

The Educational value of using bi-lingual instructional practice in students' Writing Skills in 'Entomology Course' at KUE

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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 had identified a problem whereby students majoring in Biology tended to express their content knowledge in the form of lists rather than in coherent sentences and complete paragraphs. We consequently 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 and a student focus group discussion involving around one third of the class. The results showed 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 (in this case Amharic) as the medium of instruction in higher education institutions where English is the language of instruction should be considered for science teachers. We conclude by arguing for a joined-up approach to teacher education for multilingual education systems and suggest some priorities for further research.

Keywords: Language Supportive Pedagogy, Multilingual Education, Professional Collaboration, Science Education

1. Introduction

Many countries that were formerly colonized use a European language, commonly English, as the medium of instruction for part of basic education cycle (Milligan et al., 2016). However, numerous research studies have shown that an immersive approach to English Medium Instruction (EMI), where English predominates in the classroom but little or no cross-curricular support for learning English, is ineffective for acquiring literacy, developing proficiency in English and learning other subjects (Brock-Utne et al., 2010; World Bank, 2021). Hence, international researchers and agencies argue that children should start their formal education in their mother tongue and transition to a dominant language later in the formal education cycle (Trudell, 2016; Simpson, 2019; World Bank, 2021). Ethiopia does pursue a policy of 'late transition' across most of its regions, but language transition is still problematic (Yonas, 2008; Bekalu 2011). One reason for this is that students spend most of their learning time in lessons other than English with teachers, who have no formal training in supporting the development of academic language skills. Indeed, some teachers have themselves mastered these skills. It is for this reason that we conducted a quasi-experiment at Kotebe University of Education (KUE) to develop the academic language skills of student teachers, training to teach Biology in secondary schools. This article reports on that inquiry. We start by reviewing the literature on language transition, which contrasts immersive approaches to language transition, sometimes known as subtractive multilingual education (SMLE), with additive multilingual approaches that sustain the use of students' familiar language whilst providing explicit support for learning the new (added) language of instruction. The following section describes approaches to and dilemmas of language transition in Ethiopia. Next, we describe the quasi-experimental design, which involved a language expert collaborating with a Biology expert to integrate instruction on scientific writing into a Biology course. Finally, we report on findings of the research.

2. Language transition and multilingual education

Creese and Blackledge (2010) explain that monolingual instructional practices have dominated language teaching for a long time. As a result, many teachers have developed a conviction that the immersive experience of ‘English only’ classrooms is an effective way to develop fluency in English. However, where there is limited use of English outside of the classroom, schooling becomes a pseudo-immersion exercise that does not ensure grammatical competence, does not develop originality and creative use of English (Boruah, 2015), and does not support subject learning (Clegg & Simpson, 2016; Barrett & Bowden, 2022).

The immersive approach has also been described as subtractive multilingual education (SMLE). Multilingual education here denotes that wherever a language is used for learning and teaching that is not familiar to students(L2), learning becomes a multilingual process. This is because, according to socio-cultural learning theories, all learning builds on previous knowledge and ways of learning and to do this, learners must draw on the linguistic resource of their first or familiar language (L1). This trend is observed even within education systems where the official language policy is monolingual. This is because the act of calling a dominant language the medium of instruction does not make it workable as a language for classroom communication, nor does it miraculously imbue learners with fluency (Benson, 2015). Indeed, subtractive transitions that neglect to support ongoing language learning have been observed to undermine the development of students’ L1 literacy and their learning across the curriculum, whilst being less efficient than foreign language teaching in developing L2 (Barrett & Bowden, 2022; May, 2017; Thomas & Collier, 2002). Additive approaches to multilingual education recognize that learning is multilingual and strategically and deliberately engage learners’ L1 whilst provided structured support for learning and expanding the use of L2. In stronger additive models, academic language skills continue to be developed in L1 alongside L2, with support for learners to transfer their more advanced L1 language skills into L2.

Early-exit and late-exit refer to the point at which L2 replaces L1 as LOLT. Barrett and Bowden (2022) state that early-exit transitions occur when an additional language of instruction is used in the first four years of primary (lower primary) school and a late-exit

transition takes place between primary and secondary school, or during the secondary phase. As noted above, the majority of countries in Africa, where there is a language transition, are early exit systems with Ethiopia, Tanzania and Botswana as notable exceptions. However, there is no single country in sub-Saharan Africa that uses an African language as the language of instruction at secondary or tertiary level at scale, except for South Africa's use of Afrikaans in some schools and universities (Brock -Utne, 2015). This is despite some countries, such as South Africa and Tanzania having provision in policy documents for the use of African languages throughout the basic education cycle.

In their extensive literature review of late language transition in sub-Saharan Africa, Barrett and Bowden (2022) found that both early and late-exit subtractive models are less effective than additive and flexible models, as evidenced by large-scale longitudinal studies (Manocha & Panda, 2015; Schroeder et al., 2021). In an international study, Ramachandran (2017) reported that on average 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. In Ethiopia, Seid (2019) found that L1 based-MLE increases the likelihood of enrolment in primary school and of attending the right grade for age. In a lower secondary education intervention in Tanzania, David and Nsengimana (2021) found that the use of multilingual approach known as language supportive pedagogy increased students' ability to recall and write about the content in English compared to control groups using the more common SMLE approach (a finding echoed by Juma & Opanga, 2021). Smaller scale studies using lesson observation have shown that SMLE practices restrict the ease with which teachers and learners interact and reinforce practices such as rote learning, memorization and copying written texts from the board. They can also diminish students' self-esteem, particularly when enforced through the use of humiliation to correct errors in English and punishment for speaking a familiar language, with evidence from research in Tanzania and Rwanda suggesting that girls may be most affected by this (Adamson, 2022; Kuchah et al., 2022). It is not surprising therefore, that high dropout rates are common features of SMLE systems (Kadel, 2015).

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 is neglectful of the major goals of education. At times, a vision of a future in which school graduates are fluent in a dominant language, such as English or French, and hence able to work and study anywhere in the world, sacrifices the present education experience of children still learning to read and write and articulate critical questions in a familiar language (Monacha & Panda, 2015). This shows the inadequacy of many western models of education that have been transplanted into the African continent monolingual contexts and the necessity of working for a paradigm shift in the thinking on bilingual/multilingual education in Africa (Brock-Utne, 2015). Like Rao (2015), we recognize that in Ethiopia and many other African countries, English is highly valued by parents and young people as an international language and a part (but only a part) of their country's multilingual ecology. However, additive MLE models that allow learners' use of familiar language in the classroom are more likely to develop proficiency in English than subtractive 'English only' or immersion policies and practices. We conclude therefore that the use of two or more languages in schooling is valuable in the transition period but has general educational value beyond that (Clegg & Simpson, 2016).

3. Statement of the Problem

Ethiopia is a multilingual country with a federal system that allows each of its national regions to set its own language in education policy. Cognizant of the pedagogical advantage of mother tongue education and the rights of different nationalities to promote their own language, teaching and learning in primary education uses Ethiopian languages for teaching and learning in primary schools (MoE, 2023). Since 1994, over 20 languages have been used as the medium of instruction up to grades 4, 6, or 8 of primary education, with later transition favored in regions with greater linguistic homogeneity (MoE, 2002; Benson 2010). Thereafter English becomes the medium of instruction for formal education up to the tertiary level. The use of late transition at scale and changes in policy has meant that Ethiopia has provided a natural laboratory for research into the benefits of using L1 for learning and teaching. For example, Benson (2015) reports research showing that 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. Indeed, Ethiopia's late transition policies are often identified as positive examples for policy making

elsewhere (Trudell, 2016; Simpson, 2019; World Bank, 2021). However, when the transition to English does occur, it is subtractive. The language used in learning and teaching abruptly switches with no official allowance for continued use of the previous language of learning and teaching (LOLT).

Unsurprisingly, therefore secondary school students' English proficiency is well below the level required to use it for learning across the curriculum (Bekalu, 2011; Yonas, 2008). One of the reasons given for poor performance of SMLE systems is an impoverished learning environment, and the limited L2 proficiency of teachers, who are themselves graduates of the same SMLE system. Yonas's (2008) research in Ethiopia found that teachers claimed that their own deficiency in spoken English prevented them from applying communicative language learning methods in their classroom. Even students, who graduated from English education programmes, were unable to use English for communicative purposes with their students (Ibid.). The same experience has been observed in semi-urban EMI primary school in the Assam province of India. Boruah (2015) stated that not all teachers in EMI schools are themselves proficient in English. Barrett et al. (2021) argue that teacher education, particularly within higher education institutions, is an important site for innovating multilingual pedagogies for the specificities of African classrooms. The development and use of MLE models in teacher education both improves student teachers' proficiency in L2 and introduces them to an approach they apply in future careers in schools. Hence, as a period of sustained training that is delivered at scale, initial teacher education is pivotal to developing capacity for additive transition and hence a promising starting point for introducing additive MLE into secondary schools.

It was to this end that teachers set out to design and implement a novel approach to developing student teachers' English language skills for improving teaching and learning. In the Ethiopian context, previous research has commented on language policy. For example, 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. However, we have not been able to find a single study exploring the potential of multilingual pedagogy at the secondary or tertiary level.

4. Objective of the Study

The general objective of this study is to examine the educational value of using bi-lingual pedagogy 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 biological genre.
- explore the observable benefits for learning in implementing the interventions within the 6-week Human Biology unit.

5. Intervention and research design

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 KUE. The research was also a form of professional inquiry. The research was conducted with a class of 16 final year biology students. The general objective of this study is to examine the educational value of using bi-lingual pedagogy that include code translanguaging and attention to vocabulary learning alongside a genre-based approach that supports students to develop academic writing skills. The course was 'Entomology', the study of insects, because of convenience. 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.

The research focused on developing students' subject specific academic language skills. Typically, English as a subject focuses on interpersonal communicative skills, which is to say it develops the language practices that are used for everyday social communication. The language practices of everyday conversation differ from the language used in scientific textbooks. Typical grammatical features of academic practices are heavy use of nominalization, particularly the use of abstract concept nouns, use of the passive tense and less use of dynamic verbs. There is also heavy use of subject specific vocabulary, that is terms that have a well-defined, highly specified meaning within the context of a discipline. So, for example, using communicative language, the statement may be made 'All living things breathe'. In biology textbooks the same information may be presented using the statement 'Respiration is a characteristic of living things'.

Academic language practices are described by applied linguists using the concepts of register and genres (Polias, 2016). Register concerns the formality of the language used. Interpersonal or social communication tends to be informal usually in social literacy practices such as WhatsApp and SMS messages. Interpersonal communication is associated with informal interactions. By contrast, academic registers are often written, use abstract concepts and technical terms and are used in formal social situations by experts presenting an objective position. Halliday (1995) observed that talk in secondary school classrooms frequently switched between less and more formal registers as teachers supported children to move from the familiar registers of everyday talk to the academic register of writing in their discipline. In multilingual education, learners' informal talk is usually in a shared L1, whilst textbooks tend to be written entirely using L2. Hence, classroom talk is a back-and-forth between learners' L1 and the L2 that is the official language of instruction. When the researchers employed translanguaging techniques with the intervention group, they were not just providing explicit support for vocabulary learning but also modelling the pedagogic use of translanguaging to facilitate learning that draws on the learners' full linguistic resource as part of a strategy that scaffolds learning of academic registers in English.

Genres are widely used, relatively stable forms of speech or writing. Examples from secondary school science include laboratory reports, theoretical explanations, arguments and biographies. Polias (2016) identifies 13 distinct genres of writing used in secondary school science. However, typically biology and other scientific courses only explicitly introduce students to one or two of these, most commonly laboratory reports. Describing living things and organising information about living things are key scientific process skills for biology. Therefore, our intervention focused on developing students' writing skills for the four 'describing and organising' genres identified by Polias (2016). These are descriptions, comparisons, components and classification. The purpose of each is given in table 1.

Table 1: Describing and organising genres. Source: Polias, 2016, p. 12.

Genre	Purpose
Descriptions	to describe multiple aspects/features of a natural or physical phenomenon
Comparisons	to compare features of two or more natural or physical phenomenon
Components	to present (describe and/or define) component parts of a natural or physical phenomenon
Classification	to present different types (classes) of a natural or physical phenomenon

Both a language teacher and a biology teacher planned the teaching session together. During the intervention, the researchers 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 of the vocabulary taught in the Entomology course. Later, an English teacher taught the planned session. In the teaching learning process, the teacher used code-switching, mixing both languages (Amharic and English) when necessary. All the students were proficient in Amharic which is the lingua franca language of the country. A total of six weeks was used for the intervention class. The intervention was made in the regular class schedule. The biology teacher briefed the students about the importance of the intervention class for the course he taught. After six weeks, the post-test was administrated. Both tests were administered to the same group of students (one before the intervention and one after the intervention).

To get further insights, a post session focus group discussion (FGD) with students and interview with teachers were carried out. For the FGD, the group was heterogeneous; that is, all the subjects had different backgrounds in terms of age and gender. In total, 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 (Amharic and English) 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 research 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 interviews were used to triangulate the data. These interviews were audio recorded and transcribed in Amharic.

Data collected from respondents through pre and post test results, interview and FGD were processed thoroughly to check for completeness, accuracy and uniformity of the gathered data. For the pre and posttests analysis, the analytical framework for genre analysis was adopted from (Polias, 2016). Both pre-test and posttest assessment 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.

6. Results and Discussion

Findings from the pre and post-tests

As can be seen from the students' writings below, students have shown a lot of improvements in writing. As a representative sample, let us examine the pre and the post test results of students.

Genre type-Comparison: Pre-test /top-level student/

① Filiform is linear and slender whereas geniculate is bent/elbowed
→ Filiform has uniform segmentation whereas geniculate segmentation is not uniform
→ Filiform has small scape whereas geniculate has large scape
→ Filiform has large flagellum whereas geniculate has small flagellum

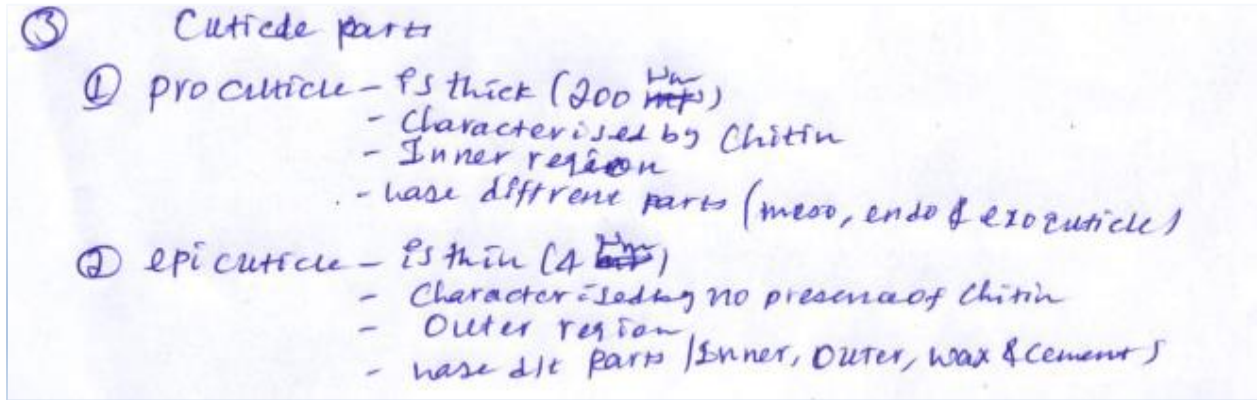
Genre type-Comparison: Post-test/top-level student/

Comparison of different antennae

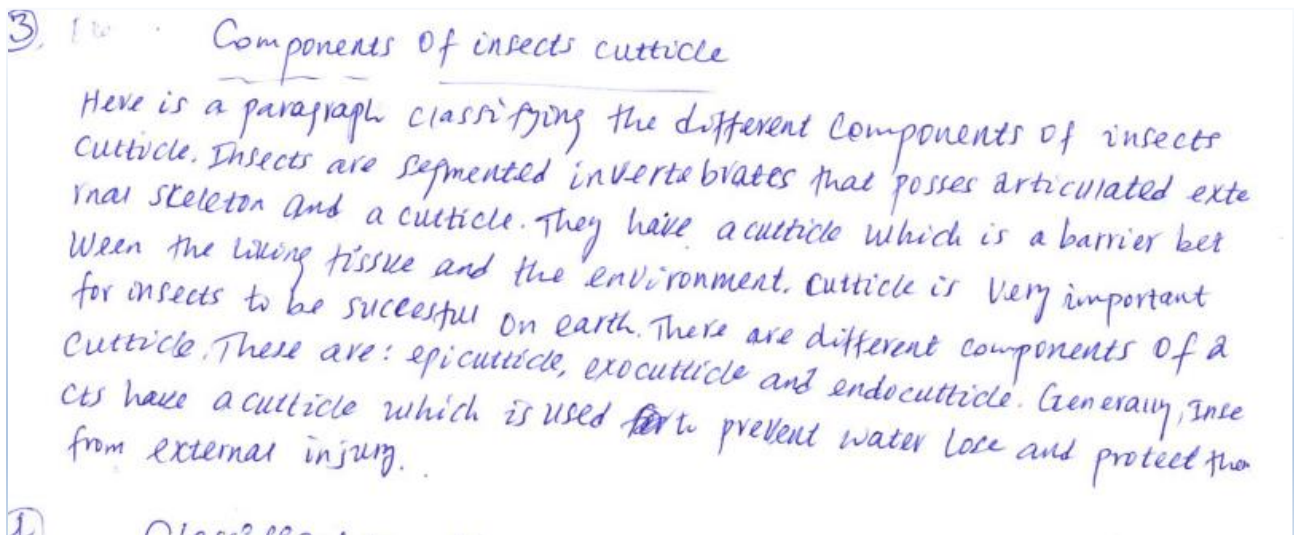
Here is a paragraph about comparison of different antennae

Insect species may have varying antennae. The filiform and the geniculate types of antennae are an example of insects antennae but, they are different in structure and also their function. Geniculate antennae is a bent like an elbow structure, which is used for the sense of smell. The bees and ants are examples of geniculate antennae. On the contrary, the filiform antennae is a thread like shape. They have many segments. In addition to this the filiform antennae is used to guide the entry of the pollen tube. The cockroaches are one of the examples of filiform antennae. Generally, different antennae forms have different function.

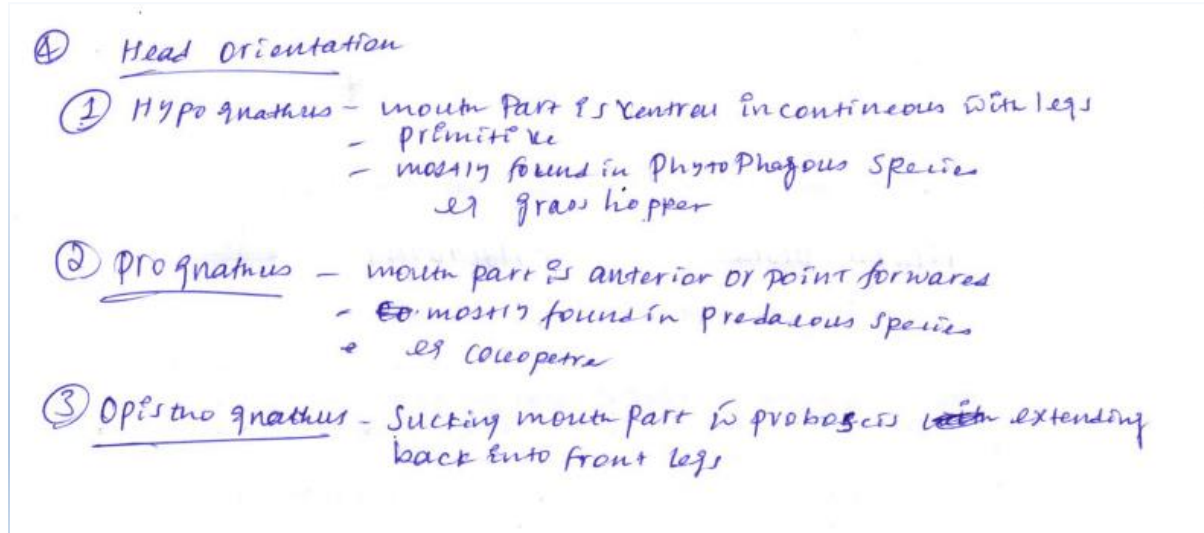
Genre type-Components: Pre-test/average-level student/



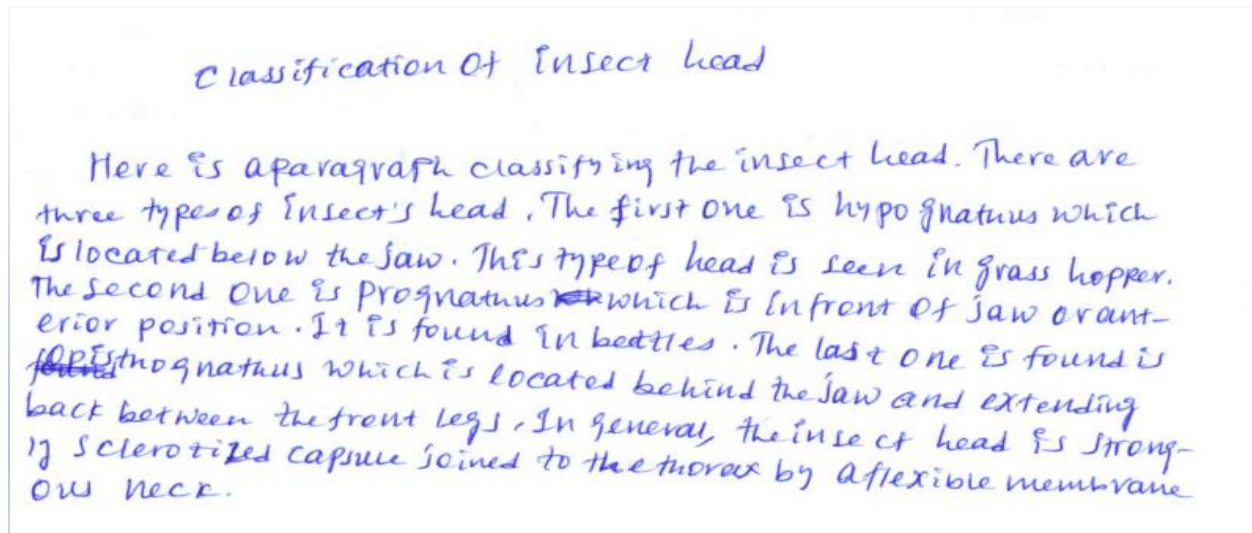
Genre type-Components: Post-test/average-level student/



Genre type-Classification : Pre-test/low-level student/



Genre type-Classification : Post-test/low-level student/



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

interviewees talked positively of the intervention. The following representative excerpts exemplify this issue further.

Haimanot in the FGD observes,

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 notes,

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.

The students' use of the term organized and particularly Alem's phrase 'organized ideas' point to how the act of writing can strengthen students' scientific understanding. When the students wrote paragraphs, they were obliged to order the scientific information which implies relations between the insect body parts. Within the description genre this order reflected the invertebrate body structure, starting from the head and moving along the invertebrate body. Students also demonstrated an ability to evaluate the significance of information and use connecting phrases, sub-clauses or position to elevate certain information within the text. For example, in the first three excerpts above, the paragraph texts conclude with a more general statement, demonstrating an ability to identify a key overarching point to emphasize in their concluding sentence.

As per the data above, students have shown 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, notes,

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 notes,

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, said,

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 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. Reporting on research in India, Rao (2015) noted that English-medium teaching makes learning difficult for most students and a mother-tongue medium education facilitates learning.

Teachers and students claimed that only-English medium instruction could silence students' engagement in learning. Sara, a teacher who participated in the interview session notes,

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 also notes,

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 understand the contents of the lesson without difficulty and develops our listening skill.

As can be seen from the responses of Sara and Hanna, using only English as a medium of instruction could limit student participation in the classroom and this further restricts knowledge production. Researchers working in schools have argued that children learn by participating in activities, but it is difficult for a student to participate in classroom discussion 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. Our findings suggest that the same principles extend to young adults in Higher Education. The transition to EMI in Addis Ababa appears to have a very long tail, whereby in the final year of an undergraduate degree, students still find it difficult to follow the lesson conducted entirely in English and learning is, for them, a bilingual process. The research literature reviewed in this article suggests that one reason for this is the ineffectiveness of SMLE approaches at both the secondary and tertiary levels.

On the other hand, our small-scale study did demonstrate that for this particular class at KUE, scientific learning and academic language skills could be enhanced over a relatively short period of just six weeks through a combination of engaging learners' L1 and providing explicit instruction in academic writing. It is, therefore, recommended to take an in-depth look at the advantages of using home language in the classroom when necessary. Thus, teachers can be encouraged to use the first language to build on students existing linguistic

capabilities. 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 a medium of instruction enhances student engagement in the learning process and it speeds up learning, innovation and creativity.

7. Conclusion

This article reports on small scale action research conducted with students in the final year of their degree at KUE. 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, a focus group discussion with six students and interviews with two teachers. The results showed 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. Previous research in Tanzania has developed language supportive pedagogies in teacher education and introduced their use into courses on teaching methodology or pedagogy (Barrett et al, 2021) and reinforced through assessment criteria for the teaching practice placement. However, this research was novel in focusing on a science course and introducing a genre-based approach alongside techniques of language supportive pedagogy (Rubagumya et al., 2021). Both projects relied on collaboration between science educators and language educators to develop and design the innovation.

The research reported in this article is just a first step in the deliberate integration of language support into a pure science course. The team did engage with literature on multilingual pedagogies, most especially through conducted a literature review on language transition (Barrett and Bowden, 2022) and engaging with findings from research conducted in Tanzania (Rubagumya et al., 2021; Barrett et al., 2021). However, the research also drew extensively on the prior expertise of the members, and it was collaboration across two departments (English language teaching and science) that made the innovation possible. It

was intended as a first step in exploring the potential of an additive MLE approach to strengthening science teaching. Given the success of this small-scale study, we recommend further collaborations between science and language educators within KUE and other higher education institutes in Ethiopia to develop further additive MLE strategies and throughout own practice, model these for students, some of whom will go on to teach in secondary schools.

Acknowledgement: The research reported here was part of the Evaluating Language Supporting Approaches to Transition at Scale project, funded by British Council through its Widening Participation Research Grant scheme.

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