate the knowledge they gained homework questions were assigned for the small groups of students to solve in line with the problem-solving strategy. The format guided them to follow steps of forward-looking model-based strategy. They were also told to make necessary preparations for projectile motion to be discussed in the next tutorial session.

Let us see the work of a small group of students in measuring the acceleration of motion along air track where the manual and the built-in instruction described the procedure in detail. Accordingly, they collected the data in table form and the analysis was made to determine g (the acceleration due to gravity). The graph was drawn with a slope = m = 1/2 a = 1/2 g sinθ. The students had used data analysis software in the software package to obtain the graphs indicated in figure 5.

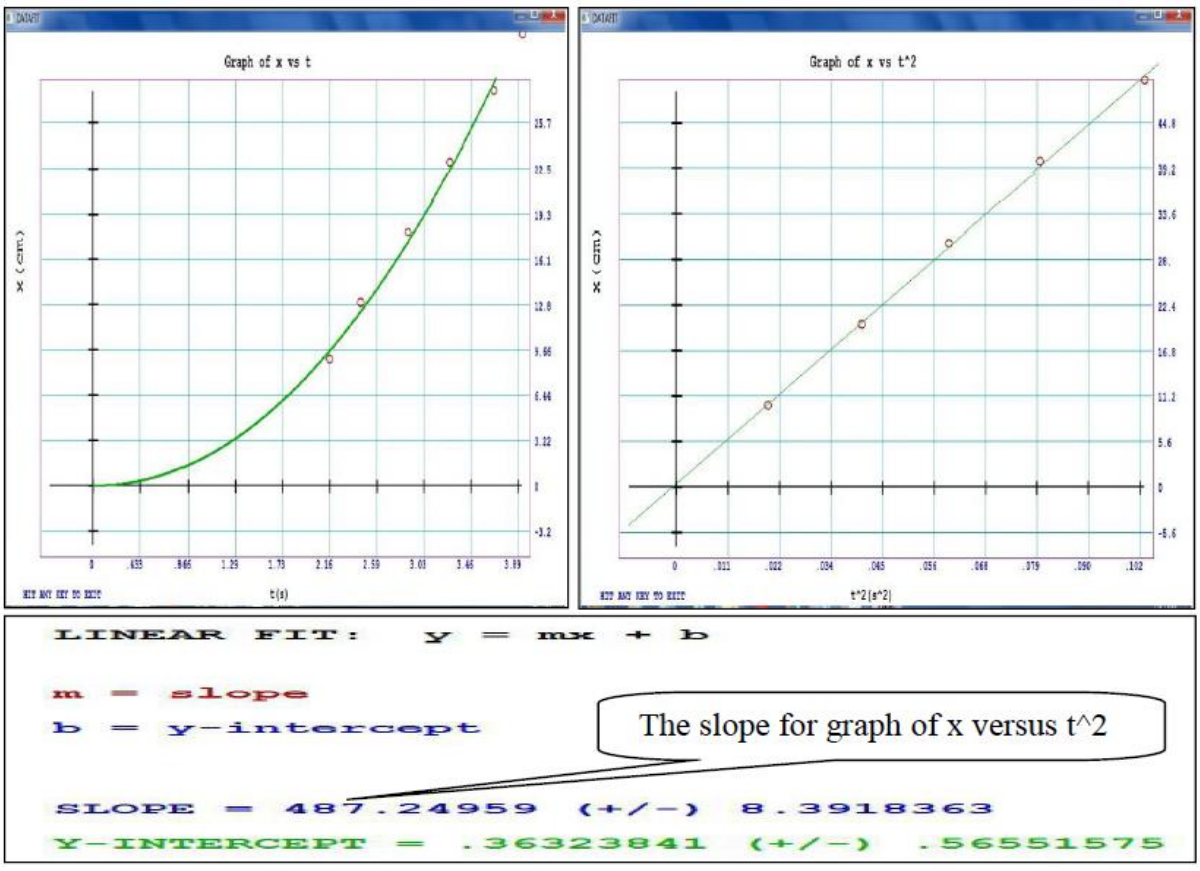


Figure 5: Example of graphs drawn by students that show x-t and x-t2 graphs

The software can easily calculate the slope of x vs t^2 graph and equate it with 1/2 a = 1/2 g sinθ. The slope of the graph was calculated to be 487 cm/s^2 or the same to say 9.74m/s^2 = g sinθ which

helped them to estimate the value of g. The students were also encouraged to use a standardized laboratory reporting format in computer-based experiments.

The conclusion of the lesson involved making remarks either from the students' or the instructors' side in order to substantiate the outcomes of problem-solving and experimentation activities. That was done in order to advance meaning-making and meaningful learning which could be ensured as students work to understand and apply scientific models. The computer model was designed in such a way that the students were engaged interactively to think and justify based on basic models. The truth is that not every model has to fit every phenomenon but the controversy (discontent) that occurred has opened up opportunities for students to be able to build the appropriate models for that specific phenomenon. The final evaluation stage was meant to verify the correctness of stage-by-stage progressions in experimentation and problem-solving which could be done in group discussions and oral presentations to be supported by assessment and feedback practices.

There was, therefore, valid evidence that the CAMR teaching method was important. The result of focus group discussions indicated what students experienced in group work, weekly activities, and peer assistance were helpful in bringing learning gains in the course. A significant percentage of the students replied that they had a better understanding of basic models, laws, principles, and multiple representations in mechanics they used in problem-solving. The instructor was interviewed to cross-check the importance of CAMR for the reported learning gains and the response attuned to the report obtained from the students.

The content analysis indicated that students made significant progress in problem-solving performance. Every time the students strictly followed the CAMR, they understood the problem by searching the basic model in mechanics. The basic models were used to make multiple representations. Students in significant numbers thought that group work, laboratory reports, computer utility, weekly activities, and peer assistance as features of CAMR were helpful in learning the course. It was also revealed that due to the implementation of CAMR in teaching, students responded as they obtained a considerable understanding of laws and principles, basic models, and multiple representations in mechanics. They also responded that they gained practical skills in designing laboratory experiments, finding trends in data, working cooperatively, and oral presentations.

4. Discussion of the Results

Lin & Singh (2015) found that for the quantitative problem involving strong alternative conceptions, simply guiding students to work through the solution of the analogous problem was not enough to help most students. However, additional scaffolding supports directly helped students examine and repair their knowledge elements involving alternative conceptions. The reason is that misconceptions, unless treated with appropriate teaching methods, could limit students' performance in problem-solving and experimentation as demonstrated in this study. Thus, active learner involvement in small group discussion through working with basic models and multiple representations, as elements of CAMR, can bring students' conceptual understanding to the level they can perform problem-solving and experimentation for better results.

The result obtained based on design one showed CAMR teaching method brought about better performance scores in problem-solving which is consistent with prior research works (Ornek, 2009; Vesenka et al., 2002). The application of CAMR in design two also brought a significant experimental performance for the effectiveness of CAMR and for students' conceptual development gains as well. Computer simulation in-line with the assessment methods is effective in both computer-based and hands-on activities (Ekmekci & Gulacar, 2015). Similarly, learners who are taught using computer simulation were happy with the approach used by Kibirige & Tsamago (2019).

Duran (2016) argues that the inquiry-based learning approach as a constructivist learning approach can contribute to students' use and development of critical thinking skills in problem-solving and experimentation activities. In addition, Raiz, Marcinkowski, & Faisal (2020) reported the effect of discovery learning on students' conceptual understanding and they found that the new approach significantly improved their conceptual understanding during laboratory activities. Brewe, Kramer & O'Brein (2009) pointed modeling instruction impacts students in a significant, positive manner in learning introductory physics courses. There is therefore supportive evidence about the effectiveness of CAMR when it is applied in problem-solving and experimentation that is revealed in this study. The overall impact of the intervention as reported by both the students and the teacher and revealed by conceptual test results and focus group interview was positive since it was helpful for students' learning.

5. Conclusion

This study confirmed that the CAMR teaching method is practical and effective in bringing about better outcomes in problem-solving and experimentation performances in mechanics courses. It was also found that male students achieved better than female students in problem-solving, but no significant difference was observed in experimentation performance. There was a significant correlation between experimentation performance tests and formative assessment scores of experimentation activities, but no significant correlation was obtained for problem-solving activities.

6. Implications

The finding of the study implies that teaching organized knowledge is essential for the effective performance of problem-solving and experimentation tasks and activities. In general, there is no one best strategy for all classroom situations, thus future research should focus in order to test new effective teaching strategies.

Declaration of competing interest

The author declare that there is no conflict of interest in this study.

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Investigation of the Correlation between Students' prior University Prospects and their Actual University Academic Achievements

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Abstract

This study was designed to determine the correlation between students' prior university prospects and their actual academic achievements. The study employed correlational research method and quantitative and qualitative research approaches. Stratified and systematic random sampling techniques were used to identify a sample of 150 students from the total 603 2nd year degree students at Kotebe University of Education (KUE) in the year 2021. Data were collected using a rating scale questionnaire, FGD, and document review. Descriptive analysis was used for quantitative Data, whereas thematic analysis was used for qualitative data. Results confirm that the correlation coefficient between students' prior university prospects and their actual academic achievement is **r= 0.989.** It shows a statistically significant and positive correlation in which students with high earlier university expectations are more likely to be higher achievers than students who had low-achieving prospects. On the other hand, the main constraints students faced in their study were lack of self-study timetable, random study habits, inadequate academic consultancy, and follow-up, absence of tutorial supports, achievement anxiety, ethno-linguistic and/or religious affiliation groupings, heightened sense of the right to deserve a passing grade (i.e. 'C',) and inability to adjust to the new academic environment. In conclusion, as students' prior university prospects are found to be potential predictors of academic success, universities should establish awareness raising programs and consultancy office in charge of university study habits and academic success strategies.

Key words: University, education, prospects, academic achievements, correlation

1. Introduction

At university, students are expected to be self-dependent and self-regulated learners. They need to program their learning and study time and experience the different university learning behaviors. They should be aware of that studying in a university requires different approaches including

solitary study, library study, peer study, idea sharing, conducting interview, survey, reporting, presenting speech, debating, reflecting, etc.

Students may have different perceptions, prospects or expectations about university learning. Suyitno et al. (2019), for example, have had the idea that many students usually have certain prospects about their future higher education study. Some may have positive expectations while others may anticipate some difficulty or challenging intervening situations. Learning prospects whether positive or negative, could have its own influences on students' performances. Likewise, Hassel & Ridout (2018) have made clear that students' prior learning prospects could be taken as potential predictors of students' academic performances.

Stated differently, learning prospect is what students predict or expect to happen in their future education. It is learning view or expectation which involves students' future orientation, aspired goals, ideas of learning values, and academic success desires (Harackiewicz et al. 2002; Hassel & Ridout, 2018; Suyitno et al., 2019). Having clear university learning prospects encourage students to be more active and interested to realize their aspired goals of academic achievement. Besides, learning prospects may act as catalyst in facilitating students' courage and determination to complete a given learning task or activity with more commitment. Hence, students who have prior university prospects are more likely to perform well and achieve better scores (Katttab, 2015).

Developing higher aspirations, prospects or expectations for university study is important for students because such perceptions mostly serve as positive energy to inspire students to work hard and realize better academic achievement. Feeling positive university expectations also helps students to experience strong mental and psychological readiness (Khattab, 2015). Besides, high university prospects and readiness influences students' level of readiness and preparation to challenge more demanding academic tasks (Harackiewicz et al., 2002; Lowe, & Cook, 2003).

Academic achievement shows the extent to which a student performs the given learning activities and scores certain marks or grade at the end of completing the academic activities as directed. Though students' actual learning potential and hardworking behavior could determine their academic achievement, other factors could intervene in the process of learning. Among the many influential and determining factors, prior academic and success experiences, study habits and strategies are some of them. Similarly, many scholars argue that students' prior university

expectations, academic understandings and success could ease the students' university learning behaviours (Lowe & Cook, 2003; Yorke & Longden, 2004; Hailikari, 2009; Khattab, 2015; Tentama & Abdillah, 2019). Whilst students with high university expectations are more likely to achieve better, students with low expectations and performance may be less prepared to deal with the challenges of higher education learning activities (Regier, 2011).

Research findings show that newly joined university students often encounter the challenges of meeting tough academic demands, while they are still under pressure to familiarize themselves with the new and complex academic environment and practices. The learning tasks are tougher and so it requires students to work hard and confront the progressively challenging academic tasks. In other words, by its own very nature, the academic environment promotes differences in thinking, interpersonal interactions, active engagement, analytic and self-regulated learning strategies. And this in turn could generate favorable learning atmosphere that does not only meet students' expectations, but also that maximizes their academic performance skills. Yet, it should be accompanied by progressive academic achievements.

Most notably, joining higher institution requires students to have clear purpose and academic expectations. They need to have mental readiness and academic goals to be achieved. However, as stated by Blonna (2005) some students may have no or low expectations about higher institution academic requirements and practices. Students who lack expectations are often stressed when they are surrounded by some challenging academic environments. For instance, "… Some are trying to cope with demands of adapting to a new living environment, new peers, academic pressures, and sexual concerns. (p. 1). Moreover, it has been exemplified that "Issues such as the nature of college classes, autonomy, the time requirement of academic work, and the outside demands on students' time were examined as factors that influence the perception of academic work as stressful" (p. 318).

Previous research findings indicate that there found substantial mismatch between students' higher education performance expectations and their actual university academic achievements. In this sense, varied barriers might be cited as reasons for the mismatch and the magnitude of these differences may vary from institution to institutions. Eventually, nonetheless, Good & Brophy (1987: 118) describe that "Studies conducted in quite different settings have shown that student achievement can be affected by expectations induced in instructors." In one sense, some lecturers may institutionalize their own culture of teaching and own expectations which may or may not meet

the student's academic prospects, whereas the students may have their own different prospects. Such discrepancies between university lecturers' expectations and new entry students' prospects could incite mismatch between the students' preset university learning behaviors and the lecturers' actual academic expectations.

The crux of the matter is that the existence of mismatch between students' expectations and their higher institutions academic requirements may have long-term effects on the students' self-confidence, competence and on their future academic life (Smith & Brown 1995; Brown, Armstrong & Thompson 1998; Purkey & Novak 1996). Even worse is that students, who are being trapped in such expectations and academic achievement mismatch may experience academic failure. Otherwise, they may suffer a lot to cope up with the academic anxiety and stresses that are confronted due to the demanding nature of academic tasks. There may also be cases in which those students who face such mismatch become anxious and so frustrated that they give up their academic efforts. In particular, "…Anxiety, discomfort and fear are incompatible with the learning process and make the teaching and learning difficult." *(*Burden, 2003:2).As a result, the students become vulnerable to academic warnings, drop outs or even to academic dismissals (Matiru, Mwangi & Schlette 1995; Ellwein, Grave, and Comfort 1990.) .

On the other hand, Weiten & Lioyd (2007: 24), have claimed that "Today, a huge number of students enter college study with remarkably poor study skills and habits." They further argue that students who lack effective study skills and experience, and who fail to expect more demanding study habits in their university life are less likely to succeed in their academic achievements.

Correspondingly, Blonna (2005: 318) has also presented the evidence that:

> …… Some college students feel inadequate and unable to cope with the intellectual demands of college. They lack the study skills…. Still others cannot handle the autonomy. With no one nagging them to get up and go to class or study, they fall behind in their classes. They lack the self-discipline necessary to get their work done.

A correlation study in Indonesia, for example, found that students' school achievements influence the students' future academic performance. Students who are academically successful are found to show higher self-esteem, self-confidence and self-efficacy in their future learning (Tentama & Abdillah, 2019), while those with poor learning performance experiences are found to suffer hard

from higher anxiety, depression, confusion and unstable learning behaviors (Regier, 2011). Similarly, a descriptive study conducted at Arba Minch University, Ethiopia, reveals that students with relevant previous school academic records were found to be more likely to succeed in their university education (Yigermal, 2017).

Another study carried out by Hassel & Ridout (2018) looked into what expectations students hold when starting university education, and what expectations university lecturers have about new students who are entering university. The study used investigative research approach in which it comprised freshman students (n= 77), and lecturers (n= 20) who were teaching the students. The participants were selected using systematic random sampling techniques. Data were collected through open-ended and close-ended questionnaires and self-reporting written responses. The collected data were analyzed using descriptive statistics: one sample t-tests and paired sample t-tests. Results prove that students had largely realistic expectations of university education. The majority of the respondents expected that university teaching approach and study strategies become the same to school teaching and study strategies. In the same way, results indicate that lecturers expected to teach first year students in the same way as they were teaching 2nd and above year students. The teaching method was focused on information transmission with teacher dominant approach.

It would seem highly likely that students whose expectations do not go in line with the actual university academic requirements, or whose expectations mismatch with the actual academic environment may show poor academic performances. Of all, one of the potential reasons is that such students are often less motivated and do have less courage to actively engage in the tough academic practices. Even more to the point, as Brown, Armstrong, & Thompson (1998: 4) have remarked, “Under-motivated students are hard to teach, gain little benefit from their studies and drain the resources of the institutions in which they study, contributing to poor completion rates and stretching the capacities and the patience of their tutors.

In much the same way, it has been learned from the lived-in-it-experiences that first year students joining KMU are not expected to face an easy and welcoming academic environment. There found little attention to support freshman students on, for example, academic consultancy, study habits and strategies, coping up with the new academic environment, providing follow-up and awareness raising programs, informing where to go for advice, etc. So, there observed lots of confusions and

student wandering around with in the campus. Even worse is that there is no academic initiation programs that could cool down the anxiety and stresses freshman students are often experiencing. Similarly, there found no special preparation on how to deliver lessons and teach freshman students. In short, it can be witnessed from personal observation and professional experiences that the university academic environment reflects business as usual.

In short, it is hypothesized that the aforementioned literature-driven data has been conceptualized as major defining factors determining students' university academic success and could be illustrated as follows:

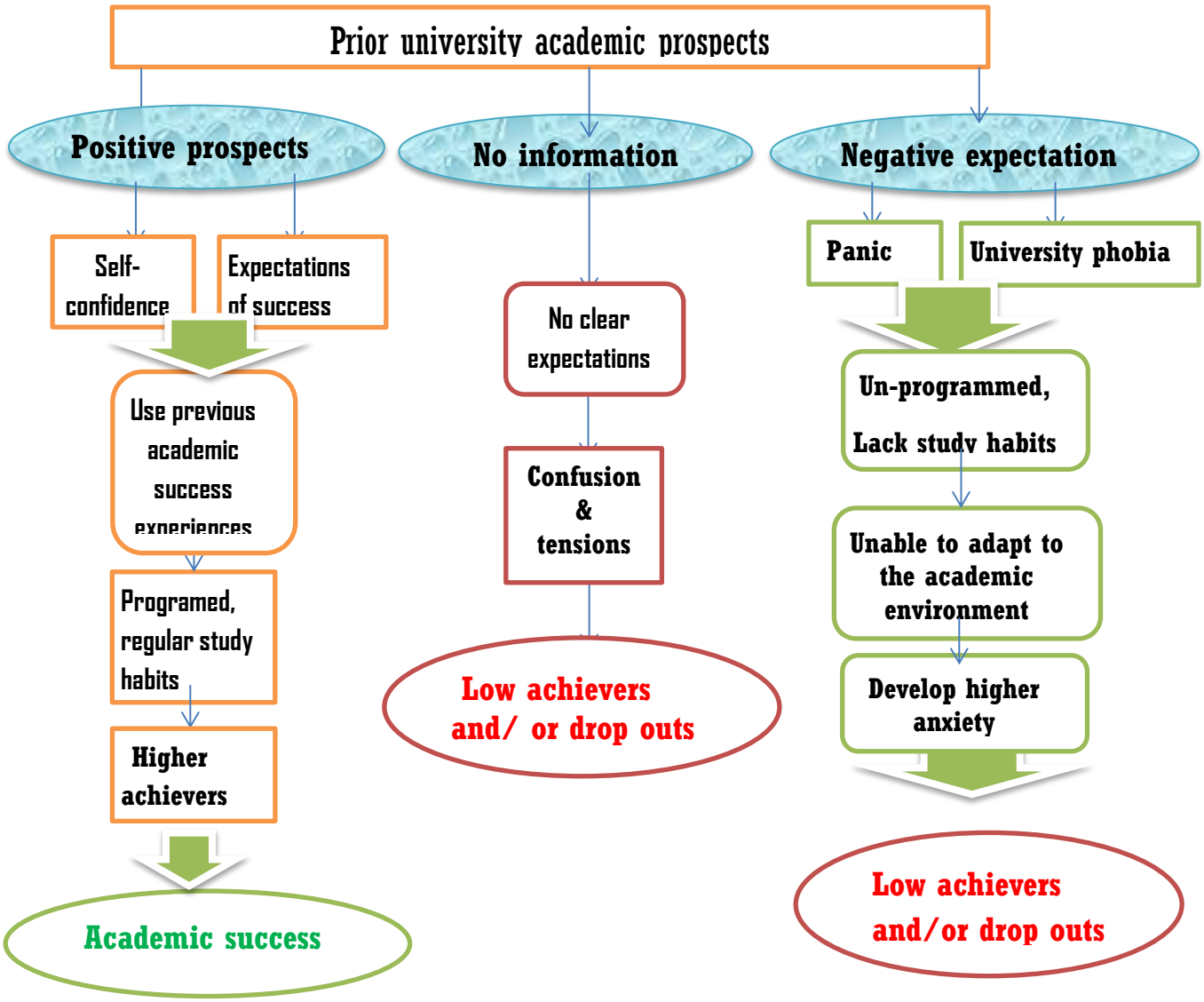


Figure 1: Overview of impacts of diverse prior university prospects on students' achievement

To this end, the main objective of this research was to investigate the correlation between students' prior university prospects and their actual university academic achievements. This helps to identify the correlation between what students imagine and expect university learning to be and their actual academic achievements in order to take the necessary corrective actions before students experience sufferings and becoming victims of the mismatch.

2. Methodology

This study was designed to pursue mixed method: quantitative and qualitative research approaches to collect and analyze data. The research project was planned to follow correlational study method to investigate how students' prior university prospects are associated to their actual university academic achievements.

Population, sampling methods and sample-size

The study comprised 150 students out of 603 total potential student populations who were attending their education at Kotebe Metropolitan University. The students were first year degree freshman students who completed the two semesters' learning, and whose first year cumulative grade point average (CGPA) was determined and communicated to the students. As the research population was organized in groups or strata, stratified random sampling technique was employed to specify proportionate sample size from each stratum. To identify specific representative sample from each stratum or group, systematic random sampling techniques was used.

Briefly, the second year degree student population was grouped into 10 departments and 15 sections. Each section, on average, consisted of 44 students. So, as the target population was grouped into sections, it was decided to employ stratified random sampling techniques.

Next, to determine the sample size to be taken from each section, it was determined to apply the formula: **n/N x Ni**; (Wiersma 1995:292)

Where **n**= Total number of sample wanted- (150 students)

N= Total number of target population- (603)

Ni = the number of each stratum size (44)

Therefore, the number of representative samples being taken from each section was ten (10) students, which were totally 150 sample students. Note that it was decided to avoid every digit for

the sake of escaping fraction numbers. Accordingly, the research included approximately **25%** of the total targeted student population.

Finally, to determine the individual student being taken from each group, systematic random sampling technique was employed. To apply this method, first the complete name list of each group was collected. Then, to decide the specific interval of the individuals being selected from the name lists, the formal **N/n = k** (Ibid) was applied.

Key: **N** = Total population of a group\class

n = the number of sample to be taken from a given group/class

K=a common factor used to determine the interval of individuals in the name list

Data Collection Methods

The study was scheduled to use three methods of data gathering techniques: questionnaires, Focus Group Discussion (FGD) and document review. The questionnaire had two types (Open-ended and Close-ended items), which was designed to collect students' opinions regarding their prior higher institution academic performance expectations. The FGD was presented to nine (9) randomly selected group of freshman students. The key purpose of the FGD was to explore in-depth details on some hidden students' tactics and strategies used to achieve their university expectations.

The study also included document review as an instrument to gather data and relevant statistics regarding the sample students' first year academic achievements or cumulative grade point average (CGPA) to cross-check their expectations with their first year academic achievements. By doing so, the research would find out the kind of relationships between their higher institutions academic performance prospects and their actual first year university academic achievements.

Data Analysis Techniques

To analyze the responses of the subjects of the study, quantitative and qualitative methods were employed. First, close-ended questionnaire was developed to elicit students' earlier university academic expectations. The questionnaire was filled in by 150 students. Then, a seven point rating scale questions was designed to analyze students' university expectations in comparison with the students' first year university grade achievements. Following this, open-ended questionnaire was developed to investigate any intervening constrains which may hinder students from their attempts

to meet their university expectations and academic success. Then, a set of frequently addressed common themes was sorted out, reorganized and discussed. In addition, a FGD was used to find out further cases.

The data collected through close-ended items and document review were analyzed using simple descriptive statistics such as counts, frequency and percentage description. The data collected through FGD was described based on thematic analysis. The rating scale question which was used to analyze the correlation between students' prior university prospects and their actual university achievements was analyzed using Statistical Package for the Social Sciences (SPSS) software version. The analysis was coupled with the ideas of some scholars cited in the theoretical parts in order to get a clear insight into how prior academic expectations and performances influence students' university academic achievements.

3. Results and Discussion

Results of the Close-ended Questionnaire

Table 1: Responses to whether students had any prior University expectations

Alternatives	No of Respondents	
	Figure	%
1. Yes	89	59.3
2. No	37	24.7
3. I was not sure	24	16

Table 1 shows students' responses to whether they had prior university expectations or not. As can be seen from the table, most of the respondents, that is, 89 respondents out of 150 indicated that they had certain university education performance expectations when they were at high school. In contrast, 24.7% of the respondents indicated that they had no expectations of university education performance. And nearly one-six, that is to say 16% of the students reported that they were not sure whether they had any expectations of university academic performance.

What is really surprising is that more or less more than one-fourth (1/4) of the respondents stated that they came to university with no openly assumed university academic expectations. Seemingly,

such students could face more unexpected academic challenges which could expose them to academic stresses and achievement anxieties.

Consistently, in a research findings conducted by Madhu and Grewal (1990), it was substantiated that students' home academic expectations and interests have direct influence on their higher institution academic achievements. This implies that institutions should have a well-grounded system to help students to readjust their expectation. Ellwein, Grave & Comfort (1990), and Sliwak (2010), for instance, remark that higher learning is not only just about how to make use of learners' expectations and resources as an input, but also it is about bridging the gaps that may be created between the students' expectations and the academic tasks.

Table 2: Responses to grades students expected to achieve in their University study

Alternatives	No of Respondents	
	Figure	%
1. Very High	30	20
2. High	62	41.3
3. Medium	30	20
4. Undecided	11	7.3
5. Low	14	9.3
6. Very Low	3	2

Table 2 displays that 30% of the respondents expected to achieve very high grades, while 62% of the respondents expected to achieve high grade in their university study. The table also shows that 30% of the informants supposed to score medium grade in their university study.

However, 7.3%, that is to say, eleven out of 150 students did not have any expectation of the grade they might score in their university study. In contrast, 9.3% of the respondents had low expectations of university academic achievements, while 2% of the respondents reportedly had very low academic achievement expectations.

Stated differently, more than half (61.3%) of the respondents proved that they had positive and significant university academic achievement expectations. Still, one fifth of the students (20%) more or less had constructive expectations to score medium grade. But, more remarkably,

marginally 11.3%, that is to say one-ninth, of the respondents more or less confirmed that they had negative university academic grade expectations. This implies that having low achievement expectations could limit the students' actual academic scores.

Within this context, Miller & Birch (2007) who have summarized that the type of university academic achievement expectations students bring to their allocated university could significantly influence their actual academic performance and achievement scores. They argue that students' earlier university expectations possibly determine the students' academic success or failure. Students with great expectation of more demanding university academics are highly likely to confront the academic challenges to earn better grade than those who had low or no clear academic performance expectations.

Subsequently, it can be inferred that the more the students have very high or high university academic performance and achievement expectations, the higher grade they achieve in their university study. In other words, those students who have higher or high academic achievement expectations could score higher or high grade when compared to those students with lower or low academic achievement expectations (Garmon, 1990).

Table 3: Responses to students' University success strategy

Alternatives	No of Respondents	
	Figure	%
1. Self-Study	66	44
2. Classroom Lecture Note-taking	48	32
3. Peer/Group Discussion	24	16
4. Assignment Works	6	4
5. Classroom Self-reflection	6	4

As can be inferred from Table 3, the majority of the respondents reported that they expected to experience university success through own self-study strategy. In other words, 66 informants out of 150 favored self-study as an approach to achieve significant university academic success. However, nearly one-third of the students, that is, 48 respondents preferred classroom lecture note-taking as a university success strategy, whereas about one-sixth of the students, that is to say, 24

respondents reportedly inclined to prefer using peer/group discussion technique as a means of university academic success strategy. The least number of respondents, that is six students in each of the following cases suggested assignment works and classroom self-reflection as their university academic success strategy.

It is, thus, very essential to underline that the table illuminates three most favoured university academic success strategies. The first is that the highest figure (44%) of respondents confirmed university academics should provide students with enough self-study time. And this finding correlated with the very typical concept of higher institution curriculum which promotes self-study and self-regulated learning practices. As well, the next highest percentage of respondents, which is 32%, reportedly chosen classroom lecture note-taking learning method. On the other hand, 16% of the respondents preferred peer/group discussion as university academic success technique. It implies that if university academic practices give more value to those learning approaches, students will possibly experience progressive academic success.

In view of that university academic practices should demand students more of independent and self-reliant learning practice. More to the point, Students may exert great energy to achieve better academic success when they get opportunities to interconnect their expectations to the classroom learning activities. Thus, "Higher education institutions need to provide students with opportunities for personal reflections and support for their learning needs at all levels so that they can develop realistic, progress-enhancing self-awareness." (Brown, Armstrong and Thompson (1998: 70). In addition, they remark that *"*For a variety of reasons, giving students responsibility for managing their own learning is becoming an increasingly popular trend with in higher education." (PP. 9-10).

Results of the Rating Scales

One of the ultimate objectives of the research was to compare the students' prior university performance expectations and their actual achievements to determine the type of relationship between the students' earlier university academic expectations and their actual achievements.

For that reason, the respondents were asked a seven item questions related to their academic performance and achievement expectations they had before joining the university. The questions were prepared with four rating scales to test the students' self- induced expectations. Then the respondents' achievement expectation was calculated and their responses were compared with their

actual academic achievement (**CGPA**) using SPSS software. The students first year CGPA was collected from the university registrar office.

Correlations

		Expectation of Students	Performance or Achievement of students
Expectation of Students	Pearson Correlation	1	.989**
	Sig. (2-tailed)		.000
	N	99	99
Performance or Achievement of students	Pearson Correlation	.989**	1
	Sig. (2-tailed)	.000	
	N	99	99

**. Correlation is significant at the 0.01 level (2-tailed).

Regression

Variables Entered/ Removed [a]

Model	Variables Entered	Variables Removed	Method
1	Expectation of Students [b]	.	Enter

a. Dependent Variable: Performance or Achievement of students
b. All requested variables entered.

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.989[a]	.979	.978	.07352

a. Predictors: (Constant), Expectation of Students

b. Dependent Variable: Performance or Achievement of students
c. Predictors: (Constant), Expectation of Students

ANOVA [a]

Model	Sum of Squares	Df	Mean Square	F	Sig.

Dependent Variable: Performance or Achievement of students

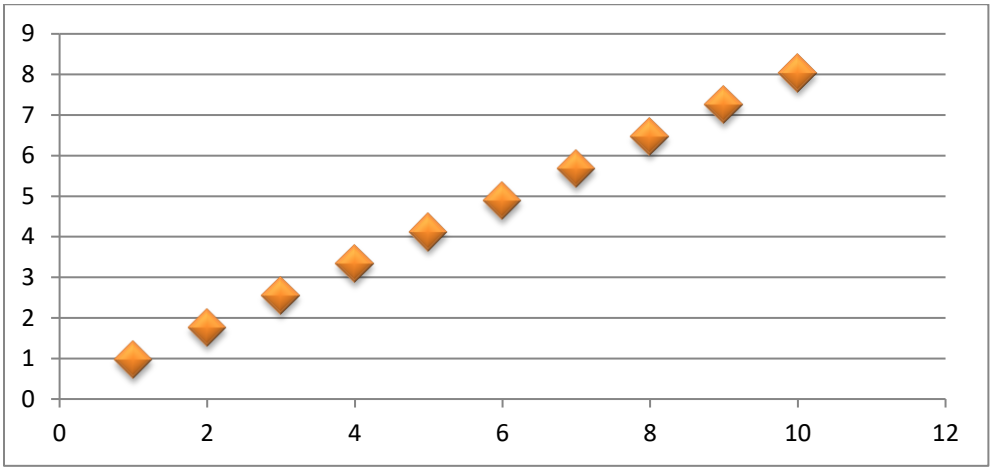
Model		Unstandardized Coefficients		Standardized Coefficients	T	Sig.
		B	Std. Error	Beta		
1	(Constant)	.193	.037		5.208	.000
	Expectation of Students	.784	.012	.989	66.586	.000

1. Magnitude = 0.989
2. Strength = Very high correlation
3. Direction = Positive
4. Coffs. Determination = 0.979
5. Prediction = Y=(0.784) x + 0.193
6. Significance = The correlation is significant at $p<0.05$ (two-tailed)

As can be seen form the analyzed data, the correlation coefficient between students' university performance expectations and academic achievement is **r= 0.989.** This shows that there is a very high or strong correlation between the two factors: expectations and achievement. The correlation is also positive with a coefficient of determination $\mathbf{R^2 = 0.979.}$ This implies that approximately **98%** of changes in academic achievement accounts for the same magnitude of changes in expectations. Thus, students' university expectation has highly and significantly great impact on their academic achievement.

Stated differently, students with higher earlier university performance expectations could earn significantly better achievement in their university overall grade scores than that of students with low university performance expectations. Feasibly, this is in agreement with Purkey & Novak (1996) who have documented that students who have greater expectations do not only envisage the need to work hard at higher institutions but also they are confident in themselves to achieve higher grades in their studies. These students are often ready to confront most of the academic challenges due to that they have already made higher expectations about higher institution academic demands. They further argue that there are some specific features which distinguish those students from others. "They usually pay attention in class, do their work with care, finish what they start, and expect success from their efforts*."* (PP. 116-117).

On the other hand, the analysis also illustrates the prediction or regression line. It reveals that each change in expectation results in a counter change in the performance. The regression line can be given (*mathematically*) by **Y= 0.784 x + 0.193**. Graphically, it is put as follows:



Graph 1: University expectations vs. actual university academic achievement

As can be seen from Graph 1, if students set higher or high prior university performance expectations, they will possibly achieve better grades and vice versa. In view of this point, the analyzed data implies that while high achieving students have high university expectations, low achieving students have low university performance expectations. Hence, the data analysis shows that students' actual academic achievement directly correlated with their earlier university prospects. It would appear that earlier university performance expectations could positively influence students' actual academic achievements. In other words, students with significantly better academic performance expectations could earn higher scores in comparison to those students who anticipate low university academic performance.

Generally, the correlation between the two factors: expectations and achievement is found to be **0.000 at P < 0.05** (two-tailed). As the results verify, though the magnitude of differences between students with high achieving and low achieving expectations possibly vary, the students' earlier academic prospects or expectations correlated with their actual academic results. One of the implications of this finding is that the more students develop very high or high university performance expectations and perceptions, the more they become high achievers.

Results of Students' Responses to Open-ended Items

This section of the study dealt with important findings which were identified from the students' responses to the open-ended questions. The students were first provided with multiple choice questions to express their earlier university educational performance expectations and their academic achievements. Then, they were provided with a four scale rating questions to compare their previous higher education expectations and their first year academic achievements. Following that, they were provided with open-ended questions in which they were requested to explain the main intervening factors that influence them not to meet their university performance expectations and academic success.

As the students' reports confirm, many of the respondents encountered significant barriers to meet their prior academic expectations. The following cited responses are presented to exemplify the actual reactions of the students. "I expected to get better support and advice from university instructors when I joined a university. I was highly eager to listen to their advice. Yet, I received little support when I have been in this university."

In the same way, the other respondent stated this case as follows: "I, for example, suffered a lot to try to adapt myself to the demands of the new academic environment. It was, perhaps, due to lack of information center and the support of guidance and counseling office. Some instructors are always busy, but it is for their own life*."*

In particular, some of the respondents reported their prior expectations and what they in reality encounter regarding university classroom learning as follows: "Personally, I am very disappointed in many of my university classes. Many of my instructors are usually in hurry. I feel that some of them sometimes forget our presence because they often just keep on talking either to themselves or to the board."

Likewise, another respondent put this point as: "When I was at high school, I expected that university classes were more of about exchanging academic understandings that students collected from library and outside classroom studies and readings. However, I now find that it is a sharp reversal of my previous expectations*."*

There are also reports in which some respondents felt different in the cases in which some university instructors became unfamiliar to use the early classes. And this in turn influenced the students to develop the same culture of missing the beginning classes of a semester. To illustrate the case, a respondent stated as:

> What shocks me most is that it is really beyond my expectations to experience that both instructors and students disregard the beginning classes. Many of them often miss one complete school week of the beginning of each semester of an academic year. At this time, the majority of the students and teachers do not go to class. Even if very few teachers may sometimes do the unexpected, I mean go to class; they often waste the periods talking either about themselves or unrelated issues. And that is one segment of the culture of university life which I had never expected.

Seemingly, some respondents were not happy with the way some instructors handle the classroom teaching-learning practices. Some respondents, for example, criticized that some instructors gave more attention to mass practices at the expense of individual learning potentials. To illustrate the case, a respondent exemplified the matter as:

> You asked me whether my previous university academic performance expectations come true in my university life or not. My obvious answer is '**No, No, No… NOT!** You know way, here in university academic practices, the common classroom learning activities are set to demand some sort of mass academic performances. Believe me; no time is given to individual qualities.

In addition, other respondents narrated related responses to the question as follows: "Some of our instructors are always in hurry just not to be late for their portion and that is their goal. I hope you understand me. As there is no time for students to share their experiences and expectations, I am not able to exercise something which is my own*."*

What is equally attention-grabbing is that there were respondents who felt that participating in co-curricular activities could assist the actual academic success. It would seem that some respondents had good high school club experiences that they missed in their university learning, and this was reported as something beyond their expectations. For instance, one of the respondents detailed this case as:

> It was beyond my expectations to see that there are no academic focused clubs in the university. So, we do not get co-curricular academic environment, where we, for example, participate in English, culture, art or drama, math or biology, etc. study clubs. Were we provided such opportunity, we could stretch out our self-learning practices and experiences.

The students' responses to the open ended-questionnaire were reviewed carefully and the frequently reported issues as barriers to the students in their attempts to meet their university academic expectations were reorganized and redistributed to the respondents to rank the difficulty level of each identified intervening factors. In other words, after the first data were collected and common and key themes were identified, the identified problems were stated in complete sentences form and redistributed to the respondents in order to rank the problems in the order of their difficulty level.

Accordingly, the common problems, as reported by the students, are listed down from the most to the least influential factors that intervened in the students' attempts to meet their university performance expectations and academic success.

Table 4: Major factors intervening students' attempts to achieve academic success

Factors	Number	%
1. Lack of enough self-study time due to random and scattered distributions of periods	87	58
2. Absence of tutorial support	82	54.7
3. Lack of information on how to study in a university	79	52.7
4. Due to inadequate guidance and counseling support	71	47.3
5. Lack of regular study habits	70	46.7
6. Absence of instructors advice and follow-up	68	45.3
7a. Absence of professional and sufficient Library services	67	44.7
7b. Absence of updating reserved academic materials in the periodical section	67	44.7
7c. Some instructors repeated class missing	67	44.7
8. Dorm-mates' and/or classmates' pressurize me not to study	58	38.7
9. Failure to quickly adapt to the new academic environment	50	33.3
10. Absence of interactive teaching practices	47	31.3
11. Being assigned in a department I didn't expect to study	35	23.3

12. Insufficient classroom opportunities to express own ideas	33	22
13. My own poor classroom attendance	17	11.3

Table 4 demonstrates that the most powerful intervening factors that hinder the students' effort to meet their academic expectations to achieve better score is lack of enough study time. More than half, which is 58%, of the respondents proved this issue as the most serious factor. The second challenging problem as reported by the informants is the absence of tutorial support to the students. Nearly 55% of the respondents claimed this issue as the factor that constraints their university academic performance efforts. The third equally influential case is that about 53% of the students confirmed that they lack information on how to study in a university. Stated differently, it would highly likely that many students were challenged to succeed in their academics due to the fact that they did not get enough self-study time, tutorial support and information on how to study in a university.

Seventy-one (71) out of 150 respondents complained that they lack adequate guidance and counseling support, whereas seventy (70) respondents seemingly substantiated that they failed to meet their academic expectations due to lack of regular study habits. It would mean that students might not develop a regular and programmed study practices. Much more related to those points is that sixty-eight students (45.3%) indicated that the absence of instructors' advice and follow-up was one of the constraints that restricted their attempts to achieve their university expectations and academic success.

Significantly, the same number of students, closely 45%, rated three constraints, namely absence of qualified and sufficient library consultants, absence of updating reserved academic materials in the periodical section and some instructors repeated class missing as potential and challenging cases impeding their efforts to meet their university expectations and achievements.

38.7% of the respondents addressed that their dorm-mates' and/or classmates' discouraged them when they wanted to study, while 33.3% reported that they suffered hard in their attempts to quickly adapt to the new academic environment. On the other hand, a total of about 76.6% of the respondents complained that problems that were possibly linked to the institution including absence of interactive teaching practices, compulsory departmental placement and lack of sufficient classroom opportunities to express own ideas were reportedly potential barriers to achieve their

expected academic success. However, 11.3% of the respondents admitted their own repeated class missing contributed to their failure to meet their academic expectations.

It follows that university learning requires a clearly set system of studying habits. Unless students are well-oriented about the how, when and where to study, they may achieve little academic success in a random and unplanned study habits. Students may develop the habit of studying their notes or reading materials in a library, dorm or somewhere else just when the actual exam time is closer. Yet, Weiten and Lloyd (2007) point out that students could experience regular academic achievements when they develop a stable and time-tabled study habits in the process of learning.

Moreover, Weiten and Lloyd (2007) also note that students who miss classes repeatedly are likely to score poor grades. They, for example, illustrate the consequence of poor class attendance by citing the research findings conducted by Lindgren (1969). It has been documented that many of the students who scored "grade average of C or below," were students who had poor class attendance, whereas most of the students who were successful, that is, those who achieved "grade average of B or above," were found to be students who respect their class attendances.

Results of Focused Group Discussion (FGD)

The result of the FGD repeats the issue that many students had little secured regular and self-study time. Most of the daily classes' were tight and unevenly distributed in all the learning days. Even worse is that there were occasions in which students were demanded to attend classes at weekends. It has been found that though the rate of differences in having classes on Saturday's and Sunday's varies from faculty to faculty, there has been greater pressure on the natural science students' self-study time. The result of the students' responses to the questionnaires also confirmed that students were under great pressure to attend classes throughout the school days.

Outstandingly, it has also been found that there exists ethno-linguistic and/or religious affiliation groupings formed by some university students. Though such groupings appear more of elusive, the members do have a hidden talk-time and talk-zone where they usually discuss how to help each other especially during exam times. What is more surprising is that cheating during exam time in order to benefit any member of the group does have even little shame on anyone of the partners in the group. Quite shockingly, the 'actor' or 'actress' involved in such situation became saluted as 'a life-safer' and so praised that every member was so eager to learn from his or her lessons.

In addition, it would seem highly likely that some students develop the misconception that passing the Ethiopian Secondary School Leaving Certificate (GESLCE) and joining a university guarantees their ability and potential to easily handle university academic practices. Yet, they faced tough and more challenging learning tasks and activities and so, they could develop academic anxiety and stress.

As to the FGD findings, some groups of students rather thought that they have had the right to getting a passing mark or grade (i.e. '**C'**). It is with no surprise that students who had such perspectives may have blocked their academic expectations. Tragically, such students' academic expectations could possibly be inadequate and they became reluctant to study due to that they felt that they owned the right to earn a survival grade.

4. Conclusion

This study was designed to analyze the relationship between students' prior university prospects and their actual university academic achievements. It was meant to determine whether the relationship between students' prior university prospects and their actual university academic achievements is statistically significant or not. The results reveal that students' prior university academic prospects and their actual university academic achievements are strongly correlated constructs.

There is statistically significant relationship between students' prior university expectations and their actual academic achievements. Results confirm that students' prior university prospects determine their academic success or failure in their university study. Those with strong and positive prospects are more likely to be higher achievers compared to those with low or no prior university education academic expectations.

Most notably, students with little or no awareness about university academic requirements, study habits, strategies, learning behaviors, and those who are already low performers in their previous school experiences could be highly vulnerable to academic failure and even drop outs. It can, therefore, be concluded that students' earlier university prospects or academic expectations are found to have big impact on new entry students' academic behaviours. Universities should be proactive to minimize the potential discrepancies between students' earlier university prospects or expectations and their actual university academic requirements. It has been suggested that as

students' prior university prospects are found to be one of the potential predictor of students' university academic success, universities need to prepare awareness raising and consultancy programs focusing on university academic practices, requirements, study habits and strategies. More importantly, there should be an official office working on student university life, study habits, and academic success strategies.

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Declaration of competing interest

The authors declare that there is no conflict of interest in this study.

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The Principals' Professional Leadership Roles in Managing the Teachers Professional Development: the Case of Addis Ababa Senior Secondary schools

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Abstract

The purpose of this research was to explore how principals play the expected professional leadership roles in managing teachers' professional development practices in the secondary schools in Addis Ababa. For the purpose, a qualitative case study was conducted in four purposefully selected senior secondary schools. Qualitative data obtained from the semi-interview were analysed and coded thematically. Thematic analyses were conducted on the data using narrative accounts. Even though there was not a significant problem in both principals' and teachers' perception of the importance of Continuous Professional Development (CPD), findings suggested that principals did not play professional leadership role in managing the CPD. To this end, the implementation of teachers' professional development was handicapped due to several challenges such as lack of inadequate professional motivation and support, too much paperwork and poor time management, lack of incentive, monitoring, and evaluation system. Thus, it was concluded that the professional leadership roles played by principals have not been satisfactorily managed and contributed to the effective implementation of teachers' professional development to enhance sustainable quality of education. The study recommends reframing the continuous professional development guideline to create accountability so that principals can develop practical competence to respond to the dynamics of CPD in a period of educational reform and transformation to influence teachers' attitudes and commitment to their profession. This study can be utilized as a direction to actualize viable CPD and can be taken as a guideline in making strides in the professional development of educational leaders.

Key Words: principals' professional leadership role, quality of education, the teacher professional development, collaborative culture

1. Introduction

Professional development in the 21st century equips teachers with the tools and skills to meet the needs of their students and keep in stride with changing educational tendencies. A reflective practice is essential to identify areas of strength and areas that need to care for development. Continuous Professional Development (CPD) has become a crucial aspect of maintaining quality standards due to, among others, the ever-changing market demands, mobility of communities, the booming trend of science and technology, internationalization, and increasing emphasis on academic freedom and accountability. The purpose of managing CPD is to uncover that change is troublesome without changing teachers' attitudes to meet the ever-evolving prerequisites for the delivery of quality instruction. A study by Haycock (1998) also found that low-achieving students increased their level of accomplishment by as much as 53 percent when instructed by a highly effective teacher.

Additionally, professional learning openings are best when they meet the desires of the individual teacher. This researcher in this study argues that principals can create overseeing aptitudes, skills and play role model leadership parts when they are given sound professional support and advancement programs. CPD does not just happen by mere chance: it needs to be managed and properly driven, and done so viably in a bid to ensure that it incorporates a positive effect and represents great value for money. An investigation by Hawk et al. (2003) on teachers' attitudes to CPD found that the status, knowledge, and approach of the CPD coordinators (and the administration group or senior administration group more for the most part) may drastically influence, emphatically, or on the contrary, staff attitudes and understandings towards CPD. The research findings indicate that principals can play an important role in school improvement (Louis et al., 2010; Le Floch et al., 2014). The evidence from the study has also confirmed a direct impact of the school principal's role in teachers' professional development (Chalikias et al., 2020). Although the role of principal leadership in managing teachers' professional leadership is significant, little attention has been paid to understanding this role in supporting and sustaining teachers' effective professional development.

The Standards in Education mentioned by the MoE of Ethiopia (2013) indicate that teachers, line managers, and CPD coordinators rarely assembled an array of CPD activities to form a coherent individual training plan. The research findings also indicate that strong school leadership is

associated with higher levels of student academic performance. The evidence from the study has confirmed a direct impact of the school's principal role in CPD (Chalikias et al., 2020).

A national learning assessment is carried out once every four years to check the relevance and learning outcomes of students. The result analysis at the national level this year shows that the average of students' scores in grades 10 and 12 are below the standard. Students' learning outcomes scored 50% and above are very low showing an average for grades 10 and 12 averaging 9.1% and 26.6% respectively, which is highly below expectation. Though scores at both grade levels are significantly low, the problem is most acute at grade 10 compared to that of grade 12. The result has exhibited a fluctuation in low performance as the years increase. In the empirical study carried out by the Ministry of Education, most of the research participants (stakeholders of education) believe that the majority of secondary and preparatory students do not have the expected knowledge, attitudes, and skills. Besides, students are viewed with the lack of the required competence and skills to join the world of work upon completion of grade 12 (MoE, 2019:25).

Recently, considerable attention has been paid to examining the role of school leaders in managing teachers' professional improvement. For instance, a study conducted by Ávalos-Bevan & Flores (2021) in Portugal taking 234 teachers in center, schools as inputs shows that teachers had the foremost vital importance of collaboration when they saw professional development support and encouragement from their principals. The principals support ceaseless professional development and are overpowered by the subject they taught as confirmed in an evaluation conducted by Chalikias et al. (2020) in five secondary schools in Ireland. They think about a bottom-up approach, engaged well, and the school principals trusted the teachers.

As elucidated by numerous local studies, principals' poor performance is responsible for the lagging behind of teachers advancement in their professional development and its viability on schools is attributable to factors such as lack of systematic coordination, shortage of reliable support, absence of monitoring and evaluation, lack of knowledge and expertise as well as budget constraints, which hinder the proper running of the major school administration related aspects (Alemayehu, 2011; Ashebir, 2014; Berhanu, 2019; Tamiru, 2019 and GezuUrgessa; 2012). Besides, they did not get to the heart of why principals do or don't play their professional leadership role in managing teachers' professional development in accordance with the existing

framework (MoE, 2009) and national professional standards for principals (MoE, 2013). There is, moreover, an assortment of leadership literature, a few of which bargain, particularly with professional development, in spite of the fact that there's a 'scarcity of leadership studies' which tie these together (Cordingley et al., 2015: 9).

In addition, a literature overview of other inquiries shows that a few targets for surveying persistent professional development practices and challenges in primary schools are found in Addis Ababa and elsewhere out of Addis (Daniel et al, 2013), Jimma Zone (Ewunetu and Firdisa, 2010), Amhara region (Tadele, 2013), and 16 primary and 3 secondary schools of Harari region (Koye, et al, 2015). However, these previous researchers did not conduct a study exploring the role of the principals in managing continuous professional development in high schools in the Addis Ababa City Administration. Besides, no empirical investigation was conducted on the side of the principal's professional leadership role in overseeing teacher professional development, especially in association with literature and practice, as well. Hence, what makes this research different from the past ones are the professional obligation and the duty of principals in managing CPD in secondary schools of Addis Ababa government schools that are evaluated.

Besides, the study findings could help principals and other school leaders in reflecting on their roles in managing professional development practices. On the whole, numerous things have been inspected so as to bridge the existing knowledge and practical gap and fill written and commonsense breaches through the efficient and intensive examination of the issue under discourse in the study area. The main purpose of this study, therefore, was to explore the roles principal professional leadership does play in managing continuous teachers' professional development. The following questions were outlined to guide the study:

- How do principals play the professional leadership role in managing teachers' professional development?
- What are the main challenges faced by high school principals in managing continuous professional development (CPD) programs in schools?

2. Research Methodology

The major concern of this study was to explore the professional leadership roles played by principals in managing the effective implementation of teachers' continuous professional

development. Thus, qualitative research approach was considered to be appropriate to emphasize on what actually happened in the overall process of development. This method considered and assented as the best method for deeper understanding of any concerned gap as well as elucidated more tracts to know what should have been done for a fruitful consequence of any subject or gap (Creswell, 2007). According to Lankshear and Knobel (2004:68), one of the major reasons for the improvement of a qualitative approach is that researcher's regular attempt to get the world from the point of view of other individuals.

Data Collection and Analysis

Interviews and document were utilized as the information collection strategies in this study. Semi-structured interview were conducted with the principals, supervisors and teachers. Besides, archives like the teachers' portfolio and inside school evaluation, outside school evaluation reports, checklists, yearly plans and records of minutes of gatherings from each school were duly used. The information taken from differing sources were analyzed in terms of designs and patterns that had been developed on CPD in Addis Ababa. All reactions were translated verbatim and were coded to recognize developing subjects, the distinguishing proof of which was guided by a practical approach, taking the theoretical and conceptual framework and the research focus into consideration (Patton, 2002; Saldaña, 2013).

As the survey continued, further categories and new codes were created or existing codes were refined to reflect developing subjects. To guarantee the legitimacy of the investigation, coding in all steps was attempted freely and the information obtained were analyzed in three stages: open coding, axial coding, and selective coding. Moreover, the information was broken down into distinct parts and after that combined in other ways from the beginning up until the last stages. From that point, they were chosen and organized into center categories, which were at that point organized into topics and sub-topics that had sharpened understanding and empowered interpretation.

A narrative analysis was also utilized wherein the participants' reactions and experiences were translated. The principals' narratives displayed during the individual interviews were reformulated in a way that held their voices (Gritty & Cronin, 2018). In other words, principals' stories were synthesized to supply an all-encompassing see their reactions to particular questions.

In keeping with the story investigation, the analyst tried to put himself in the participants' shoes and attempted to see the world from the standpoint of them as well.

3. Results and Discussion

The participants from all the groups, that is, teachers, principals and supervisors concerning the role and the value and the importance of teachers' continuous professional development which is believed to help come up with significant gains. Specifically, the views of Teachers A, B and E concerning what CPD is, are stated verbatim below.

Teacher "A" explained:

> *The idea of equipping and empowering teachers sounds good in theory, but in our specific situation, it feels like a burden without providing any new information or additional knowledge.*

Similarly, teacher "D" mentioned:

> *Teachers' professional development is a never ending cycle of learning that begins with initial training and continues as long as teachers remain in the teaching profession. It is whereby teachers attend workshops for development and seminars and also where they upgrade their profession in principle. However, the implementation is not as expected because of many reasons.*

Teacher "B" added an important dimension to the discussion by clarifying that the development the teacher acquires is irrelevant to the actual teaching and learning environment. He stated that the focus of professional development should promote effective teaching and learning that would enhance students' achievement. In his own unedited words, he stated:

> *It is the development of a teacher within a professional environment, e.g. how to behave, what pedagogical skills are needed to do certain tasks, etc. However, we are not practicing it inline because the topics of CPD not based on our needs they are cascaded and imposed from top to bottom without our needs and interest, we didn't practice.*

As expressed by both Teacher "A" and "B", professional development is not a progressing process of reflection and review executed by improving the plan that meets corporate, departmental and personal needs, the learning prepare of self-development driving to individual development as well as development of knowledge and skills that encourage education. This

suggests CPD in all the activities in which teachers include during the course of a career which are planned to upgrade their work.

The participants' views on the issue of the perception on the implementation of CPD is summarized as follows:

> *It is an ongoing developmental process whereby teachers themselves identify their weaknesses and strengths. They capitalize on it for proper development needed by each teacher. However, in our case we were not lucky to employ teacher driven needs assessment to practice professional development; rather, it was cascading from the education bureau through sub-cities and influenced by principals to accept it as it is. Besides, the identified and cascaded needs are not focusing on deepening our content knowledge we have been taught, and pedagogical skills we have been using the methodology and the assessment that our ties to measure our teaching progress for feedback. Therefore, we are practicing for the sake of paperwork and report consumption, not for practical means for change.*

Furthermore, teacher "E" said,

"….Instead, implementation of CPD is simply paper work copied from one another or last year portfolio document is copied to fulfill the requirement of performance evaluation and career promotion."

Principals A, B, and supervisors C & D also concurred with Teachers D and E as follows:

> *It is a continuous process whereby teachers are overhauling themselves by means of attending workshops and sharing data with peers about the course work and the teaching methods. In any case, we don't have the opportunity to choose our own content and process the wants for the execution of CPD. As principals, we don't distinguish teachers' staff development needs. Indeed, the teacher's role in choosing what his own learning needs could be is more limited. In such a way determining and making a difference in individual teacher needs learning and developing the profession as basically outside of our obligations to us. We drilled the cascaded needs from the instruction bureau through the sub-city and were affected by specialists from sub-city workplaces to acknowledge it because it was. Of the three needs of teachers to practice, one of their claims and the rest two cascaded from the best and demonstrate their zones of requirements. We also see their problems through general quality management program processes.*

Leaders and supervisors have also perceived CPD as a burden imposed and a lot of paper work without adding value for principals, supervisors and teachers' ability and students learning and learning outcomes. Decisions about professional development needs are not based on both by

teams and by individual teachers. The informants from teachers clearly indicated that the needs for implementation of the CPD were decided by education bureau, sub-city education office and the school management, albeit without consultation with staff and alignment of its development with the vision and mission of the school. Regarding the words and phrases, nevertheless, at the end they portrayed common understanding. The result confirmed by the other research conducted by Haramaya University cited in MoE (2009). The study revealed that in nearly four out of five schools, the practice of continuous professional development is either absent or inadequate. To the extent that the principal, in particular, fails to well discharge these roles, even well-designed professional learning programs cannot succeed (Sparks, 2002). This agrees with the Fullan's assumption (1991:315). In agreeing with the participant, Fullan seems to argue by stating:

> Nothing has guaranteed so much and has been so frustratingly inefficient as the thousands of workshops and conferences that have driven no noteworthy change in improving when the teacher shouts and returned to lack students in learning their classrooms.

The same disappointment is seen in the inquiry about the professional development of teachers in developing nations (Motala and Pampallis, 2020:23). These scholars agree that management of professional development in the education sector is ineffective and needs urgent attention.

The result shows that the support, which was provided by principals and supervisors for effective implementation of CPD, was insufficient and insignificant. While regarding support in implementation of CPD, one of the teacher participants - D- during the focus group discussion reflected that:

> *We know that we are anticipated to attempt CPD exercises in our school. I have no complaint about that. But, how could we viably actualize it in a circumstance where there's no visit and feasible support with motivations, follow-up and opportune criticism from the relevant authorities just like the principal and vice principals in charge of coordinating and managing CPD?*

However, participant principal "A" expressed the following in his interview:-

> *As a principal, I have failed to fulfill these professional leadership responsibilities in helping teachers, enabling teachers through workshops, practicing need assessment and generating income to encourage by providing incentives to encourage teachers during CPD implementation. This was because we didn't have opportunities to request a budget from the government and NGOs were also not interested to support CPD training and*

> *implementation. Our priority agenda has been equipping schools with educational materials and keeping the school peaceful and the safety of students as well.*

Principal "B" indicated that teachers need feedback from their superiors. He expressed what he feels as follows:-

> *Teacher continuous professional development is nothing but the development of teachers. As a principal, I couldn't give support through monitoring and feedback to teachers, and I didn't take that as development. I give them that information to develop the whole staff. Development is in many ways…. Permanently, I delegate vice-principals to most of the duties of teachers' professional development. You know, as principals, we are always busy with academics and political cases.*

This suggests that the culture of support to the school community by the leadership is yet to be developed. Lack of support and follow-up by principals and supervisors, absence of fertile ground to follow up and support targeting at meaningfully monitoring the program, the absence of sustained supervision and feedback provisions are trying factors not to sustain the implementation of continuous professional development.

Teachers' reporting progress is not being monitored in a systematic or consistent manner. In schools, this is an area that management overlooks. At the school level, there is no good planning for CPD and it is not incorporated with strategic and annual planning of the goals, activities and programs. School administration does not set aside time for these activities, and school principals, as the driving force in their schools, do not ensure that teachers participate in CPD programs or have the ability to do so.

Regarding the aforementioned point, principal "C" said: -

> *"My main concern or duty is to manage the staff I am leading, not CPD. It is not part of my job description. Each educator should manage his/her own CPD activities. We all have our CPD to manage. In fact, what is that?"*

The principal's response suggests a lack of awareness or understanding of the concept of CPD (Continuing Professional Development) and its importance within the education field.

The principal's statement that CPD is not part of their job description and that each educator should manage their own CPD activities shows a lack of accountability and leadership in promoting professional growth and development among their staff. The principal's primary

concern being managing the staff they are leading rather than CPD indicates a narrow focus on immediate day-to-day operations rather than the long-term growth and success of their educators.

This mindset downplays the significance of ongoing professional development and its potential impact on teacher effectiveness, student outcomes, and overall school improvement.

The principal's question of "what is that?" regarding CPD further demonstrates a lack of awareness and engagement with the concept. This lack of knowledge might hinder the principal's ability to effectively support their staff in their professional growth and could perpetuate a culture of stagnant teaching practices.

This response raises concerns about the principal's leadership style and their commitment to fostering a culture of growth and learning within the school community.

Overall, the principal's response suggests a disregard for the importance of CPD and a lack of dedication to promoting continuous improvement among their staff.

In the same vein supervisor "A" elaborates the above issue as follows:

> *Principal's delegation is not with intent of developing and empowering the subordinates rather disregard that the benefit of professional development for quality of teachers. Teachers are responsible for CPD practices based on the cascaded and the needs identified. The role and responsibility about leading and managing CPD is not properly incorporated in our guideline.*

This implies that principals are not discharging their official duty regarding the professional leadership role. This also indicates that principals are not in the line of supporting teaching staff in planning and implementing research-based professional development. Besides, CPD is not the duty and responsibility of supervisors to influence the proper implementation CPD.

Regarding this, Teacher "D" added:

> *Content training is needed in our phase more especially for teachers; my principal has never arranged any workshops for us. Does he know that he has a responsibility to develop us? Maybe he can try to assist in intermediate and senior phases; with the foundation phase, he is clueless. My principal must enroll and study the education management and leadership degree that I have done. I will tell him to know that he is responsible for my development. In practice, CPD is not an agenda for our leaders, particularly to the principal.*

This indicates that school principals have not discharged the expected responsibilities as a professional leader in enhancing the proper implementation of continuous professional development programs. The role of receiving adequate supervision, monitoring and support from various bodies are of paramount importance for the success of any education-related change agendas such as CPD. With regard to support in implementation of CPD, teacher "D" said the following:

> *We know that we are expected to undertake CPD activities in our school. I have no objection to that. But, how could we effectively implement it in a situation where there is no regular, frequent and sustainable support with incentives, follow-up and timely feedback from the relevant authorities like principal and vice principals that are in charge of coordinating and managing CPD.*

This suggests that the leaders did not feel that their enhanced knowledge as a result of professional development enabled them to provide more informed support with incentives as intended (MoE,2009) that ensure that the institution/department/faculty produces an Annual CPD Plan and manages the budget. Teachers, on the other hand, positioned themselves as recipients of assistance. Officers involved in the program's coordination, do not have a good understanding of CPD and its prospective implementation tactics, according to an assessment of teachers' perspectives. This circumstance appears to have resulted in a lack of comprehension among the teachers who are the primary targets of the CPD program (Daniel et al, 2013). Because of their lack of knowledge, these officers and school administrators were less willing and capable of supporting CPD efforts in their individual offices and schools.

The results, thus, obtained are compatible with studies conducted by (Çalık & Şehitoğlu, 2006; Ekinci, 2010). It has been shown that school principals do not adequately support the professional development of teachers. This finding is significantly related to the contents of the works of literature taken (Hallinger, 2003; Louis et al., 2009) and has linked the work of principals to teachers' practices. Several researchers Ashebir (2014), Alemayehu (2011), Gosa (2012) and Fatih, M. (2020) stated that lack of support from principals and supervisors, lack of organizing educational activities outside the training period, lack of trained facilitators, insufficient allocation of budget, the absence of systematic follow-up and evaluation were the major hindering factors of CPD program implementation.

School leaders should be well mindful of activities that make them role models of professional development. Principals can be displayed through intelligent practices, continuous learning, advanced checking, and being open with staff regarding individual development. This indicates that principals are not role models in supporting staff in planning and implementing research-based professional development. This view is not in harmony with the argument of Koyeetal (2013) who emphasized that:

> "Principals shall be modeled to their teachers so that it will be easy for them to monitor their teachers. Otherwise, teachers may assume that CPD is a burden laid on them rather than a professional improvement opportunity (pp. 60)".

Flawed understanding, lack of training, and documents related to CPD among teachers and educational administrators, according to a study conducted by Daniel et al (2013), were uncovered to be one of the challenges among the studied schools.

According to supervisor participants (A, B, and C):

> *The principals are not very actively involved in planning the meetings and professional development presentations. They confirmed that they are not "absolutely" taking a strong role in presenting information to the staff. They further said "they have to model what you expect." They said the program would not be effective if they principals were observer rather than active participants.*

On the other hand, the interviewed school principal "D" indicated that:

> *A lack of tailored capacity-building initiatives such as timely training and experience sharing, targeting them and supervisors has resulted in their low ability to lead, supervise and coordinate CPD activities in their respective schools. Had they been adequately equipped about CPD, they added, they would have been in a position to clarify and persuade teachers about the basics and the merits of CPD. The same participants further complained that their inability to get access to various CPD-related policy documents, guidelines and manuals clearly issued by MoE and the regional education bureau are among the problems they are facing in this regard.*

The school principals suggested that giving personal advice and supervision to manage CPD programs effectively is necessary. This is relevant because they must lead by example and are considered parents for the students at the schools.

In terms of leadership by example, teachers who participated in the focus group discussion unanimously elaborated:

> *Principals can be role models of professional development through continuous learning, acquiring new knowledge, sharing knowledge, and supporting teachers to acquire new knowledge. They have to show us the example first. So the leadership must be by example. We give good examples to the surrounding people so the changes can be quickly learned. In practice, our principals are not the role model to inspire us towards the implementation of CPD in our school.*

The result of the study indicated that the professional leadership principals played very minimal role in discharging and managing their duties and responsibilities in teachers' professional development. This includes lack of modeling high standards of performance, poor development, and collaborative culture through professional learning among teachers, lack of action aiming at empowering and supporting individuals and teams as well as the absence of monitoring the implementation of continuous professional development. One of the most important obligations of a principal is to supply continuity and collaborative teacher support. Principals must gradually develop these connections, whereas taking the time to urge to know each teacher's qualities and shortcomings.

In light of the above, teacher "D" added:

> *Not surprisingly, the greatest barrier to practice professional development in fragile contexts is the difficult conditions in which we are working. The low remuneration, overcrowded classrooms, lack of respect and trust of our school leaders and status of teachers, community members, violence from school, the existence of too many needy students, and lack of teaching and learning materials are highly attributing to such a difficult working condition.*

During this interview, the researcher observed the cold facial expression of Principal "D" while mentioning the issue of the interference of the political influence in the management of the school. He said:

> *"Teachers' attitude towards this profession is negative. Teachers want to earn money, but they don't want to work for it. Thus, teachers do not want to listen to our orders."*

By and large, it seems that there is a lack of systems and incentives to help teachers improve their practice. Members we contacted and school directors alike raised the need for a satisfactory

budget to organize programs in the schools and lack of city-level arrangements of trainings and workshops are regarded as genuine problems. In supporting this, Desalegn (2010) says, "inadequacy of resource is the main challenge of CPD implementation." Other researchers have also exhibited the same findings (Ashebir, 2014; Daniel et al, 2013). The following themes emerged during the analysis of the participants' interviews conducted in this study

Theme1: Teachers' Motivation in Managing Teachers' Professional Development

Motivation driven by principals can have a positive impact on teachers. Motivation is a force that can be viewed as a generator of energy to ignite behavior; it gives direction to behavior and underlines the tendency for positive behavior to persist, even in the face of difficulties (Bipath, 2008:79). Furthermore, the principals are expected to identify and prioritize professional development needs systematically and implement learning and development needs in line with organizational requirements (MoE, 2013). Principal "C" agreed with this by saying:

> *By acknowledging, motivating and respecting teachers and understanding that we are all unique. Teamwork also helps us to understand each other's strengths. For now, I am still struggling to win the teachers. They tell me straight that they are exiting the system, so they are waiting for their day. This is because they are not satisfied with the job.*

The above excerpt highlights the uniqueness of every teacher and the fact that a one-size-fits-all form of motivation would not inspire and ignite the energy of all teachers in the same way. If teachers do not understand the way subject teachers facilitate, then they can indicate how they want to be trained and implement CPD for the improvement of teaching and learning. Some teachers are moved by intrinsic motivation while others prefer extrinsic motivation. Ingersoll, R. M., Merrill, L., & May, H. (2014) has noted that some teachers left the teaching profession for various reasons such as a lack of job satisfaction or a desire to pursue a better job, a lack of support from the school administration, student discipline problems and a lack of teacher influence over decision-making.

Teacher-E strongly complained about a lack of leadership motivational skills that led to poor performance of the school in the following manner:

> *I will be frank with you, lady … this school doesn't have leadership. Our leader does not have the interest of this school at heart in playing a motivational role in supporting us. Leadership skills in motivating teachers are needed. The teacher remains with little*

> *information and poor delivery in the class because we don't get psychological motivation and pedagogical development. If there is no development of teachers in professional competencies and skills, therefore being identified as an underperforming school suit us? However, strong leadership teams enable teachers to work with their peers and focus on improvement rather than evaluation. When teachers work together in teams, they coach each other, learn from one another, and become experts in specific areas.*

Motivation is crucial for improving administrative and educational settings. In the current educational landscape, principals must be present for students, teachers, and community members. As leaders, principals are responsible for using psychological and motivational strategies to actively engage in the system and enhance learning and teaching.

Theme 2: Challenges in Encountered Managing CPD in Supporting Technology

It also emerged that the introduction of ICT in schools was not supported by the old teachers, which led to a drop in performance in some classes. The challenge of digital literacy does not only affect learners, but it also affects teachers as seen in the response below from school head D, which echoed the sentiments of Teacher B on this matter:

Most teachers here are old to attend workshops. They don't want to come back and give feedback as well. Most teachers that were born before computers are challenged by this world we are moving in. Most teachers in the foundation phase want to resign because they do not have computer skills.

Principal "D" explained this as follows,

> *I have two different types of teachers in my staff, experienced teachers with quite a number of years being in the system and a number of years teaching in one school. Others are new teachers and young. Old teachers don't like the introduction of ICT in the school. Those teachers are hindering improvements concerning learners' performance. There are school teachers who still prefer using pen and paper only in their work. The number of tech-savvy generation of teachers who tend to use social media and the Internet, is so limited. Because the world has changed so much, the old batch of school teachers must adapt to the changes. The young teachers get ICT interesting and learners also love using these devices. Now there are signs of development in the other phase…… but on the other side there is still backwardness highly visible in schools.*

Based on the views of participants expressed above, complex challenges that are either positive or negative with regard to CPD have been identified. Participants viewed the introduction of ICT

in schools and its implementation in classrooms as demoralizing. Some teachers in these schools who were digitally-challenged viewed resignation as a preference to escape this challenging barrier.

Teachers in the intermediate and senior phases seem to be good implements of ICT, which is yielding good results for learners. A lack of accountability in School 'D' is a challenge that was mentioned by different participants in this school. Teacher resistance and a lack of interest in improving the culture of teaching and learning have a negative impact on learner performance.

Document Analysis

Interviews and portfolios of participants were the major sources of information. As a result of qualitative information and analysis, the study has produced a few discoveries related to the role of principals in managing the implementation of portfolios as a professional development/learning device for teachers and they were overseen by school pioneers. One of the critical roles was the documentation of teachers' learning over a period of time, which is generally not recorded by the teachers. The method is not also checked and assessed by principals to move forward teachers in ceaseless reflection of their convictions and practices. This ceaseless reflection provides opportunities for teachers to memorize from their claim encounters and build their information and understanding. They disregard the significance of the working environment, and learning, through reflection. With respect to this same CPD framework, MoE, (2009) states that school leaders are responsible to ensure that the institution/department produces an Annual CPD Plan and manages the budget and regularly monitors the effectiveness of the changes in the teaching and learning process.

The portfolio is not well compiled; documents were inadequately prepared because of lack of information about the format and the purpose of the portfolio. Teachers copied one from the other by simply inserting their names without discussion and understanding. Similarly, some of the portfolio documents were copied from the previous year's portfolio. Thus, using school-based continuous professional development as an instrument for upgrading and updating was given less consideration.

Here it was clearly understood that principals were not in line with practicing professional leadership roles. Basically, it should be noted that managing CPD is enhancing the

implementation of CPD itself through developing the commitment of teachers by monitoring and assessing the content of individual Professional Portfolios and giving constructive feedback.

5. Conclusion

The outcomes of this investigation have shown that participants from all the groups, (i.e from teachers, principals and supervisors) have provided the research with unanimous insights regarding the necessity of CPD as they genuinely responded to the critical questions concerning their perceptions about CPD. This indicates that principals and teachers in sample schools had almost similar positive perceptions of the importance of teachers' continuous professional development. However, these participants emphasized that CPD is a burden imposed by top officials without teachers' and principals' need based topics rather cascaded from concepts which were not related to the subject matter they teach, the pedagogic skills which play a major role in empowering teachers using different strategies to improve learning and learning outcomes. Thus, CPD is a vital process that benefits the teachers and students as well.

As learnt from the results, one of the major roles of school principals in the area of teacher professional development is making teachers capable of effectively discharging their responsibilities to produce productive citizens in delivering quality education. However, it was practiced insignificantly and was not playing the professional leadership role in building capacity among staff towards creating, nurturing, and maintaining over time to enable teachers to have a self-renewing culture and authentic learning community. The research result also indicates that principals and supervisors were not role models in practicing the professional development. Thus, it can be concluded that the implementation process might have been negatively affected because of unsatisfactory professional supports from school leadership and supervisors. There was a failure in arranging training programs, intra- and inter-group discussion forums and arranging for scaling up best practices.

As mentioned earlier, logically and in reality, teaching is a long-lasting process and hence principals ought to be at the cutting edge of learning and should be exemplary for the academic staff in general. Teacher respondents explained that successful principals demonstrated teaching practices in classrooms in which collaboration with principals expanded teacher inspiration, adequacy, intelligence practices, and directions development. Notably, the principals show without proficient administration in past work, our impacts were not about as solid as when we

included them. In this way, we conclude that the leadership roles played by principals have not contributed to the effective implementation of teachers' professional development to enhance the sustainable quality of education. Moreover, the study is concluded that CPD was not even satisfactorily managed in teachers' "professional practices", which specifically influence students' accomplishment emphatically.

For further research, it is better to focus on replicating and extending these findings with different populations of schools, teachers, and students. Better to conduct the studies using mixed approach and its relation to school effectiveness in order to come up with evidence that might give policy direction about managing CPD in Ethiopia, so as to ensure wider scope and the ability to generalize and use the findings of this research.

These findings have implications for understanding and exhibiting the implications of practitioners amongst whom encouraging professional school leaders who focus on instruction in managing and supporting teachers in professional learning communities and their collaborative practices in the complex role of a teacher in the delivery of quality instruction.

6. Recommendations

The fundamental role of the principal leaders is in a supporting teacher change in attitude, understandings, and/or practices are highlighted in this case study. It is advisable and quite useful for professional learning community to shift professional development towards continuous professional development to a more support-based intervention such as modelling, coaching, observations and feedback. These communities create collaboration and joint work with other teachers on concrete assignments and problem-solving styles for supporting teachers' shared help, obligation, activity, and administration. Professional learning communities can be created where teachers can meet frequently, share skills and experiences, and work collaboratively to progress teaching abilities and the scholarly execution of learners. More prominent utilizes of social media should also be energized in this respect. All in all, policymakers should change and reframe the existing persistent professional development guideline in a bid to address the 21st century learning skills and technological advancements.

Declaration of competing interest

The authors declare that there is no conflict of interest in this study

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Roles, Constraints, and Prospects of Scientific Knowledge Transfer at Science Shared Campus: Kotebe University of Education

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Abstract

Scientific knowledge transfer (SKT) across various settings is currently increasing worldwide, though it is little in Ethiopia. The purpose of this study was to identify the existence and magnitude of application of SKT based on the concept of the prevailing linkage between tacit and explicit knowledge transfer provided in the regular mainstream teaching and learning processes. This research is theoretically based upon problem solving and SECI (Socialization, Externalization, Combination, and Internalization) models of knowledge transfer. Different tools for data collection including questionnaire, observation, interview, and document review were employed. Based on lottery method, 114 students and their respective parents out of the total 350 students were involved in the study. The questionnaire data were analyzed using SPSS, and qualitative data were analyzed by verbatim translation and interpretation method. The data were validated by the principals, top scorer students, cluster coordinates, and key informants. As a result, about 56.7% of student respondents, 61.9% of parent respondents, and 50% of teachers indicated that the external knowledge transfer was carried out in the field of natural science through academicians, researchers, and laboratory experts with unreserved effort owing to pay for their effort. The result also shows that concerns on time, scope, language, complexity and strategy were found to be barriers. The identified constraints on SKT are internal factors in the instructors' views like communication problems, language problems, interpretation problems, and technologies and techniques used in the transfer of knowledge. Thus, working with these limitations could improve SKT rate in educational institutions.

Key words: Constraints, Prospects, Knowledge Transfer, Science Shared Campus:

1. Introduction

Equipping students with effective science and technology-based knowledge and skills help them to overcome practical problems encountered in their future workplace. The term knowledge implies the capacity to use information acquired through learning, observing, and practicing to get things done and make decisions (Delong, 2004). It has a similar meaning to the terms "data" and "information", so portraying their variation becomes necessary. Colman (2010) defined it as anything which is or may be known; information and the body of truths or facts accumulated by the man during time passes.

On the other hand, Zaltman (1982) distinguished data and information from knowledge. In a sense, data might involve statistics that can currently be stored and later retrieved in the information technology system (Teresa & Cedric, 2009). But if this statistic has meaning depending on and is specific to one system, it would refer to information (Chini, 2004). Knowledge results from the combination of different pieces of information, including their interpretation and meaning. The process of combining the information has to be seen in the processes of sense-making and sense-giving, where individuals use different frames of reference and thereby develop different perceptions about their surroundings (Chini, 1998). According to Nonaka and Takeuchi (1995), the basic difference between knowledge and information is that knowledge belongs to individuals, whereas information can be independent of people. Contrary to information, knowledge is about actions, beliefs, and commitment, as it is dependent on the perspective or intention of individuals (Andreasian & Andreasian, 2013; Davenport & Prusak, 1998; Huseman & Goodman, 1999; Teresa & Cedric, 2009).

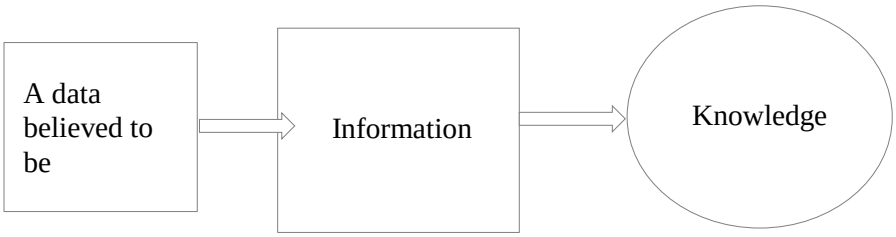

Figure 1.1 data, information and Knowledge linkage (Adapted from Andreas & Roman, 2008)

Knowledge can be alienated into two categories: explicit and tacit. Explicit knowledge is defined by different scholars in different ways. Explicit knowledge is the knowledge that is transferable by the media (Delong, 2004); explicit knowledge is the knowledge that can be consciously identified

(Andreas & Roman, 2008) the knowledge that exists in scientific documents (Roghayeh & Mohammad, 2012). Explicit knowledge is documented, made public, structured, and can be structured and shared through information technology and other means (Ivana & Jaroslav, 2016).

Understandably, thus, those scientific research results, empirical beliefs, opinions, and explanations of experts released in different media, including the internet, are labeled as explicit knowledge. It is knowledge that cannot be transmitted through media (Delong, 2004); knowledge that prevails in people's minds and is usually portrayed through their action and behavior (Roghayeh & Mohammad, 2012). It is knowledge people carry in their minds but are not aware of or cannot access consciously (Andreas& Roman, 2008) while tacit knowledge resides in people's minds, behavior, and perception and evolves from social interactions (Ivana & Jaroslav, 2016). Whether it is explicit or tacit, the process of sharing one's knowledge with others in any organization is understood as knowledge transfer. Both types of knowledge must be diffused because knowledge has a depreciation value if it is not transmitted (Ivana & Jaroslav, 2016). While knowledge might be expensive to generate, it is relatively inexpensive to diffuse it**.**

Knowledge transfer has a multifaceted role in providing relatively sustainable competitive advantages. As a case in point, it helps employees to self-update in parallel with the rapid science and technology progress; to get success in the professional and competitive world economy; to go one step ahead for further invention required for the job; and to be smart in all aspects of the requirements by being full of both practical and intellectual knowledge (Khamaksorn, 2016). If it's so important, the core concern included in the dynamic learning system is that the transfer of knowledge depends on the factors that define how knowledge is to be acquired, in what form, and what knowledge is important for the given organization (Roghayeh & Mohammad, 2012).

This means that there are constraints that hinder the effectiveness of knowledge transfer. Some of these constraints emanate from knowledge transfer or behavior, and others from knowledge lack of absorptive and communication capacity. According to the educational sector, affecting knowledge transfer and externalization depends on time, scope, language, complexity, and strategy. The other factors will determine the effort and resources required for knowledge transfer, and education to improve pedagogical skills, teaching and learning capabilities, and social networks to transfer the knowledge for its successful implementation. The barriers to the transfer of knowledge arise from

many factors, such as communication problems, language problems, interpretation problems, and technologies and techniques that are used in the transfer of knowledge.

There are also institutionalized and technology-oriented limitations, among others. The educational system, constraints vary slightly from those in other productive institutions. According to (Siu Felix L.C. and et al., 2017), the constraints of the KT emanate from three sources: human aspect constraints**,** policy aspect constraints, and technology aspect constraints **(**which include technology, knowledge accessibility, and the nature of knowledge being tacit and explicit). The more points indicated about the policy aspect, the more crucial they are in this research because emphasis is given to the rules and regulations enacted at the school or university levels that determine the transfer level of knowledge.

As to Olomolaiye & Egbu (2013), there is little agreement on a universal context about the classification of knowledge, yet wide consensus abounds that it is myriad and consequential. Colman (2001) classified knowledge into three categories: declarative knowledge, which means knowing what; procedural knowledge, which means knowing how; and acquaintanceship knowledge, which describes things we know unconsciously. According to Love (2016), knowledge is classified into three types: basic science knowledge (knowledge that is related to basic science subjects including math); applied research and development; and practice knowledge. Scientific knowledge is a phrase usually observed in different articles portraying research findings obtained through scientific methodology. This phrase cannot necessarily be applied to the knowledge of pure science fields. Rather, knowledge that is found by way of scientific inquiry can be considered scientific knowledge**.** Babalhavaeji & Jafarzadeh (2011)**,** ascertain the above statement by saying:

> *If experts' beliefs, ideas, experiences, and background information provide the basis for their research and scientific expansions, people's intellectual assets could be introduced as scientific knowledge.*

On the other hand, the knowledge that is acquired in the sciences is also regarded as scientific knowledge Jang & Wagner (2013), Learning science fields requires the coordination of a complex set of cognitive, affective, and motivational strategies and skills in order to acquire and process scientific knowledge. Science teachers and any other interventionist not only need to understand this complex set of methods for obtaining scientific knowledge but also understand where their

students want to go for their future careers in the field of science and technology. When they do so, they can impart scientific knowledge, which allows students to understand the universe, its rules, laws of nature, etc. (Gelena & Andreasian, 2013). STEM has emerged as the best teaching-learning strategy in education that integrates science, technology, engineering, and math to foster students' acquisition of knowledge in science (Sanders, 2009).

The theoretical framework several models of knowledge transfer have been proposed in the literature on education. The ones that are convenient to this study, however, get emphasis and are described as follows. According to Love (1985), Havelock laid the foundations for the current theoretical developments pertaining to KT. These models are subdivided into four main models, such as the research, development, and diffusion (RDD) model; the problem solver model; the linkage model; and the SECI models. The SECI model that has been developed by Nonaka and Takeuchi (1995) remains very essential in this paper because it not only explains the knowledge transfer between teachers and students in formal education but also supports knowledge sharing between students. Each model suggests a somewhat different perspective on the pivotal elements taken into consideration in the KT process. The SECI is a process of knowledge creation on the basis of the distinction between tacit and explicit knowledge (Dahalin & Suebsom, 2010); Gelena & Andreasian (2013).

The model comprises socialization (tacit-to-tacit), externalization (explicit-to-explicit), combination (explicit-to-explicit), and internalization (tacit-to-explicit). On the other side of this study, many aspects are getting specific consideration in order to draw out a conceptual framework. Co-curricular activities foster the actual curriculum-based acquisition of knowledge. So that knowledge is transferred in such a way that students engage in a multitude of co-curricular activities either through interaction or direct action on the tasks required in the activities. Curriculum activities are the basis for building as well as transferring knowledge. Instructional processes are the basis for the task of preparing students to function within a knowledge-based society (Abuhimed, 2015). The conceptual framework for the knowledge transfer process includes extracurricular, external knowledge transfer from others, peer knowledge sharing (students), co-curricular activities, and also curriculum activities (the teaching-learning process).

Beyond teaching-learning activities in the classroom, if favorable conditions exist for experts (from KUE or other sector institutions) to share scientific knowledge with students in their study area, students might use it for their all-round personality development. Unfortunately, there is no such system in the area under study, and that has inspired the researchers to do research on the role, constraints, and prospects of scientific knowledge transfer in the study area. The central point of the research, including this one, would be focusing on how the study undertaken in this area develops mechanisms to minimize the constraints while simultaneously enhancing the role of knowledge transfer. This study was conducted to address the following guiding questions.

1. How are internal (implicit) and external (explicit) SKT processes going on in SSC?
2. What are the roles of scientific knowledge transfer processes for the gifted students of SSC?
3. What are the major constraints and possible solutions to diffusing scientific knowledge in the area under study?
4. What are the mechanisms adapted to be underway in the processes of both explicit and tacit knowledge transfer in the study area?

The study result is hoped to be significant for school administrators who are looking for ways to address the learning styles of gifted students in the school, and who are trying to implement the enhancing and acceleration programs of gifted education. It opens up a strong linkage between SSC and the main campus (KUE) that is needed to work in collaboration to help talented students. It can be exemplary and be the cornerstone for the schooling of talented students in Addis Ababa and somewhere else in the country. Planners, policymakers, and educators whose work is linked to gifted students may use the study results as a reference source. It also opens viable opportunities to researchers dealing with thematic research areas for further research work on knowledge generation, transfer, utilization, and management as well.

2. Research Method

The research approach was a mixed method: qualitative and quantitative. During the analysis and interpretation stages of the research, the qualitative and quantitative findings were integrated and validated in a discussion. This allowed a comprehensive analysis of the intended outcomes for all stakeholders based on the research track. Mixed-method research connects or combines both qualitative and quantitative data to provide a more thorough understanding of a research problem.

It involves philosophical assumptions and the linking of both approaches (Creswell, 2003). When our research analysis uses both qualitative and quantitative approaches, a better understanding of the research problem is obtained than by utilizing either approach alone.

The study was designed to follow the interpretive and constructivist paradigms, which are really suitable for the mixed research methods (quantitative and qualitative) employed in this study. Contrary to experimental studies, descriptive studies may be fruitful for more quantitative data. Thus, a descriptive study was the general framework of this study's research design. Questionnaires, interviews, and observations, which are parts of mixed-method research strategies, were used to gather data. Instead of experimental and exploration methods, simple descriptive analysis was used in this study because the majority of the data were qualitative in nature. Interpretation, direct quote, and insight of the researchers were applied to analyze qualitative data gathered through observation and interviews from different sources.

Data Sources

Descriptive survey research, which determines and reports the way things are and which involves collecting numerical data to address questions about the status of the subject of the research was employed in this study. Numeric data were collected using a questionnaire to provide a quantitative description of the general situation of the roles, constraints, and prospects for the transfer of scientific knowledge. To substantiate the primary data source with the facts available, reviewing documents became essential, and hence policy documents, journals, the annual work plan of the SSC, the yearly work plans of the Research and Development Directorate, and the University-Industry Linkage Directorate, including their reports and minutes, were of the key documents that were reviewed.

In this study, both interviews and questionnaire were used so as to gather relevant data, and key informant interviews were prepared on the basis of close-structured questions. An in-depth interview was conducted face-to-face with the researchers and school principals about the general school structure, processes of teaching and learning, extent of knowledge transfer, and its roles, constraints, and prospects. Key informant interviews were carried out face-to-face with high-scoring students about the problems of knowledge transfer in informal education, the process of

practicing scientific knowledge, the capacity of the science teachers, whether it goes in line with their demand or not.

Table 1.1 participants involved in this study

S. No	Target groups	Methods	Number of participants	Sampling techniques
1	Students & parents	Questionnaire	114	Random/lottery
2	School teachers	questionnaire	20	Quota
3	Student trainees	questionnaire	37	Systematic
4	Top scorer students	Key informant interview	6	Purposive
5	Cluster coordinators	Key informant interview	3	Purposive
6	School principal and V/principals	In-depth interview	3	Purposive
7	Academicians/researchers/ managers	Key informant interview	7	Purposive

I. Questionnaire

Four different types of questionnaires were prepared and administered to students and teachers in the study area. The first three questionnaires were targeted at sample students and their respective parents. The theme of the first questionnaire was the process of internal knowledge transfer. It focused on the process of transferring knowledge from science teachers to students. A few (8 items) fully structured five-point Likert scale questions were prepared on top of how teachers impart content knowledge in or der to address the learning style of gifted students. The second type of questionnaire was prepared to be filled in by a sample of students, aiming at gathering information about whether or not external (tacit) knowledge transfer exists at the school level, including the roles that knowledge transfer played in their academic and behavioral development.

A semi-structured question comprising 15 items was administered to sample student respondents to gather information on the focus points. Both questionnaires were the continuation of field and classroom observation processes being undertaken during the pre-understanding phase. A semi-structured question (encompassing 10 items) was also prepared for sample student parents for triangulation. This question was administered to parents with the consent of the sample students.

The third type of item was a semi-structured question which was distributed to be filled in by those students who engaged in the external knowledge transfer (training) prepared by the British Council on top of "life skill development". The question was purposefully conducted to analyze the effectiveness of knowledge transfer processes. The last semi-structured question was prepared for science subject teachers to gather information about the roles, constraints, and prospects of internal and external knowledge transfer processes. Except for science subject teachers, the rest of the questions were prepared in Amharic, with the aim of minimizing language barriers.

Data collection process

To achieve the research objective, the data were gathered from different stockholders in the study area. The first research target was students. In this study 114 students and their respective parents were selected out of the total target research population of 350. The samples were identified using random lottery. The second research group was the science shared school teachers; 20 teachers out of the 33 total campus teachers were recruited purposively (table 1.2).

Table 1.2 Teachers' profile in SSC

Position	**Number of Instructors persubjects**												**Total**	**Remark**
	Amh	Eng.	Math	Bio.	Phy.	Che.	Geo.	Hist.	Civic	ICT	P. Ed	TD		
Lecturer	3*	2*	3*	4*	3*	3*	1*	*	3*	2*	1*	1*	26	*area of deficit*
Instructor/ Lab. Assis	-	2	-	1	2	-	-	-	-	2	-	-	7	
										Grand Total			33	

In the third targeted group, student trainees were trained in different short-term training. 37 students were selected systematically and requested feedback on the training as well as their challenges. Scientific knowledge transfer does not happen in easy ways in different aspects requested by the questioners. In the fourth and fifth research target groups, purposive sampling techniques were employed to include key informants from SSC and KUE main campus, aiming to reach the exact valuable person from the top scorer students and cluster coordinators. Six and three researchers conducted entirely interviews with key informants of SSC and KUE main campus.

Science teachers in the science fields, top scorer students, school principals and vice principals, experts, academicians, researchers, and managers (from the main campus) were all target groups of this study. Data collected through interviews form administrative bodies, especially the school

principal and vice principal, as well as academicians, researchers, and managers were triangulated and validated in detail (table 1.3).

Table 1.3 Numbers of students in science shared campus through the years.

No	Variables	2016 G.C /2008E.C/			2017 G.C /2009E.C/			2018 G.C /2010E.C/			2019 G.C /2011E.C/			2020G.C /2012E.C/		
	Sex	M	F	Tot.	M	F	Tot.	M	F	Tot.	M	F	Tot.	M	F	Total
1	No of students through the years **(KMU-SSC)**	34	55	89	84	86	170	131	120	251	184	157	341	189	159	348
2	Completed grade 12^{th} on 2011 current student remain,										34	54	88			

Data Analysis

The descriptive statistics analysis was employed in this study mainly to analyze questionnaires. SPSS (Statistical Package for Social Science) version 25 and Microsoft Excel were the two exhaustively used materials to analyze the data. Information from the questionnaires was first entered into the Microsoft Excel database. The Microsoft Excel program was used to immediately allow the user to arrange data individually. Then, the respondents' data were entered into the Microsoft Excel spreadsheets step-by-step, and then migrated into SPSS software. The measurement of the first questionnaire was based on the five-point Likert Scale (ranging from 0 to 4 where 0 is strongly disagree, 1 is disagree, 2 is uncertain, 3 is agree, and 4 is strongly agree).After reliability analysis was made, descriptive analysis was carried out by using means and standard deviation in tabular format. The reliability analysis is important to indicate whether the statements are reliable. The analysis is done based on Cronbach's alpha, which has a formula.

$$\propto = 1 - \frac{kr}{(1 + (k-1)r)}$$

Where k is the number of indicators or number of the items; r is the mean inter-indicator correlation. As described by (Dahalin & Suebsom, 2008), the acceptable value of Inter-rater reliability fits the observation checklist, 0.00 and 1.0. An alpha value above 0.5 is acceptable and below this value should lead to either collecting more data or rethink which variable to be included.

In addition to mean and standard deviation, frequency (count) and percentage were used for the analysis of quantitative data gathered from students, parents, and teachers, as well as multiple response analysis, which is used in this study for analyzing data obtained on the themes of identifying knowledgeable persons, mechanisms of knowledge transfer, and the interest and capacity of knowledge recipients to use or renounce the knowledge.

The transcription, organization and categorization of data obtained via email from key informants of KUE main campus underwent similarly on the basis of three main themes –roles, constraints and prospects of scientific knowledge transfer. Some of the major themes were broken down further into sub-themes where it was deemed necessary to enhance understanding of the concepts. Then, data were analyzed, triangulated, interpreted using descriptive and narrative method. Furthermore, induction method is applied to interpret the results.

Reliability and validity of the Tools

Validity is used to emphasize how the instrument in particular and the study in general are credible at large, while reliability is used to measure the consistency of the study results if it replicated. Actually, replication of the study result may not be achieved because the area under study is so small and was also intended to address research problems identified at this site. But efforts have been made to test the reliability scale of quantitative research data by using Cronbach's reliability analysis model in addition to various tools for gathering the same information for triangulation purposes.

Ethical Issues

Great efforts were made to respect all kinds of research ethical principles. Ultimate care has been taken not to violate any commonly agreed-upon ethical or legal principle. Whenever the participants were contacted for interview purposes, they were first asked to give their informed consent and voluntary participation. At the same time, all ideas were taken from other authors, and interviewees were duly recognized. As much as possible, we tried to be free of subjectivity during the interview, data analysis, and data interpretation to avoid or minimize bias or self- deception. Respect for intellectual property was guaranteed by giving proper acknowledgement or credit for all contributions to this study. As far as possible, all measures were taken to avoid any plagiarism. Both qualitative and quantitative research approaches will be employed in this study. Quantitative

approach was used for those data that were gathered through questionnaires from students and students' parents. Data obtained through interview and key informants were analyzed qualitatively.

3. Results

Observation was made to determine the extent to which internal knowledge (content knowledge) transfer was processed and became fruitful to address the need of gifted students in the study area. Accordingly, researchers observed students when discussing and reviewed the lesson in the class. Some discussions were in the form of debating while others on the way of narrating and making clarification of the contents learned. The situation was positively comply with the first mission of open observation and taken as a good way of knowledge transfer reviewed in literature of Abuhimed (2015) and Becheikhetal (2007).

With regard to the second mission of open observation, the result shows that some common claims rose up on certain teachers about their teaching techniques, their academic language commandment, time management and ways of ascertaining learning quality (correction and feedback giving for class work, homework, assignment etc.). It was observed plenty of good and bad practices happening both in the classroom and laboratory work and all these situations encouraged researchers to devise a questionnaire in order for triangulation as discussed ensue.

On top of the teaching techniques, resource utilized, and knowledge sharing among students in the classroom, the five-point Likert Scale analysis made relying on reliability analysis test showing about an alpha value of 0.90. The following table indicates a summary of the variables, mean, and standard deviation of the results.

Table 1.4. Mean scale of teaching techniques, resource utilized and knowledge sharing

Item	Variables	Mean	S.D
1	Generally, Applying active learning methods	0.84	1.321
2	Project work as a means of acquiring knowledge	1.92	1.395
3	Individual and tiered assignment technique use	0.79	1.133
4	Status of Lab work in scaling up learning by doing	0.96	1.353
5	Excursion facilitates the link b/n students and university academician	0.65	1.121
6	Ability to use different resources to substantiate curricular materials	1.02	1.141
7	Status of knowledge sharing among students in the classroom	2.55	1.523
8	Satisfaction level in addressing the learning style of gifted students	0.80	1.206

From table 1.4, the mean value is 2.55 for the knowledge sharing in which teachers allowed students to discuss the content in the classroom. This means that the majority of respondents' extent of the agreement rested upon mediocre to the statement mentioned in item number 7. In other words, the knowledge transfer process was going on at a somewhat fair level in the classroom. This is because the mean value lies in the middle between 2(uncertain) and 3(agree) labels on the Likert scale. Contrary to this, the excursion form of knowledge (tacit) acquisition represents the mean value of 0.65 which means the field trip does not exist currently in the school program. This mean value allied somehow to the majority of respondents' agreement level in the middle position of 0 and 1 of the Likert scale.

The analysis of the ability of science teachers to use another resource in addition to the textbook represented a mean value of 1.02. The majority of respondents had found knowledge acquisition outside of the textbook to be at a poor level. This means that the majority of science teachers stuck on the textbook and ran fast to finalize on time rather than to integrate the textbook contents with contents found in other related materials. The worsen result was obtained to pertaining teachers' ability to "satisfying" the curiosity of gifted students learning- 0.80(approx. strongly disagree level) mean value- which means respondents perceived at a poor level the process of internal knowledge transfer in addressing the learning style of gifted students.

In general, the application of appropriate active learning methods including tiered assignments, project works is indispensable for knowledge transfer. In other words, the role of applying different active learning methods including project works and individual/tired assignments are immense in the process of transferring explicit(basic/content) scientific knowledge although certain obstacles are there in the study area and this suggestion goes in line with the suggestion given by (Grassler & Glinnikov, 2008; Dahalin & Suebsom, 2010). As the mean analysis indicates the role of knowledge sharing among students in-and-out of the classroom is so great so that it should be scaled up from the existing fair level to the level of perfect status. The role of additional resource utilization (opposing to stick solely on the textbook) for knowledge transfer processes is also critical as was reviewed by (Millar R., 2004) in that gifted students get the opportunity to enrich as well as accelerate educational processes.

Trip knowledge, experiential knowledge, and observation play significant roles in transferring scientific knowledge especially the tacit one. It also provides linkage chances to the students with resourceful personals (knower's- researchers, expertise, etc) to acquire tacit knowledge which accentuates either learning by doing or in addressing the learning style of gifted students. In connection with explicit scientific knowledge transfer processes, face-to-face interviews were conducted with different sources for triangulation and validation purposes of the results of questionnaires. For the question posed, how do you think the role of internal knowledge transfer and also evaluate science subject teachers' capacity to impart scientific knowledge to gifted students in SSC? The school principal generally suggested the following statement:

> ". . . Yes, *scientific internal knowledge transfer is basic for gifted students, despite the fact that they require some special knowledge transfer approaches." But as for me, not fully lecturing content knowledge to the gifted students is important; rather, applying appropriate methods that allow gifted students to reflect their knowledge and experience is essential. "Extract the gifted students' mind instead of filing their mind with knowledge."* Mr. Z (one of the school principals)

The above school principal's statement implies the potential roles of sharing knowledge and active learning methods, including project work, problem-solving and tiered assignment provision, as a means of internal knowledge transfer processes. Besides, he explained why these roles were obscured was because teachers follow more of a "teacher-centered approach" and have no positive attitude to apply other methods that are labeled under active learning ways (refer to the extra explanation in the section on constraints).

> "..The *role of internal knowledge transfer is great because it provides the first foundation for science and even helps gifted students further in the field of science in their higher-level schooling. But my fear is how their curiosity is addressed by the instructors in this harsh school environment. By the lecture method, I don't think there would be a full understanding, and instructors have a lack of perception or attitude to follow active learning methods. This doesn't mean this is the character of all instructors. Some have given full time to transfer content knowledge in different mechanisms and should be given acknowledgment for their effort and dedication as well."* Mr. M (the administrative vice principal)

Suggestions by one of cluster coordinate from Information and Technology, department

> "*..The role of internal knowledge transfer played in the knowledge acquisition potential of gifted students is many if content knowledge is properly transferred. But, I do not think this was realized due to a multitude of constraints. Instructors are not committed and give no more time and effort to apply different methods that facilitate internal knowledge transfer processes effectively. For my subject most often I preferred to apply for project work as a better means of knowledge transfer…"* Mr. N. (one of the cluster coordinator)

According to interviewers from natural and social science subject coordinators including the vice academic principle, the overall aforementioned roles that internal knowledge transfer processes played in identifying the talent of gifted students and in addressing their curiosity are immense and vital despite the many problems encountered with our instructors to put into effect the roles.

Internal (Explicit) knowledge transfer processes

On top of the teaching techniques, resource utilized, and knowledge sharing among students in the classroom, the five-point Likert scale analysis made relying on reliability analysis test showing about an alpha value of 0.90. The following table indicated a summary of the variables, mean, and standard deviation results as described in Table 1.5 below.

Table 1.5 Mean scale of teaching techniques, resource utilized and knowledge sharing assessment

Items	Variables	Mean	S.D
1	Generally, Applying active learning methods	0.84	1.321
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From table 1.5, the mean value is 2.55 for the knowledge sharing in which teachers let students discuss the content in the classroom. This means that the majority of respondents' extent of agreement rests upon mediocre to the statement mentioned in item number 7. In connection to explicit scientific knowledge transfer processes, face-to-face interviews were conducted with different sources for triangulation and validation purposes of the result of questionnaires. For the

question posed how do you think the role of internal knowledge transfer and also evaluate science subject teachers' capacity to impart scientific knowledge to the gifted student in SSC? School principal generally suggested the following statement

> "--- *yes scientific internal knowledge transfer is basic to gifted students despite they require some special knowledge transfer approach. But as for me not fully lecturing content knowledge to the gifted students is important rather applying appropriate methods that allow gifted students to reflect their knowledge and experience is essential. "Extract the gifted students' mind instead of filing their mind with knowledge*" ---

The above school principal's statement implies the potential roles of sharing knowledge and active learning methods including project work, problem-solving and tiered assignment provision as a means of internal knowledge transfer processes. Besides, he explained why these roles being obscured was because teachers follow more of a "teacher-centered approach" and have no positive attitude to apply other methods that are labeled under active learning ways(refer to the extra explanation in the section of constraints).

> "*..The role of internal knowledge transfer is great because it provides the first foundation for science and even helps gifted students further in the field of science in their higher-level schooling. But my fear is how their curiosity is addressed by the instructors in this harsh school environment. By lecture method, I don't think there would be fully addressed and instructors have a lack of perception or attitude to follow active learning methods. This doesn't mean this is the character of all instructors. Some have given full time to transfer content knowledge in different mechanisms and should be given acknowledgment for their effort and dedication as well…*"

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According to interviewers from natural and social science subject coordinators including the vice academic principle, the overall aforementioned roles that internal knowledge transfer processes played in identifying the talent of gifted students and in addressing their curiosity are immense and vital despite the many problems encountered with our instructors to put into effect the roles.

External (Tacit) knowledge transfer processes

A semi-structured questionnaire was used for students, parents, and school teachers for obtaining data on trends of external knowledge transfer processes such as identifying the kind of knowledge needed to be transferred, identifying the knower's and the mechanism of knowledge transfers. In this regard, the dichotomous quantitative data (about extant of EKT) were analyzed by using descriptive analysis such as frequency and percentage. Whereas, data in identifying the type of knowledge transferred and the way how this knowledge was transferred was analyzed by using multiple response analysis and presented as ensue.

Table.1.6 Dichotomous response for extant of KT in the past

No	Questions	Count	Number	Percentage	Remark
1	Did you see when EKT was carried out since you have joined the campus? (**Students**)	Yes***	19	16.7	"***"Of the first batch sample students
		No	84	73.7	
		I do not recognize it	11	9.6	
	T o t a l		**114**	**100%**	
2	Out of the formal mainstream education, did you remember when EKT undertook to your child in the SSC? (**Parents**)	Yes***	16	15.2	
		No	80	76.2	
		I do not recognize it	9	8.6	
	T o t a l		**114**	**100**	
3	Was there EKT to gifted students in the school since you have hired on this campus? (**Teachers**)	Yes***	4	30	
		No	16	70	
		I do not know	-	-	
	T o t a l		**20**	**100**	

Table 1.6 indicates the respondents' opinion upon whether they saw when the external knowledge transfer process was undertaken systematically in the years before the 2018 Academic Calendar. Regarding this, students' response swing between "yes" and "no" depending on their entrance time variation in the school. For about 15.2 % (16) respondents, external knowledge transfer processes

were going on in the school, while the majority about 76.2% (80) sample respondents said "No" and hence EKT was never carried out in the school, systematically. And the rest 8.6% (9) students did not recognize when the time EKT is carried out. The field of knowledge that had been transferred was solicited to those students, parents, and teachers who said collectively external knowledge transfer was carried out in the school from the outset. Accordingly, about 56.7% of student respondents; 61.9% of parent respondents and 50% of teachers saw when the external knowledge transfer was carried in the field of natural science. This analysis was validated by interview questions conducted with principals, top scorer students, cluster coordinates, and key informants.

> *However, only one top scorer student, the school principal, and some key informants ascertained the response was right. In summarizing their suggestions, in the years when the school of science shared campus was established, the first batch of students was learning at the main campus(KMU) and hence acquired knowledge in attending a regular mainstream formal education(explicit knowledge), laboratory works, and additional knowledge transfer(tacit knowledge) in the science and technology fields.* Mr. Y (one of the cluster coordinator)

This was due to the closeness of students to those academicians, researchers, and laboratory experts who had helped them with unreserved effort owing to paid for their effort made. Besides, the students were brilliant and keen to acquire knowledge so fast so that teaching them and transferring tacit knowledge delighted most academicians & experts beyond getting money for their effort.

Constraints of SKT

The barriers to scientific knowledge transfer start at the school where curriculum-based formal education going on in affecting the formal content (explicit) knowledge transfer processes. Much has been discussed in the first section of this chapter so that to go through it in detail again might not be the intention of the researchers. Rather, we would like to slightly oversee internal knowledge transfer processes and however, priority for investigation was given up on what barriers are there in the external (tacit) knowledge transfer processes. To this end, researchers used the information obtained during the pre-understanding phase to list out the assumed constraints during an understanding stage in the sample student questionnaire. And hence the frequency and percentage analysis begin with the opinion of sample students. As table 4.3 indicates, out of the total sample respondents, about 14% (16) said school structure and management system created an impediment

on SKT processes. Out of the total sample student respondents who said "teachers' lack of interest and commitment" to integrate explicit and tacit knowledge in addressing the need of gifted students' accounts for 9.7% (11). About 11.4% (13) student respondents said generally science teachers have no enough experience of teaching gifted students. Student respondents who said the loaded classroom instructional activities impeded the processes of tacit knowledge transfer were about 9.7% (11). Similarly, for about 12.3% (14) respondents' time is a major constraint of SKT. Lack of teamwork of science subject teachers (7.8%), lack of attitude of the university managerial for SKT (13.2%), resource and infrastructure problem (11.4%), and the weak relationship school administrator has with other institutions (10.5%).

Table 1.7 percentage analysis of students' response upon presupposed constraints of **SKT**

		Responses	
Variable	**Constraints (Optional)**	**No.**	**Percentage**
Choose the one which do you think the major constraint/challenge of SKT processes in the school.	School structural and management problem	16	14.0
	Science teachers' lack of interest & commitment to link tacit and explicit knowledge.	11	9.7
	Science subject teachers have no experience in how to teach talented students.	13	11.4
	Loaded instructional processes in the classroom created the problem in the transfer processes.	11	9.7
	Time is much tapered for teachers by involving in extra school tasks	14	12.3
	Science subject teacher may not be working disciplines as required of gifted education	9	7.8
	University managerial bodies have no attitude about how important is if their academician can transfer scientific knowledge for gifted students.	15	13.5
	Lack of resources such as transport facility and financial support	13	11.4
	Week relation the school administrator with PTA and other institutions working in the science fields.	12	10.5
			100.00

Generally, the constraint in the process of SKT in the SSC was the overall result of the aforesaid barriers despite a little bit difference seen among them in the extent to which is the major and minor constraint. School setting and lack of awareness in school management bodies about the importance of providing opportunity student to have received both explicit and tacit knowledge for addressing their curiosity as gifted students were remaining to be the major obstacle of SKT. In the same vein, KMU managerial attitude and enthusiasm was very low for developing the system by which university academician, researchers, and laboratory technicians help gifted students in transferring tacit knowledge as well. Beyond that, especially science teachers in the school are required to get special training either as a form of CPD or in-service training up on how to teach talented students and the methods of teaching in the science fields. To teach students as per the requirement of inquiry-based learning, teachers' time may not be tapered, and need to have enough time for guiding, monitoring, coaching, and scaffolding individual talented student work and performance for assuring the quality of learning. Moreover, supplying different facilities and creating linkage of the school with other education and non-education sectors for transferring tacit knowledge is indispensable to make a complement the gap that existed in explicit knowledge transfer processes. These are not simply articulated conclusions rather supported and triangulated by the comments of school principals, cluster coordinators, and key informants'. Some of the interviewee comments are discussed here in an ensuing way.

> *"--- whatever is fundamental SKT for gifted students that we have, it has not been put into effect in the school due to lack of positive attitude and perception among higher rank manager of the school and the university and the instructors as well. As you know that each subject teacher engaged in many curricula and co-curricular activities so that they do not have spare time to mull over linking the classroom instructional process (explicit knowledge) with the ways students get supplementary knowledge (Tacit) from university academician or other sectors. Besides, the school environment is not conducive for talented students. There are many problems such as insufficient infrastructure, low standard of laboratory equipment including technology that foster instructional processes, etc. these all shortcoming hampered the practicality of external knowledge transfer processes in the school."* Mr. X (one of the school manager)

The school cluster coordinates substantiated the above analysis of the constraints of the SKT process about the problem with science teachers, school administrators, and the attitude of managerial personnel of the university (KUE). The Interview made with university academicians,

researchers, and experts were used to substantiate the variable more in the following way. There are many constraints. First, the KUE teachers are university teachers. Hence, it would be difficult for them to teach high school students. This is a scope related constraint. Second, KUE teachers are conducting research and community service, along with teaching their students. Because of this, they are busy. It goes to time related problem. The laboratories, library, and the school environment, in general, are below the standard and are not suitable for talented students. These ones are organizational culture problem.

A lack of having a strategy that helps to find resource persons and link them to the school to transfer tacit knowledge including technologies. Moreover, there was no mechanism in building the capacity of teachers engaged in teaching talented students. In this regard, should be continuous training in the science subject content knowledge transfer, methods of teaching, assessment, and application of technologies for teaching gifted students. This is basically **s**trategy related constraints. Demonization among students is one of the major problems due to the low level of school infrastructure. The infrastructure needed to be properly arranged to be conducive to the level of talented students in that they are attracted and focus on the learning of science, innovation, and technology. The initial intention was to integrate SSC with STEM center where students nurture their talents through working on projects they have in mind. Unfortunately, this intention was reverted and now the SSC became even very much less than any ordinary high school. It describes an interpretation related constraints (Dahalin & Suebsom, 2010)

Prospects of SKT

In all these problematic situations of scientific knowledge transfer processes in the school, there will be hope that seems to be reversing things to the normal condition. This is because students in the school still eagerly wait for looking at the system set up in the school that enables both explicit and tacit knowledge transfer processes going on side by side in addressing their learning style. In this regard, sample student respondents were solicited if the need still be there with them for having tacit knowledge in the interim of receiving explicit (curriculum-based) knowledge. To this end, for the question “Do you like knowledge and experience of some prominent individuals should be transferred to you?” Almost the entire respondents (93.9%) replied “yes” while the rest 6.1% (7) respondents said “No”. This response reveals that still; students want to receive tacit knowledge if conditions are allowed for them. In the subsequent reply for the question “In which one of

knowledge- field you are interested with to have tacit (external) knowledge?" the majority of respondents have selected out two areas such as natural science including the medical field of knowledge and technology-related knowledge. The selection of these two areas is not a surprising event because the students are science learners so that they preferred external knowledge should be transferred in science and technology perspectives if the school system enabled doing so. Figure 1 depicts the percentage choice of field of knowledge that should be transferred in the future.

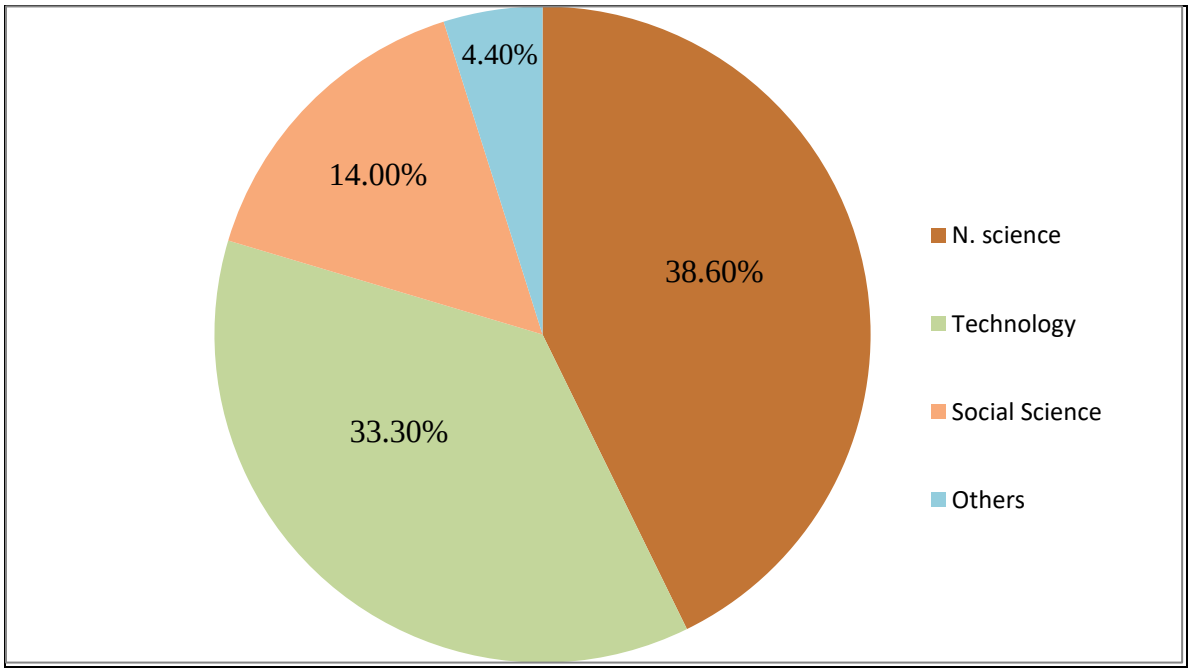

Fig. 12 Percentage description of students reply for their preference of field of tacit knowledge

As the figure illustrates, about 38.6% (44) out of the total 114 respondents, preferred natural science fields, including the medical field of knowledge to be transferred while about 33.3%(38) of student respondents preferred technology-related fields of knowledge including ICT. About 14% of student respondents were preferred social science-related external knowledge should be transferred to them. The rest who selected out laboratory- technical works, language-related knowledge, and others were about 4.4% (5).

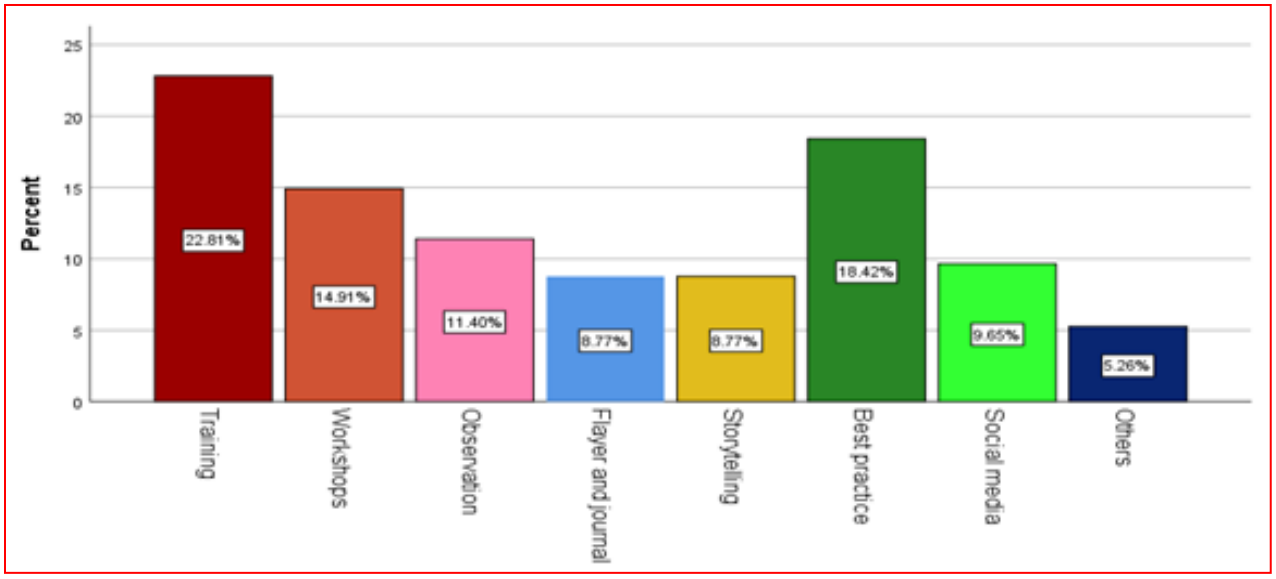

Figure 1.2 mechanisms of External knowledge transfer.

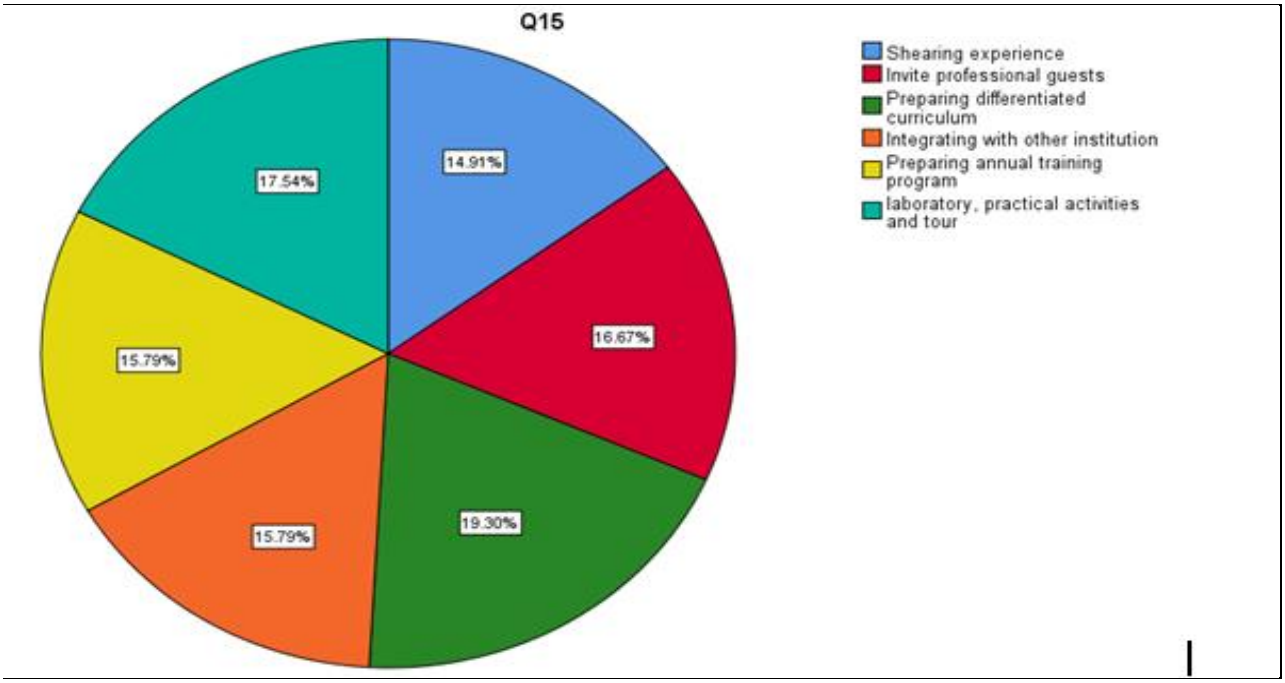

Figure 1.3 Percentage descriptions of methods of tacit knowledge transfer in the future.

Student respondents were also asked to choose which mechanisms of knowledge transfer provide them an opportunity to grab efficiently the knowledge that will possibly be transferred. As figure 4.2 reveals, sample students preferred knowledge should be transferred by *training* (22.8%), *best practice* (18.4%), *workshop* (14.9%), *observation* (11.4%), by using *social media* (9.7%), storytelling(8.8%), by using flayer & journal (8.8%) and others(5.2%). Generally, training, the

narration of best practices, and workshops constitute the larger portion of students' preference mechanisms whereby tacit knowledge will be transferred from resource persons. In the meantime, the statements of those interviewees solicited to express the points that they thought left aside to be not mentioned, were presented as follows.

> *I believe this research is relevant. We should help the SSC students to be important citizens who are hopes of their country Ethiopia.* ---- N's reflection.
>
> *Not enough attention is given to the students based on the initial aim of the school. That is why there is a mismatch between the potential of the students and what they learn right now. Thus, a special curriculum, teaching methods, and specially trained teachers are needed for these students. The current teachers in SSC should be given continuous training on different issues related to teaching these students.* ---- O's reflection

In connection to this, sample students in the questionnaire were asked to select ways (because more than one option was allowed to select) with which the sustenance of SKT will be ascertained in the future in the school. For the student, the pallet questionnaire for sustainable knowledge transfer with regard to being developed suggested that the knowledge transfer in our campus will achieve the mission of the SSC. *The* given replies were summarized as a questionnaire in Table 1.9.

Fig.1.9 Students response on their preference of the KT through sustainable in our campus.

Variable	**Sustainable manner OF Kt (Optional)**	**Responses**	
		No.	**Percentage**
Which would you suggest for the future to sustainable KT in campus?	Shearing experience	62	15.0%
	Invite professional gusts	81	19.6%
	Preparing attractive and interesting program	70	16.9%
	Integrating with other institution	64	15.5%
	preparing annual training program	66	15.9%
	laboratory, practical activities and tour	71	17.1%
	T o t a l	414	100.0%

From the above data, it is possible to say that 19.6% of the majority of respondents invited professional experts to suggest sustainable knowledge transfer for their students. The other three

options, like laboratory, practical activities, and tour, preparing attractive and interesting programs, and sharing experience, are preferred for sustainable knowledge transfer on our campus.

A typical example of the prospect of EKT process

To depict how was effective the given training and how will it be valuable if students have it in the formal education, the researcher used the data obtained through the questionnaire that was prepared for the students who attended the STEM power training scheme. The data were analyzed by using the mean and standard deviation of which drawn from the rating system of the five Likert scales ranging from 1-5 (1 was very important, 2 was important, 3 was not sure, 4 was somehow important and 5 was not important at all). Before analyzing the data, a reliability scale test of prevailing variables has been made, and found the variables to be more reliable (as Cronbach's alpha shows in table 3.8).

Table 1.10 result of reliability analysis of the variables

R E L I A B I LITY STATICS	
Cronbach's Alpha	N of Items
0.958	7

In the questionnaire, students were requested to indicate the level of effectiveness of the training given and how much training is sustained as a system of receiving additional knowledge in their formal education. The study findings were presented at the table 4.8

Table 1.11 Importance and effectiveness of the training given by **STEM** power program

The aspect of evaluating the effectiveness of the given training	**Mean**	**Standard Deviation**
Please rate the overall level of the given training and your expectation.	1.37	0.817
Rate the relatedness of contents in the training with contents you have learned in some subjects.	1.38	0.733
The level of the training could be effective means of knowledge transfer	1.42	0.846
Please rate the importance of the training to your overall curiosity of tacit knowledge receipt and long – term retention.	1.48	0.799

The status of the training in terms of transferring knowledge and skill as goals set aside.	1.50	0.744
Please rate the level of the training relative to fill the gap of knowledge created by formal education.	1.50	0. 875
Rate the level if such training will be part of the school system along with the regular mainstream of formal education.	1.71	1. 148

The findings in table 4.2 show that the majority of trainees rate that the overall training situation was very important for them as this was indicated by a mean of 1.37 with 0,817 S.D. also the study found out that respondents evaluated that there are relations between contents of the training and the contents learned in some science subject in the formal education. This was indicated by a mean of 1.38 and 0.733 S.D. Further, the study found out that the majority of trainee respondents also rate by a mean of 1.42 (0.846S.D) that training became a very important mechanism of knowledge transfer during the training. Also, as indicated by a mean of 1.48 with S.D of 0.799 majorities of trainee found the training given to be very important in connection to receiving tacit knowledge which can be retained for a long in the mind of the students (trainee). Further, the study found out that majority of the respondents as was indicated by a mean of 1.50 with S.D of 0.744 in this case rate that the training was very important in terms of transferring scientific knowledge relative to its own goal. Also, the majority of respondents found the training to be very important again in filling the gap of scientific knowledge created informal education. This was indicated by a mean of 1.50 with S.D 0. 875.

4. Discussion

The observations were conducted to observe the extent to which internal knowledge (content knowledge) transfer was processed and became fruitful in addressing the needs of gifted students in the study area. Accordingly, in the field, researchers observed when the students discussed and reviewed the lesson learned in the class. Some discussions were in the form of debating, while others were in the form of narrating and making clarifications of the contents learned. This conclusion is positively consistent with the first mission of open observation and taken as a good way of knowledge transfer, as reviewed in the literature of Abuhimed (2015) and Becheikhetal (2007). With regard to the second mission of open observation, the result indicates that some common claims rose up against certain teachers about their teaching techniques, their academic

language commandments, time management, and ways of ascertaining learning quality (correction and feedback giving for class work, homework, assignments, etc).

The role of applying different active learning methods, including project work and individual/tired assignments, is immense in the process of transferring explicit (basic or content) scientific knowledge, although certain obstacles are present in the study area, and this suggestion goes in line with the suggestion (Grassler & Glinnikov, 2008; Dahalin & Suebsom, 2010). As the mean analysis report indicates, the role of knowledge sharing among students in and out of the classroom is so great that it should be scaled up from the existing fair level to the level of perfect status. The role of additional resource utilization (as opposed to sticking solely to the textbook) for knowledge transfer processes is also critical, as was reviewed by Millar (2004) in that gifted students get the opportunity to enrich as well as accelerate educational processes. Trip knowledge, experiential knowledge, and observation play significant roles in transferring scientific knowledge, especially the tacit one. It also provides linkage opportunities for the students with resourceful people (knowers, researchers, experts, etc.) to acquire tacit knowledge, which accentuates either learning by doing or addressing the learning style of gifted students.

5. Conclusion

This study found out that the role of content knowledge transfer is basic for the future academic competence of the students and by which effectiveness in turn relies on active learning methods, teachers ability to adapt in the classroom teaching-learning activities and which in its expense let students go at their pace for knowledge acquisition. If it could be effectively applied in classroom instructional processes, for example, problem-solving, project works, tiered assignment, inquiry-based learning, etc., there would have been numerous roles that active learning methods played.

Active learning method fosters a productive learning environment which students, teachers even the school is benefiting from. Since active learning promotes active engagement of students in the teaching-learning processes, therefore, it enhances interest in the subject as well as to the science field in the future schooling progress or else in the future career. In this reality, applying active learning methods plays great roles in academic performance of the student. Yet, the reverse is found to be the reality again in the study area. Most instructors follow teacher-centered approach which

prohibits in its side students' active involvement in instructional processes as against to the learning style of gifted students.

With regard to tacit knowledge transfer, once in the past there was such a transfer to the first batch of students, who benefited from acquiring implicit knowledge given by university researchers and academicians due to better communication the school leaders had with them. But the study reveals that, currently, such a trend has stopped and students have no chance to acquire additional knowledge in the science fields. In principle, gifted students, like the student in the study area, need to engage in enrichment and acceleration gifted education, which support the idea of transferring external knowledge, and knowledgeable persons must let students acquire their knowledge, skills, and experiences through different mechanisms. Based on the analysis result, the following recommendation and further insight of indicating the thematic area of other research will be presented as follows.

The role of internal (explicit) knowledge transfer is multifaceted in shaping both the academic and behavioral development of students. By taking this into considerations, there should be support for teachers in equipping teachers with the necessary know-how on top of applying active learning methods in instructional processes by way of improving their teaching capacity via CPD, in-service training, scholarship for advanced learning, etc. Besides, reinforcement and recognition for those teachers who showed good deeds in their work are important. Providing, mentoring, counseling, monitoring, and coaching services one step ahead to the present nil position. Paying little attention to the shared science campus was one of the great problems that led to a shortcoming in internal and external knowledge transfer processes. Thus, as special needs learners learn on campus, special attention should be given by KUE leaders to the overall circumstances.

With the consent of the student, parents can arrange extra time (that may be after school or on weekends) to transfer both tacit and explicit knowledge to gifted students. KUE's R & D directorate and others should design and develop a development plan that can be cascaded to the school level, specifically related to knowledge transfer processes for gifted students. Essential facilities and financial support must be budgeted for specific purposes in order to transfer tacit knowledge as quickly as possible. Advise, order, awareness, and necessary incentives should be given to KUE researchers and academicians to make it convenient to transfer their potential knowledge, skills,

and experience to the gifted learners in SSC. Finally, one must think about conducting other research on top of how the system is developed to execute effective and efficient scientific knowledge transfer processes in the study area.

Limitations

The study was confined to the Science Shared Campus due to the fact that researchers work there and looked at all the pitfalls that occurred in the teaching-learning processes there, especially some limitations for requesting instructors and key informant persons about the barriers to knowledge transfer. Plus, SSC is more accessible, being found at the main lane and positioned at the pivotal place of the Addis Ababa City Administration. Although the study was aimed at being finalized within one year, due to the repercussions of COVID-19, it has consumed more than that time frame.

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Declaration of competing interest

The authors declare that there is no conflict of interest in this study.

Authors' contribution

All authors contributed equally.

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Effects of Tutorial Sessions on the Academic Performances of Female Urban Environmental Management Students at Kotebe University of Education, Addis Ababa

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Abstract

Unlike the developed world, developing nations, including Ethiopia have a far less enrollment of female students at higher education institutions. Even those enrolled evidenced a relatively high attrition rate and lower academic performance for many reasons. There are various socio-economic factors for the academic impediment of the many girls who entered into tertiary level institutions, including Kotebe University of Education. To curb such obstacles, different approaches are suggested such as giving tutorials to students. The aim of this study was to evaluate the difference in the test performances of the least-scoring Urban Environmental Management undergraduate female students due to the administration of tutorials using a cross-sectional study design. Thus, purposive sampling, which focused on low-performing female students, was applied. Data on class room achievement was gathered using test items. The data collected has been entered to excel sheet and was analyzed using R. The results show that a statistically significant difference in in the test performance was achieved by the selected students following delivery of the tutorial. Aside from the scores, the engagement of the students observed during the tutorials was notable. Therefore, such kind of supports can help regain performances in an undergraduate female student at higher education institutions.

Key words: Academic performance, Female students, Test, Tutorial

1. Introduction

Despite the appreciable university enrollment and success ratio of female students in the developed world, female students' success in universities in the developing world, including the African continent, is disproportionately low for many reasons. Female students' college dropout used to be high when compared to male counterparts in countries such as Ethiopia (Abdurehman and Bekele

2019; Melese and Fenta 2009; Sperling and Winthrop 2015). Such facts are attributed to the many factors, including family background related, school and students' related characteristics (Tadesse 2009). These prevailing facts and the considerable impact of educating girls on the general society calls for alternative pedagogic interventions so as to offset the hurdles such as the application of tutorials, which is proved to be operative in filling the gaps among those academic risk students (Glomo-Narzoles and Glomo-Palermo 2020). The tutorial has been defined by scholars as "tutoring is a formal process that involves as a relationship between a more experienced and knowledgeable person that plays a supporting role with a less experienced and knowledgeable person, so as to facilitate that person's career and personal development" (Glomo-Narzoles and Glomo-Palermo 2020).

Regarding improvement of female students' academic performance, diverse initiatives were designed by the government of Ethiopia (Bayeh 2016). Despite the many efforts with little improvements, gender imbalance continued to be an issue in almost all universities in Ethiopia. Based on a study by Asfaw in 2012, the many challenges female campus students faced and identified included economic, underestimating girls' ability and gender bias (Asfaw 2012). Ethiopian experience also showed the least matriculation (27%) and high attrition (a quarter of them) of female students, especially by those who come from the remote areas of the country (Asfaw 2012; Yasin 2013). These and other factors are impeding female students' academic success.

Tutorials have been practiced in different levels of the formal education sector, ranging from preschool to undergraduate college students. The mode of its delivery also varies depending on the settings that include group tutoring, one-to-one tutoring, peer tutoring and parental tutoring. Even though, such lessons are helpful to every candidate depending on interest and course nature, it usually targets the least scoring and needy students (Baker et al. 2000).

Hence, administering tutorials in the case of Kotebe University of Education was deemed useful for supporting those low performing female students and to see if that brings the desired impact. Consequently, the current research evaluated the effect of administering tutorials on the first year Urban Environmental Management (UEM) female students whose academic performance was relatively lower among the same cohort using a cross sectional study design. Comparing the academic results of the students before and after tutorials, a significant improvement was seen from

the results. Thus, the finding suggests the pivotal role of administering tutorials to bring academic performance improvements in female students. However, the latter claim is subjected to the proof of the same result based on a university-wide study.

2. Methodology

Studies that aim to determine factors regarding the performances of students involves the administration of pre and post-tests following the manipulation of instructional media and methods (Lestari and Setiawan 2017).

Study design and sampling

A cross-sectional study design was applied in the current study whereby low-performing female students of the same entry batch were selected. Therefore, purposive sampling was applied to select the respective department, course and the students. While selecting the students, a number-coding was given to each student anonymity. Test items were developed to measure the knowledge of the students in the course administered. The nominated students were double-tested on the same content before and after the delivery of the tutorial, which was carried out in a purposefully selected classroom setting located within Kotebe University of Education's main campus.

In this process of double-testing, the whole first year UEM students were first involved in the test and later those female students who scored below average, the course instructor, the research group and a technical assistant in the same department have been involved. There were totally 59 year-I UEM Students of both sexes who were the study population and those who scored below average were given tutorial before the post-test. Coincidentally, these students were at risk of dismissal. The ten questions were all multiple-choice by type.

Before the tutorial, all students were given 20 minutes of test in the specific course called Urban Hygiene and Communicable Diseases Control (EnMa 2319). After the result of the first test those female students (20 %), which accounted for the 98 % of the least scorers and who scored below average were, selected to be given tutorials for a period of 3 hours per week (conducted biweekly) for four consecutive weeks. The tutorial session was provided based on their prioritized problem in the course chapters. Following the tutorials given, the students took another 20 minutes of test on the same content and their scores were compared before and after the tutorials.

Data collection

Classroom achievement test was used to collect the required data. The test score of those selected students was recorded before and after tutorial using spread sheet. Different stationery materials, classroom, and other electronic resources were utilized during the assessment.

Data analysis

The data entered to excel were coded, cleaned and organized and later analyzed using the freeware R. The study employed the non-parametric test, which is Wilcoxon signed-rank test, to analyze of the effect of tutorial delivery to those underscoring first year female students of the Department of UEM. Following, it was interpreted and compared with past related studies elsewhere.

3. Results

The minimum score difference following the tutorial action was two and the maximum was eight with an average of 3.833± the standard deviation, which was 1.99. Student number 2 and 11 were excelling while they came out of the previous poorest performance, according to the pre-tutorial record, which include student number three and ten. In fact, the average score during the post test was 6/10, which is relatively higher than the pretest average score of all study subjects that was 5/10. The results of the pre and post tutorial performance of students is presented in figure one.

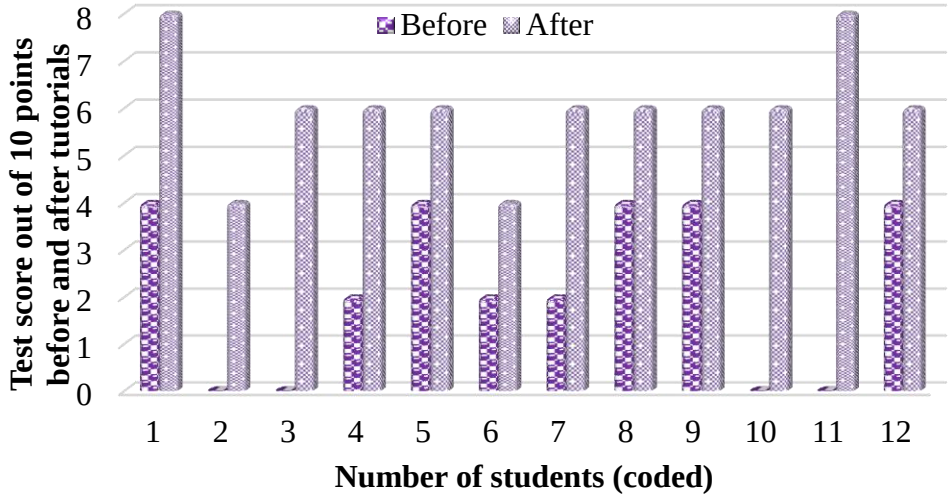

Figure 1. Difference in the test performance of female Urban Environmental Management Students before and after tutorial

Based on the data distribution test for normality, the data were abnormal or skewed, perhaps due to the lower sample size (**Fig. 2**). Therefore, the alternative or non-parametric test equivalent to the paired t-test, which is the Wilcoxon signed-rank test, was applied.

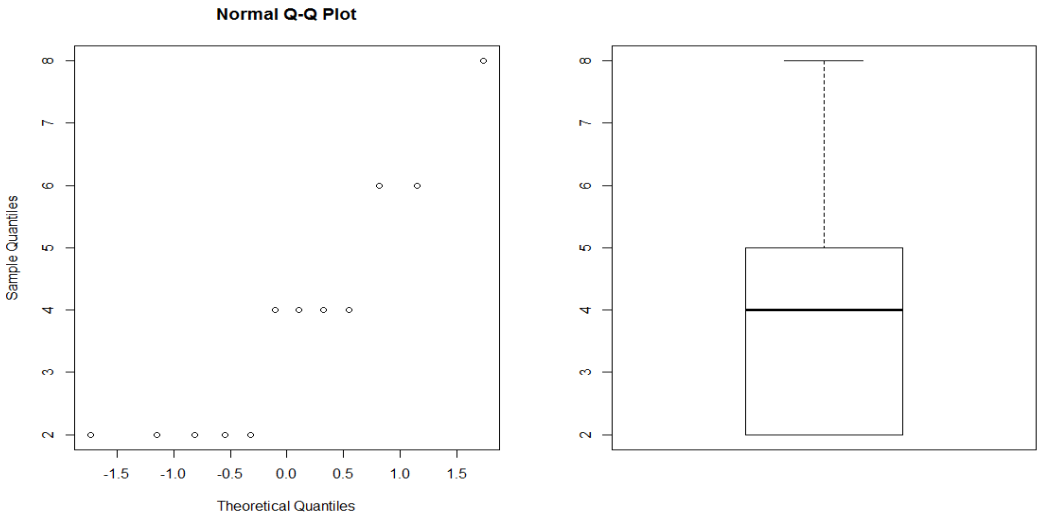

Figure 2. Line and box plot for the data on the difference of the scores of students

4. Discussion

The finding of the current study reveals that all female students brought a significant improvement in performance following the delivery of the tutorial. The statistical test showed that the performance of female students before and after tutoring was significantly different (p-value = 0.002) in favor of positive performance. This finding agrees with a related lower grade study, which was conducted by Fantahun Admas and Tirussew Teferra, which was a survey done on elementary and high-school students in three locations in Ethiopia and has proved the effect of student support such as in academic areas enabled students achieve and adjust better (Admas and Teferra 2017).

During the tutorial sessions, the students also demonstrated appreciable engagement and noticeable freedom of interaction when compared with the regular session's experiences. Regarding interaction and beyond advantages of tutorial delivery is also reported by a study conducted in Wachemo University in Ethiopia, claiming the psychological advantage of tutorials in addition to the academic improvements (Melaku 2021). Thus, understanding female students' performance needs to consider not just academic features but also the students' characteristics as it can lead to gaining of possible policy inputs (Dimbisso 2009).

Indeed, the need for tutorials that bases on gender or age is not something universal. For instance, a study in an Australian University found a weak relation between tutorial and the age or sex variables with the performance of accounting course students. This same study further argues that the administration of tutorial solutions to students did not prove improved performance by the students. Thus, the implication of prior academic experience, including performance at high school also plays a key role in the tertiary level education performance. Consequently, the application of tutorial session at university level courses cannot guarantee the success of low performing students irrespective of age or sex variations. However, sex, ethnicity and age remained as a potential factor to influence performance of students, even in the developed world that include the United States of America (Monem 2007).

In a related fact, the attendance or non-attendance of tutorials by the students brought a significant effect in the performance of university students, based on a study by Patrick and Arjan (Bijsmans and Schakel 2018). This study conducted on first year Maastricht University students claims that attendance need be given attention equally to an interactive and student-centered approach like that of problem-solving one. Hence, tutorials in themselves cannot guarantee high pass rates. Undeniably, more other factor, including self-discipline, social coherence and positive attitudes play parts in students' success (Matsoso and Iwu 2017).

In any case, however, student performance is not universally influenced by gender in favor of the boys. In some geographic regions or school girls can perform better than boys or vice versa (Awan and Azeem 2017). Contrarily, a study in Bahir Dar University reported a less success rate of female students at higher education institutions, mainly due to socio-cultural factors (Tiruneh and Petros 2014).

Regarding devising of a systematic approach on how to apply tutorial programs for female students in the entire campus female students, it was recommended to involve contributor parties like technical assistants and language assistants during tutorials. Moreover, the voluntarily commitment of the instructors in charge is crucial. On the students' side, it is advised that considering the students' diverse background and approaching them and being cognizant of that would help much.

5. Conclusions

Delivery of tutorial sessions to least performing female students can bring a significant change in

their academic performance. Though, tutorial endeavors would demand commitment and material as well as time expenditures, Kotebe University of Education and other similar institutions need to consider assisting of least performing students for tutorials using various means.

6. Implications

The promising findings indicate the role of tutorials to academic performance improvements, especially for low-performing female students thereby indicating the inclusion of diverse pedagogical approaches to providing policy inputs. However, further university-wide study based on random sampling is recommended to prove if similar outcome will occur.

Limitation

The low sample size and non-presence of the control group was a limiting condition in the generalization of the findings.

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Declaration of competing interest

The authors declare that there is no conflict of interest in this study

Authors' contribution

All authors contributed equally.

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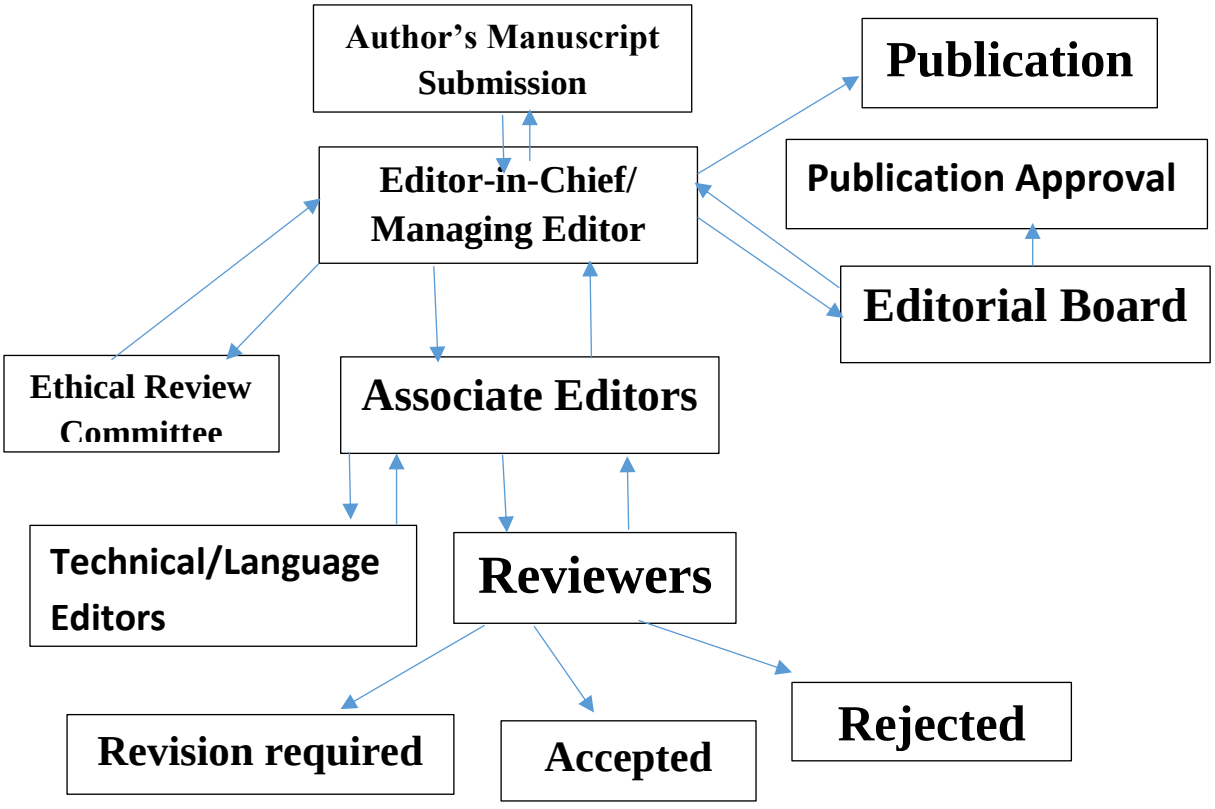

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