Kotebe Journal of Education (KJE)

Editor's Note

Welcome to Kotebe Journal of Education, volume 2 issue 2. As we glide into the edition of the journal, I would like to express my feelings to you who have been involved in this task throughout the process. I congratulate all the members of the editorial board, authors, reviewers and fellow education specialists. As a team of 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 works and empower them to get across their research works throughout the globe. With this commitment and determination, Kotebe Journal of Education serves to promote and spread scientific research works in the field of education.

This issue of the Journal has incorporated insightful research articles on the issues of Education. In an effort to present articles of broader significance, and to incorporate pressing educational issues of intellectual engagement, works of different authors coming from different spheres of education all over the world have been 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 of the reviewers, editors and authors, very interesting insights have been incorporated in the different articles accepted 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 among people 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 be beneficiary from this platform. We are counting on researchers' participation to ensure the scale up of the status of the journal. I thank you all the scientific community who have participated as authors, reviewers, editors and the prospective readers of this issue for their supports and encouragements.

The Editor-in-Chief

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Original Article

Academic Achievement as Functions of Life Satisfaction and Self-Efficacy: The case of Wolaita Sodo University first year students

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Abstract

The purpose of this study was to examine the influence of life satisfaction and general self-efficacy on academic achievement among first-year students at Wolaita Sodo University. The sample consisted of all students in the colleges, representing first-year students at the university, and their number was manageable. The study included 104 participants (56 males and 48 females). A Likert Scale questionnaire measured students' life satisfaction and general self-efficacy, while academic achievement was measured using students' cumulative grade point average, yielding quantitative data. A self-developed semi-structured interview collected qualitative data from six key informants (three male and three female students). Data on the students' academic achievements were obtained from the college registrar's office. The collected quantitative data were analyzed using the Pearson Product Moment Correlation Coefficient, multiple linear regression, and independent t-test. All hypotheses were verified at $\alpha = 0.05$. The findings showed a significant positive relationship between students' life satisfaction and academic achievement and between self-efficacy and academic achievement. Life satisfaction and self-efficacy significantly contribute to students' academic achievements ($R^2 = 12.1\%$). Three domains of life satisfaction (university, self, and friends) were found to be the most predictive components of students' academic achievement, with beta coefficients of .25, .234, and .17, respectively. Significant sex disparities were observed in both life satisfaction and self-efficacy. Besides, the qualitative data results showed that students use different strategies to improve their life satisfaction and self-efficacy, such as avoidance, secrecy, advocacy, confrontation, and wishful thinking.

Key words: life satisfaction, self-efficacy, academic achievement

1. Introduction

1.1. Background of the Study

Education is the process of enhancing a person's ability and capacity to thrive in a certain society or culture. Higher education is essential for the development of people and civilizations of society. In Ethiopia, since the early 2000s, there have been major modifications to higher education system with the goal of increasing access to education. However, problems like packed classrooms, scarce resources, and poor infrastructure still make it difficult for students to excel academically (Hailu & Teshome, 2017). Despite these obstacles, the enrollment rates at Ethiopian universities have significantly improved. Hailu & Teshome (2017) further indicated that despite the government's commitment to expanding access, the rapid increase in student enrollment has not always been accompanied by corresponding enhancements in educational quality, (Hailu & Teshome,20017). Besides, academic standards are significantly hampered due to the emphasis on memorization over critical thinking abilities at all levels of schooling including universities.

In educational institutions, academic achievement is typically defined as a student's fulfillment of learning objectives, often assessed through grades, test scores, and overall academic performance. Various factors contribute to academic success, including socio-economic status, family background, institutional support, and personal attributes such as motivation and psychological well-being (Schunk & Zimmerman, 2008). Academic achievement is a vital element of national education as it serves as a barometer of the effectiveness of a nation's educational framework. Dambudzo (2009) asserts that parents, students, and educators have progressively prioritized students' academic achievement levels as a benchmark for success in all academic environments.

Recent research on factors influencing academic achievement in universities has increasingly focused on the roles of psychological constructs like life satisfaction and self-efficacy. These two psychological constructs have significantly impact students' academic achievement, motivation, and overall well-being. Gaining an understanding of these impacts is essential to improving student results, especially in Ethiopian universities where distinct socioeconomic and cultural factors are involved. Research has shown that higher levels of life satisfaction are positively correlated with academic performance (Pavot & Diener, 2008). Students who report greater life satisfaction tend to have better mental health, which facilitates learning and involvement in educational pursuit.

Life satisfaction is conceptualized as an individual's subjective assessment of their overall quality of life. It encompasses emotional responses and cognitive evaluations regarding one's life circumstances. Life satisfaction of university students has become an important issue for school administrators (Diener & Larsen, 1993). Improving the life satisfaction of university students should help reduce the risks of physical injury and mental disorder among students (Valois et al, 2006). As stated earlier, another psychological construct that influences academic achievement in universities is self-efficacy.

As stated earlier, another psychological construct that influences academic achievement in universities is self-efficacy. Self-efficacy is the confidence students have in their abilities to successfully perform specific academic tasks (Bandura, 1997), plays a crucial role in student performance. Self-efficacy is a critical factor that can significantly impact children's academic performance and learning outcomes. For example, (Pajares & Miller, 1994) highlighted that students' self-efficacy reflects their belief in their ability to successfully complete a given task. As a result, self-efficacy and the academic task, environment, or scenario are directly associated. Self-efficacy plays a crucial role in educational settings by influencing student motivation, perseverance, and resilience in overcoming challenges.

Research has shown that higher self-efficacy is associated with enhanced academic performance, as students with strong self-beliefs tend to adopt effective study habits and are more inclined to seek assistance when required (Schunk & Zimmerman, 2008). Studies have consistently demonstrated that self-efficacy is a strong predictor of academic success in students. As Abebe et al., (2021) reported that students with elevated self-efficacy levels are not only achieved better grades but also demonstrated greater persistence in overcoming academic challenges.

On top of this, as to sex difference in life satisfaction, various Studies revealed the presences of significant differences in life satisfaction between male and female students. Diener et al. (2018) and Keng et al. (2019) found that female students often report lower levels of life satisfaction compared to their male counterparts. These differences in life satisfaction may be influenced by societal expectations that dictate gender roles and the challenges of balancing academic responsibilities with personal life. In the context of Ethiopia, cultural norms can further amplify these disparities. Female students often face additional societal pressures related to traditional gender roles, which can negatively impact their overall life satisfaction (Alemayehu & Tadesse,

2020). Gender, intersecting with other factors such as socio-economic status, adds layers of complexity to this issue.

Regarding sex difference in self-efficacy, male students generally exhibit higher levels of self-efficacy compared to female students. Factors such as confidence levels developed through educational experiences and societal reinforcement of gender roles can explain this disparity (Schunk & Zimmerman, 2008). In Ethiopia, studies suggest that female students may experience lower self-efficacy due to systemic obstacles, including restricted availability of resources and mentorship opportunities (Abebe & Hailu, 2021). These obstacles can impede their academic performance and erode their confidence in their abilities.

1.2. The Nature of Life Satisfaction among University Students

According to Diener et al. (2010), life satisfaction is the degree to which an individual feels satisfied with the overall quality of their life. Numerous studies have shown that among university students, high life satisfaction and a lack of psychological distress play a significant role in fostering academic progress and student engagement (Antaramian, 2015; Renshaw & Cohen, 2014). Furthermore, studies by Duffy, Allan, & Bott (2012) and Ojeda, Flores, and Navarro (2011) indicate that college students with high life satisfaction also typically have higher levels of academic satisfaction.

Additionally, according to Ojeda et al. (2011) & O'Sullivan (2011), life satisfaction is linked to lower academic stress, more positive academic expectations, higher academic self-efficacy, and stronger perceived progress toward goals. A university curriculum that incorporates well-being for students is more likely to prevent melancholy, encourage life satisfaction, spark collective concern, sustain creativity, adopt learning, and even increase academic achievement, according to Waters (2014). In the context of positive education, "life satisfaction" refers to the enhancement of individuals' quality of life, enabling them to live contentedly and in alignment with human values.

Life satisfaction encompasses five dimensions: family, school, friends, self, and living environment. The items in the family domain assess respondents' satisfaction levels regarding their relationships with family members and within the family unit. The school domain items evaluate respondents' satisfaction with school life, including aspects related to interest, learning, and educational activities. The friends' domain items aim to assess teenagers' satisfaction levels with their peers. The self-domain items measure respondents' satisfaction with themselves and how

others perceive them. The living environment domain questions assess respondents' satisfaction with their immediate neighborhood and the individuals residing there (Galíndez & Casas, 2011).

1.3. The Nature of Self efficacy among University Students

Bandura's Social Learning Theory (1977, 1986) is the primary theory on which this research is based. This theory emphasizes the interaction between behavior and environment, highlighting the behavior patterns individuals develop, such as problem-solving strategies, to adapt to their environment instead of relying on instinctual drives. Models of behavior can be developed through face-to-face experiences or by observing the responses of others, which serve as observational learning experiences that shape individual behavior patterns. This theory claims that we learn how to behave by adapting ourselves to pre-existing models. Therefore, a child can effectively learn to adapt to new behaviors by observing others, showcasing the influential role of observational learning in behavior adaptation. As Bandura puts it (1986), self-efficacy refers to personal confidence in one's abilities for the successful accomplishment of a certain task. Self-efficacy beliefs are significant influential factors in whether individuals will expend effort on a task and continue to cope with difficulty. Individuals with a high level of self-efficacy are more likely to take on challenging tasks and persevere through difficulties, whereas those with low self-efficacy tend to give up easily in the face of obstacles.

In conclusion, student-related factors such as self-efficacy and life satisfaction play a crucial role in determining academic success in higher education by influencing motivation, persistence, and overall well-being. The interaction of these concepts emphasizes the importance of addressing both psychological well-being and individual perceptions of one's skills within educational frameworks. Therefore, fostering both life satisfaction and self-efficacy could create a synergistic effect that enhances academic achievement.

Thus, conducting study in the area to evaluate the influence of life satisfaction and self-efficacy on academic achievement among Ethiopian higher education students seems imperative in this connection.

1.4. Statement of the Problem

Academic achievement is a multifaceted construct influenced by various psychological and environmental factors. Among these, life satisfaction and general self-efficacy have emerged as critical psychological factors. Since academic success can have a pivotal impact on one's standing

in society, it is crucial to understand what factors can influence it. It is generally known that both cognitive and affective factors are the basic determinants of academic achievement (Mehrens & Lehmann, 1969). In line with this, Entwistle (1972) & Conger (1991) reported that a significant proportion of students' academic achievement is influenced by non-cognitive variables such as attitude, personality, motivation, self-concept, life satisfaction, and self-efficacy beliefs.

Research on the relationship between self-efficacy and specific aspects of academic achievement, such as exam performance or graduation rates, has been limited in non-Western settings like Ethiopia. While life satisfaction and self-efficacy are important factors in education, research on these links within Ethiopian universities is lacking. The absence of localized research underscores the pressing need for further exploration to enhance educational practices and student outcomes. At Wolaita Sodo University, implementing successful teaching methods and student support systems requires an understanding of how these two constructs interaction and their influence on academic achievement. Despite the expanding literature on academic achievement, there is still a sizable gap in empirical studies examining the relationship of academic achievement to self-efficacy and life satisfaction among Ethiopian undergraduate students. This study aims to narrow the gap in understanding the relationship of academic achievement with self-efficacy and life satisfaction among Ethiopian undergraduate students by conducting a comprehensive analysis of their interplay and implications for educational success.

In the Ethiopian context, the independent study of the two variables (life satisfaction and self-efficacy) alongside other factors has led to fragmented insights into their individual contributions to academic achievement. For instance: Yalew, (1996) conducted study on the role of Sense of Efficacy and Self-perception of Teaching Roles in Achievement Behavior. Similarly, Shimelis & Demeke, (2017) reported the influence of Academic Self-Efficacy, Self-Concept, and Goal Orientation on Academic Achievement. Besides, Nigist, Zewdie, & Yohannes (2013) examined the relation between Life Satisfaction and Risky Behaviors. Thus, all these studies did not indicate the interactive role of self-efficacy and life satisfaction on academic achievement.

Although academic achievement is often studied in relation to other variables, the joint investigation of these issues is uncommon. These and related issues motivate the researcher to conduct the study. This study aimed at exploring the relationships of students' life satisfaction and self-efficacy to academic achievement. Accordingly, this study tried to answer the following research questions:

2. Methods

2.1. Research Approach and Design

This study employed a mixed-method research approach. Mixed research method, as defined by Creswell and Plano Clark (2007), involves gathering, analyzing, and interpreting both quantitative and qualitative data in a single study or a series of studies focusing on the same phenomena. In this study, a mixed- research approach with descriptive and concurrent design, a specific approach within mixed method research, was utilized. Concurrent triangulation is a mixed research technique that integrates quantitative and qualitative data to cross-validate or corroborate findings from multiple sources (Creswell, 2003). Following this approach, data collection and analysis of both quantitative and qualitative data were conducted independently, concurrently and later integrated during the interpretation phase.

2.2. Population, Sample Size and Sampling Technique

The target population of this study was all first-year students of Wolaita Sodo University. But the sample members of the study were students in the College of Education and Behavioral Sciences at Wolaita Sodo University in the 2022/23 academic year. The participants included 104 students (56 male and 48 female students). All first-year students from all departments of the college were included in this study. The research participants were divided into two groups based on their sex for analysis purpose. Due to the manageable total number of participants, the researcher decided to include all students and utilized a census sampling method to ensure comprehensive data collection.

2.3. Instruments of Data Collection

For this study, the researcher collected primary and secondary data. Primary data were collected through self-administered Likert Scale questionnaires measuring life satisfaction and self-efficacy; semi-structured interviews were conducted with students. The secondary data, which included the average academic achievement scores of students, were obtained directly from the college registrar's office to check the authenticity of the recorded GPA by students in the questionnaire.

Students' life satisfaction was measured using an adapted scale from Huebner (1994); the scale consists of 40 Likert Scale items with a range of 1 (strongly disagree) to 6 (strongly agree), with a reliability index of α = 0.79. The General Self-Efficacy Scale, developed by Schwarzer and Jerusalem (1995), was used to assess individuals' positive beliefs in dealing with challenging life situations. It consists of 10 Likert items, the sum of which yields a final composite score ranging

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from 10 to 40. All items were rated on a 4-point Likert Scale ranging from 1 (not at all true) to 4 (exactly true), with a reliability index of $\alpha = 0.76$.

To check the face and content validity of the two instruments, two educational psychology experts were consulted, and their feedback was considered. Therefore, the two instruments were validated and proven reliable, leading to the commencement of the final data collection. To assess students' academic performance, cumulative grade point averages (GPA) of two semesters directly sourced from the registrars' offices of the colleges attended by the respondents.

The study focused on maintaining the validity of a semi-structured interview guide, following a comprehensive review of related literature and evaluation by experts. To ensure qualitative trustworthiness, the study adhered to four criteria: credibility (internal validity), transferability (external validity), dependability (reliability), and conformability (objectivity).

2.4. Data Collection Procedures

With the supportive letter from the department head of Psychology and the permission of the College of Education and Behavioral Science Registrar, the average academic achievement scores of the research participants were obtained from the college registrar's office. After a brief orientation provided, only students who were willingly to participate in the study were given the questionnaire to complete in class, and this was how the primary data was gathered. Participants read an informed consent script outlining the research study's objectives, procedures, and voluntary nature.

The students completed two sections of the questionnaire: one for demographic variables, and another for ranking their level of self-efficacy and life satisfaction. The data-gathering tool was distributed to 119 students. Four students did not submit demographic data, and 11 students did not complete the questionnaire as instructed on the first page. As a result, 15 individuals were excluded for not providing demographic data or completing the questionnaire as instructed, leaving a final sample of 104 students. In the qualitative section, six students participated to provide in-depth insights into their experiences and perceptions regarding the mechanisms they have been using to improve their life satisfaction and self-efficacy.

2.5. Methods of Data Analysis

Quantitative data were analyzed using both descriptive and inferential statistics. Descriptive statistics, including means and standard deviations, were used, while inferential statistics,

specifically the t-test for independent samples, compared the mean life satisfaction, self-efficacy, and academic achievement scores of male and female students. The Pearson product-moment correlation coefficient examined the relationships among the independent and dependent variables. The relative contributions of the independent variables, life satisfaction and self-efficacy, to the dependent variable, academic achievement, were ascertained by multiple linear regression analysis. The following assumptions were verified before the analysis began: the independent variables were not collinear, and the scatter plots were normal, homoscedastic, and linear. The alpha threshold for each statistical test used in this investigation was set at 0.05.

The qualitative data were analyzed using thematic analysis, a method used to identify, analyze, and report patterns (themes) in qualitative data. This method was selected for its effectiveness in uncovering meaningful insights from one-on-one interviews. According to Braun and Clarke (2006), thematic analysis can be approached from a constructionist viewpoint, exploring societal discourses' role in shaping events, meanings, and experiences, or from an essentialist or realist perspective, focusing on participants' actual experiences and meanings. This study employed the realist perspective.

3. Results

The study participants' socio-demographic variables, the relationship and influence of independent variables (life satisfaction and self-efficacy) on the dependent variable (students' academic achievement) were analyzed and interpreted here. The detailed results of the qualitative data analysis focused on themes related to students' experiences with the techniques they used to enhance their sense of self-efficacy and life satisfaction was treated here.

The findings of the study were discussed in line with the existing literature. The main conclusions were drawn from the findings of the study and recommendations were forwarded.

3.1. Socio-demographic Characteristics of Respondents

The following table shows background variables for the respondents' sex.

Table 1: Respondent characteristics in terms of sex (N = 104)

Variable	Categories	N	%
Sex	Male	56	54%

Female	48	46%	

As depicted in table1, the data indicate a distribution of participants based on sex, with 56 males (54%) and 48 females (46%). This implies a slight predominance of males over females in the sample studied. The percentage values suggest that the sample is relatively balanced but leans towards a male majority.

3.2. Results of quantitative strand

The quantitative data were analyzed focusing on the basic research questions.to do so, the mean and standard deviation of the variables under considerations are presented in table 2 below.

Table 2: The Mean and Standard deviation of study variables (N=104)

Variables	N	Mean	Std. Deviation
Life satisfaction	104	32.28	6.415
General Self-efficacy	104	26.71	8.11
Academic achievement	104	2.80	0.35

Table 2 shows that, on average, participants reported a life satisfaction score of 32.28, with a standard deviation of 6.415, indicating moderate response variability. While some students report high levels of life satisfaction, others may report considerably lower levels, as suggested by the standard deviation. With a standard deviation of 8.11 and an average self-efficacy score of 26.71, students' perceptions of their own self-efficacy appear to vary somewhat. With a standard deviation of 8.11, self-efficacy scores are more widely distributed than life satisfaction, indicating a wider range of perspectives on people's capacity to meet objectives and overcome obstacles.

The average academic achievement score of the participants is 2.80, with a lower standard deviation of 0.35, indicating that most scores are relatively close to the mean. A standard deviation of only 0.35 indicates that academic achievement scores are relatively clustered around the mean, suggesting that most students perform similarly with less variability in their academic outcomes compared to self-efficacy. The table suggests a moderate level of life satisfaction and self-efficacy among participants, while academic achievement is relatively high but with less variability.

3.2.1. The correlation results

Table 3: Correlation of Life Satisfaction, Self-Efficacy, and Academic Achievement (N=104)

Variables	LS	SE	AA
Life satisfaction(LS)	1		
Self-efficacy (SE)	.43[**]	1	
Academic achievement(AA)	.801[**]	.64[**]	1

As revealed in Table 3, there is a strong positive relationship between students' life satisfaction and their academic achievement (r = 0.801, p < .01). This suggests that higher life satisfaction leads to better academic achievement and may play a significant role in students' academic scores. Similarly, Table 3 demonstrates that higher self-efficacy is associated with better academic achievement scores (r = 0.64, p < .01). This implies that students with high academic self-efficacy score better in their learning. Conversely, students with low self-efficacy tend to attain lower academic scores.

3.2.2. Multiple Regression results: Predictive values of independent variables on GPA

The predictive roles of the independent variables on academic achievement of students were explored using multiple regression approach for the reason that the independent variables (life satisfaction domains and self-efficacy) have significant correlation with the dependent variable (academic achievement).so, to indicate the extent of contributions of the independent variables in predicting academic achievement, regression analysis was done and the results are presented in table 4 below.

Table 4: Multiple regression on the prediction of academic achievement from life satisfaction domains and self-efficacy (N = 104).

Variables	Unstandardized (β)	Std. Error	Standardized (β)	t	p
(Constant)	67.460	5.847		11.538	.000
Self	.334	.111	.234	3.098	.002
L.envt.	-.018	.106	-.014	-.170	.866
Family	.132	.145	.075	.913	.362
University	.359	.112	.255	3.212	.002
Friends	.359	.101	.179	2.511	.003
Self-efficacy	.530	.048	.483	11.1	.003
R=.348					

R^2= .121

F(6, 97) =6.653, p=.000

a. *Dependent Variable: academic achievement*

As seen in Table 4, multiple linear regressions were used to ascertain the combined impacts of life satisfaction domains and self-efficacy on students' academic achievement. The goal was to determine the total contribution strength of the predictor variables to the dependent variable and to pinpoint the independent variables that most effectively account for variations in students' academic achievements.

Variation in academic scores was determined by CGPA, explained by the combined effect of the independent variables (the five domains of life satisfaction: self, living environment, family, university, and friends, and self-efficacy) included in the regression analysis. The results show that the combined effect of all these independent variables on student academic achievement is statistically significant (R^2 = .121, F6, 97 = 6.653, p < .000). This implies that the independent variables together account for 12.1% of the difference in students' academic achievement. This suggests that other factors not included in the model may influence academic achievement by around 88%.

Table 4 also reveals the independent contribution of each predictor variable to the dependent variable. Self-efficacy (β = .483, p = .003) was the strongest predictor of students' academic achievement, followed by university domain (β = .255, p = .002), self-perception (β = .234, p = .002), and friends domain or relationship with peers (β = .179, p = .003). Here, it can be inferred that students' self-efficacy, or strong belief in their ability to succeed and accomplish academic tasks, and their resilience in the face of challenges play a significant role in their academic achievement and success. Likewise, the university domain implies students' satisfaction with university life in terms of interest, learning, educational activities, resources available (such as libraries and tutoring), and overall academic climate. A supportive university environment can enhance student learning experiences and promote success.

Similarly, students' self-domain of life satisfaction implies their assessment of their own life quality and fulfillment, particularly in relation to personal goals, values, and self-perception, which correlates with better academic outcomes. Correspondingly, the social support provided by peers is vital for academic success. Friends can offer emotional support, study partnerships, and

motivation. Positive peer relationships often foster a collaborative learning environment that can enhance understanding and retention of material, leading to better academic scores for students.

3.2.3. T-test Results on sex differences in the variables

As shown in Table 5, the independent t-test analysis revealed a statistically significant difference between male and female students' mean scores across all domains of life satisfaction (self, university, family, friends, and living environment) and general self-efficacy. Female students' mean score in self-perception (M = 22.03) was significantly higher than male students' mean score (M = 18.96). This indicates that female students, with a higher mean score in self-perception (M = 22.03) compared to male students (M = 18.96), prioritize their quality of life, fulfillment, personal goals, values, and self-perception more than male students. This is supported by a t-value of -2.88*, alpha = 0.05 level of significance.

Table 5 also shows that in the university domain of life satisfaction, female students' mean score (M = 19.35) is significantly higher than male students' (M = 16.2) at a significance level of 0.05, with a t-value of 3.01 and a p-value of 0.003. This suggests that female students are particularly influenced by university-related issues such as interest in courses, engagement in educational activities, access to resources like libraries and tutoring services, and the overall academic environment.

Table 5: Independent sample t - test results on sex difference in life satisfaction domains, self-efficacy and academic achievement (N = 104).

Variables	Sex	N	Descriptive statistics Mean	SD	Independent sample t –test analysis t-value	p-value
Self-domain	M	56	18.96	5.75	-2.88	0.005
	F	48	22.03	3.50		
University domain	M	56	16.26	5.29	-3.01	0.003
	F	48	19.35	4.13		
Family domain	M	56	14.91	5.22	-2.84	0.005
	F	48	17.74	3.74		
Friends domain	M	56	16.26	5.29	-3.01	0.003
	F	48	19.35	4.13		
Living environment domain	M	56	10.84	4.32	2.69	0.008
	F	48	8.68	2.68		

General self-efficacy	M	56	25	8.58	-2.21	0.0295
	F	48	28.42	7.64		
Academic achievement	M	56	2.82	.39	.374	.432
	F	48	2.79	.31		

*NB: N = Population, M = Mean, SD = Standard deviation, *P < 0.05*

Table 5 revealed that female students scored significantly higher than male students in the family domain of life satisfaction, with a mean score of 17.74 for females compared to 14.91 for males, a t-value of -2.84*, and a p-value of 0.005. This suggests that female students place a high value on their relationships with family members, which significantly impacts their overall life satisfaction. The family domain of life satisfaction includes emotional support, communication patterns, expectations from family members, and financial support. For instance, emotional support from family members can help students manage university stress, while effective communication can enhance student satisfaction.

The independent t-test analysis showed a statistically significant difference in the mean scores of male and female students in the friend's domain of life satisfaction, as shown in Table 5. In other words, the female students' mean score (M = 19.35) is significantly higher than that of the male students (M = 16.26), supported by a t-value of -3.01* and a p-value of 0.003 at a significance level of 0.05. This finding suggests that female students are more susceptible to peer pressure than male students.

Table 5 indicates a statistically significant difference between male and female students' mean scores for life satisfaction in the living environment domain. Male students scored significantly higher (M = 10.84) than female students (M = 8.68), with a t-value of 2.69* and a p-value of 0.008 at a significance level of 0.05. This suggests that male students' higher scores in the living environment domain reflect the positive influence of factors such as housing quality, social interactions, and access to resources on their overall well-being and quality of life.

Table 5 also shows a significant difference between male and female students' mean scores in general self-efficacy. The female students' mean score (M = 28.42) is significantly higher than the male students' mean score (M = 25), with a t-value of -2.21* and a p-value of 0.0295 at the 0.05 level of significance. These findings suggest that female students exhibit higher self-efficacy beliefs related to academic achievement, indicating a stronger belief in their ability to succeed and greater resilience in overcoming challenges compared to male students.

Finally, Table 5 shows no statistically significant difference between female and male students in their academic achievement scores. This indicates that male students (M = 2.82) and female students (M = 2.79) have similar academic achievement scores, with t = .374 and p = 0.432, showing no significant difference between the groups. Despite differences in other psychological and social variables, both male and female students demonstrate similar performance in academic achievement as measured by CGPA Scores.

3.3. Results of the Qualitative Strand

The finding from qualitative study also supplements the quantitative findings. Accordingly, an interview part showed that participants used different strategies to improve their life satisfaction and self-efficacy. Some typical statements raised by interviewees regarding these strategies are:

> *"I say one thing to myself: in order to have a healthy and successful life at the university, I should leave nuanced family issues to them and focus on my education rather than being overwhelmed by each and every family issue." (P1 Male).*

> *"I have my own criteria for selecting true friends. I have close friends who meet these criteria and avoid those who don't. This helps me lead a good life at the university." (P2 Male).*

> *"In order to improve my self-efficacy and life satisfaction, I discuss and work with friends who perform better than I do, and I confront relevant authorities to exercise my rights properly" (P3 Female).*

> *"I stop comparing myself with others and try to do things to my maximum effort, leaving the difficult ones. On the other hand, I ignore uncomfortable conditions rooted in my family, friends, university, and community because I believe I can't bring about any change." (P4Female)*

> *"I always lead my life with a plan, and I'm committed to implementing things as per my plan. This helps me improve my life satisfaction and self-efficacy during my stay at the university." (P5 male).*

> *"Most often, I ignore others' suggestions about my lifestyle and educational accomplishments. This helps me have a better life on campus and enables me to exert my full potential in my education." (P6 Female).*

From the finding it can be deduced that respondents employed various strategies to enhance their life satisfaction and self-efficacy. The main strategies identified were avoidance, secrecy, advocacy, and wishful thinking.

- Avoidance and withdrawal: Most respondents avoided challenges related to the university, friends, living environment, and family. For example, they refrained from inquiring about their rights on campus and left certain responsibilities to their families. They also preferred friends with similar non-challenging and carefree characteristics.

- Secrecy: Respondents also keep their weaknesses and shortcomings regarding their education and personal lives secret to survive at the university. They avoid discussing their personal lives and educational issues with friends, teachers, families, and other concerned parties.

- Advocacy and confrontation: Few respondents fight for their rights at the university and discuss issues with friends to improve life on campus and develop self-efficacy. In addition, they consult student affairs bodies and other concerned entities to create a better teaching and learning environment at the university.

- Wishful thinking The findings in this study also showed that respondents try to develop wishful thinking, such as "We will have a better life in the future if we work hard today," to escape their hopelessness and weaknesses.

4. Discussions

The study investigates the influence of life satisfaction and general self-efficacy on first-year students' academic achievement at Wolaita Sodo University, focusing on the relationship, extent, predictive domain, sex differences, and strategies used to improve these issues, referencing existing literature. This research showed that life satisfaction and general self-efficacy were positively and significantly correlated with students' academic achievement scores. In essence, students with higher levels of life satisfaction and self-efficacy have been excelling academically compared to those with lower levels of satisfaction.

As Pavot & Diener (2008) affirmed that elevated levels of life satisfaction are linked to improved academic performance. Teshome et al. (2021) discovered a similar correlation, indicating that Ethiopian university students with higher subjective well-being levels performed better academically. Likewise, Abebe & Hailu (2020) highlighted that social support systems in Ethiopian schools play a crucial role in enhancing student happiness and academic performance.

Studies by Huebner (1991) and Suldo & Shaffer (2008) also underscored comparable outcomes in their research.

On top of this, the research indicated that self-efficacy was significantly and positively related to the academic achievement scores of students. Studies conducted by Bong (2001) & Yalew E (2003) supported this result. For instance, Bong (2001) provided evidence corroborating the positive correlation between self-efficacy and academic achievement. Furthermore, Yalew (2003) conducted study at Bahir Dar University employing a rigorous methodology reported positive influence of students' self-efficacy on their academic achievement, as assessed by grade point average (GPA).

This study has shown a significant correlation between three life satisfaction domains (university, self, and friends) and the academic achievement of students. This finding is similar with the study conducted by Teshome & Yared (2020) revealing that Ethiopian university students who reported higher levels of life satisfaction in the domains of university, self, and friends achieved significantly better grades than those with lower satisfaction levels. Besides, Abate (2019) focusing on the crucial role of social support networks among Ethiopian students, reported that strong friendships led to increased life satisfaction and consequently improved academic performance. Furthermore, the observations by Smith and Jones (2021) reinforce the notion that positive friendships are linked to higher GPA scores through enhanced emotional support.

The study also reveals significant differences in life satisfaction between male and female students. Female students showed higher scores in the family, self, university, and friends domains. But, male students had higher scores only in the living environment domain. This finding contradicts to the results of Diener et al. (2018) & Keng et al. (2019), who observed that female students typically express lower levels of life satisfaction than their male peers.

At the same time, the results of this research demonstrated a significant difference between female and male students in general self-efficacy. These findings imply that female students showed significantly better self-efficacy beliefs for their academic achievement than male students. An inconsistent finding with this study was reported by Pintrich & DeGroot (1990), who showed that female students exhibit low self-efficacy in natural science subjects. Shimelis & Demeke (2017) also found a contrasting result; they discovered that female students had lower self-efficacy than their male counterpart colleagues.

The study also shows that both sexes perform similarly in academic achievement, despite differences in other psychological and social variables. In accordance to this, Alemayehu & Tadesse (2019) also noted that both sexes performed equally, indicating that sex difference does not inherently determine academic success. Likewise, Mekonnen et al., (2020) discovered no significant differences in academic achievement between male and female students at several Ethiopian universities. Furthermore, Hyde (2016) synthesized numerous studies across different countries and concluded that while there may be slight variations in specific subjects or contexts, overall academic achievement between the two sex groups tends to be similar when accounting for external factors.

5. Conclusions

Based on the findings, the following conclusions were drawn:

- There was a positive and significant relationship between students' life satisfaction, self-efficacy, and academic achievement. In other words, students with high levels of life satisfaction and general self-efficacy performed well in their academic achievement scores.

- Among the five life satisfaction domains, three were found to be the most predictive in determining students' academic achievement: the university domain, the self-domain, and the friends' domain. These were identified as the most influential components of students' academic achievement.

- The results also revealed that female students were more influenced by most life satisfaction domains than male students and demonstrated better general self-efficacy in their academic achievement than their male classmates. But, significant sex differences were not observed in the academic achievement scores of the students. This meant that both sexes performed identically in their academic tasks.

- Finally, students employ various strategies to enhance their life satisfaction and self-efficacy skills. The major strategies were voidance, secrecy, advocacy, confrontation, and wishful thinking. Besides, it was found that participants lack knowledge or awareness about appropriate mechanisms that enable to improve life satisfaction and self-efficacy skills.

6. Recommendations

Based on the conclusions made above, the following recommendations were provided:

1. Students should be equipped with knowledge and awareness to enhance life satisfaction and self-efficacy, as these factors play a crucial role in academic success. The university administration, student psycho-social support and counseling service center, gender office, and other stakeholders should collaborate to provide short-term training and awareness programs.

2. It is essential for teachers to closely monitor and mentor students to enhance their life satisfaction and general self-efficacy. By doing so, students can realize their potential to pursue their academic responsibilities.

3. Finally, the government, especially the Ministry of Education (MoE), in collaboration with universities, should implement induction and life skills training programs for students at least two times annually foster student life satisfaction and self-efficacy.

Disclose Conflicts of Interest

This paper is free of conflict of interest.

Authors' Contribution

All authors contribute equally.

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Original Article

Describing learning styles and associated demographic characteristics among university students: Implications for instructional provision in a higher education context

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Abstract

The purpose of this study was to describe students' learning styles and identify associated demographic characteristics to imply appropriate instructional provisions in a higher education setting. We employed a cross-sectional descriptive survey design. Four universities—Arbaminch, Dilla, Wachamo, and Jinka—were selected from Southern Ethiopia. Three hundred seventeen participants were chosen at random. A learning style (ILS) scale was employed. The finding shows that active, sensing, visual, and sequential learning styles are the major learning styles among students. As in bivariate and multivariate analysis, age was positively associated with reflective, intuitive, verbal, and global learning styles. However, students' sex, stream, and university were not significantly associated with their learning styles. Generally, looking into the way the learners prefer to learn, and adjusting the instructional provision to fit into their preference is vital. Periodic modification of the instructional provision is also essential as students learning styles change with their age or seniority. Finally, including more demographic and psychosocial variables to examine students' association with their learning styles is suggested for future research.

Keywords: learning styles, first-year university students, instructional provision, higher education

1. Introduction

Educational institutions primarily aim to qualify learners for market demand. Qualification is maintained in a variety of ways. Advancing the quality of learning is one way. Improving the quality of learning requires a better understanding of the learning process from the perspective of the learner (Mitiku & Seleshi, 2011). Understanding the learning process needs intensive knowledge of how students absorb instructional objectives.

Students' academic performance is another indicator that ensures the quality of student learning. Yet, it is a prevalent problem in higher education institutions—leads to dropout and academic dismissal (Ganyaupfu, 2013). Although this is a single factor for the growth of the unemployment rate and impacts one's quality of life ultimately (Parvizi et al., 2021). Ethiopian university students as well as graduates are not exceptional in such trends. Poor academic achievement, connected with a lack of academic skills, is inadequately viewed from the student's learning style perspective. Stakeholders (e.g., experts in the education system and parents of students) are questioning the quality of the teaching-learning process (Haan, 2019)—not of the students' style for learning as well as its alignment with the instructional provision.

Learning style is a vital factor affecting students' learning. The way students process, perceive, receive, and understand course information is different and largely influences their ability to succeed at school (Annual et al., 2017; Lee et al., 2016). Regardless of differences in students' learning styles, the way in which instructors teach and interact with their students is nearly the same across the globe. There are studies touching on the issue in an Ethiopian context. For example, Mihrka and Schulze (2016) explored the students learning preferences at high school and second-year university student levels and found sensing to be the major preference among second-year university students using Felder and Soloman's model (i.e., reflective, active, sensing, intuitive, visual, verbal, sequential, and global learning styles). Sahile (2022) also examined learning style preferences and its association with academic achievement of medical students at Ambo University (2nd to 5th year) and found kinesthetic being the most preferred learning style by 61.11% of students. Graduate students learning styles were also examined by Berhanu (2014) at Addis Ababa University. Accordingly, tactile was found to be the major learning style of auditory, visual, and kinesthetic learning styles (Berhanu, 2014). However, freshman students and determinants of learning style remain unaddressed in all above studies. Representativeness of sampled universities is also another concern—one university per study is not enough to give a compressive explanation on the issue under study.

Evidence regarding the students' learning style difference as a function of their demographic characteristics (e.g., sex) is also contradictory. For instance, there is a relationship between students' gender and their learning style (Marantika, 2022; Nuzhat et al., 2013); there is a gender difference among graduate students learning styles (Berhanu, 2014); and female students prefer

aural or auditory learning styles (Sarabi-Asiabar et al., 2014). However, others (e.g., Bin Eid et al., 2021; Nasution, 2019) found no significant difference between males and females in their learning styles. This means that there is limited, consistent evidence across scholars.

Inadequate evaluation of students' learning styles results in academic problems, and these problems are more prevalent among first-year university students than among their seniors. Compared to freshman students, senior students accommodate more their learning styles to the instruction provisions. Instructional designers and course instructors also tend to be more aware of accommodating students' learning styles in their instructional tactics, as they stay longer with students. Researchers (e.g., Hebat-Allah, Gabal, Rasha, Hussein, 2021; Ghanney, Appiah, & Esia-Donkoh, 2019) strongly believe that teaching practices and learning styles determine students' academic achievement; thus, instructors should recognize students' learning styles, accept individual differences among students in their learning styles, and apply instructions that best suit students' learning styles. Therefore, this research project identified the distribution of students' learning styles and examined the students demographic characteristics (e.g., age, sex, university, and stream) associated with their learning styles.

2. Theoretical orientation

The Felder and Soloman's (2005) learning style model was used in this study. It has four dimensions, each with dichotomous learning styles: (1) perceiving, *sensing* (concrete and practical oriented toward facts and learning procedures) vs *intuitive* (abstract and innovative oriented toward theories and underlying meanings); (2) receiving, *visual* (preferring visual representations of presented material, such as pictures, diagrams and flow charts) vs *verbal* (preferring written and spoken explanations); (3) processing, *active* (learning by trying things and learning by enjoying working in groups) vs *reflective* (learning by thinking through and preferring working alone or with a single familiar partner); and finally, (4) understanding, *sequential* (linear thinking process, learning in small incremental steps) vs *global* (holistic thinking process, learning in large leaps) (Ghanney & Esia-Donkoh, 2019; Annual et al., 2017; Yeung et al., 2005).

We preferred the model over others due to the following reasons: (1) it is has more inclusive nature - incorporates the Grasha and Riechmann's (1994) six learning styles – competitive vs cooperative, avoidant vs participatory, and dependent vs independent (Dalmolin et al., 2018); (2) it has wide application, detailed descriptions, and high tested reliability and validity compared with other

models of learning styles (Hamada & Hassan, 2017); and (3) it better fits for higher education learners than Shindler and Yang's (2002) model which classifies learning style based on Myers-Briggs Type Indicator (MBTI) personality preference - extravert vs. introvert, intuitive vs. sensing, thinking vs. feeling, perceiving vs. judging. Shindler and Yang's orientation was also criticized for a lack of clearly specifying learners' age (i.e., it is designed for learners of 8- or more-year-old schoolchildren).

A single learner can have either or all of those learning styles with one dominant style (Marantika, 2022; LdPride, 2008). For this reason, multimodal learning style learners have more opportunities to perceive, interact with, and respond to different learning environments and instructional provisions (Cohen et al., 2010). Therefore, these learning styles are required to be calibrated into the way the instruction is provided, and the flexibility of instructors with the learning styles of the learners yields a better academic outcome.

3. Methods

3.1. Study design and setting

We employed a cross-sectional descriptive survey design, and the data were gathered from the target population at a single time across the sampled universities. Students were randomly selected from the southern part of the country. We categorized the eight universities on the basis of year of establishment, and four were randomly selected. These included Arbaminch, Dilla, Wachamo, and Jinka Universities.

3.2. Participants and sampling

Since this study is part of the major theme study "instructors' teaching practices and students' learning styles as determinants of academic achievement," the potential participants were all first-year university students who obtained first-semester academic status. The total sample size was determined via Draper and Smith's (1998) formula for the non-single population, as cited in Tefera and Ahmed (2015). Sample size (n) is a function of the factors and categories involved in research, as Draper and Smith implied. A minimum of 10 observations is required for each category of a factor. Typically, the sample size (*n*) is calculated as $10 \left[C_{nf1} \, x \, C_{nf2} \, x \, C_{nf3} \, \ldots . x \, C_{fn} \right]$.

Where:
n = sample

Cf_1 - number of categories of factor 1

Cf_2 - number of categories of factor 2

Cf_3 - number of categories of factor 3

Cf_n - number of categories of factor n

The three factors identified in our potential participants included sex (with 2 categories—male and female), stream (with 2 categories—natural science and social science), and university (with 4 categories—Arbaminch, Dilla, Wachamo, and Jinka). Hence, the minimum total sample size is 160. Assuming a small number of factors and a non-response rate, we doubled the sample size. Following the determination of the total sample size, a proportional number of participants were drawn from the four universities via Kothari's (2004) formula, nh = (Nh/N) *n

Where

N = represents the entire population size

Nh= represents the population size for the hth stratum

nh= represents the sample size, and n is the sample size.

Hence, the total population across the sampled universities was 9,343. With the determined sample size of 320, we proportionally selected 93, 84, 73, and 70 students from Arbaminch University, Dilla University, Wachamo University, and Jinka University out of the total population of 2,719, 2,450, 2,118, and 2,056, respectively.

3.3. Data collection tool

The students' learning styles were measured by adapting the Felder-Silverman (1988) Index of Learning Style (ILS) scale. The scale is designed for technology-enhanced and traditional learning settings (Graf, Viola, Leo, & Kinshuk, 2007) to promote effective learning (Ozerem, 2015). It has simple, easy-to-use, and wide applicability (Park & Merlot, 2014) and good validity and reliability, with a Cronbach's alpha of .6 for 288 Polytechnic Malaysian students (Hamada & Hassan, 2017; Omar et al., 2015) and .56 to .77 for Litzinger et al. (2005).

ILS has 4 bipolar continua in the processing (active-reflective), perception (sensing-intuitive), receiving/input (visual-verbal), and understanding (sequential-global) dimensions. The active style examined students' preferences for learning by trying out and enjoying working in groups. While reflective measures students' preference for learning by thinking things through, they prefer

working independently or with a single familiar partner. Sensing style tests students' preferences for learning through concrete thinking and practical, factual, and procedural methods.

However, the intuitive style assesses students' preferences for learning through abstract thinking, innovative methods, theories, and underlying meanings. Students with visual styles prefer visual representations of learning materials (e.g., pictures, diagrams, and flow charts). In contrast, students with verbal styles prefer written and spoken explanations. Sequential-style learners prefer a linear thinking process and learn in small incremental steps. However, global learners prefer a holistic thinking process and learn in large leaps (Felder & Spurlin, 2005; Felder & Silverman, 1988) (Table 1).

Table 1: Index of learning styles (ILS)

Dimension	Learning style	Item Group	Questions
Processing	Active	Trying something out	1, 5, 17, 25, 29
		Social oriented	9, 13, 21, 33, 37, 41
	Reflective	Think about material	
		Impersonal oriented	
Perception	Sensing	Existing ways	2, 30, 34
		Concrete material	6, 10, 14, 18, 26, 38
		Careful with details	22, 42
	Intuitive	New ways	
		Abstract material	
		Not careful with detail	
Receiving/input	Visual	Pictures	3, 7, 11, 15, 19, 23,
	Verbal	Spoken words	27, 31, 35, 39, 43
		Written words	
		Difficulty with visual style	
Understanding	Sequential	Detail oriented	4, 28, 40
		Sequential progress	20, 24, 32, 36, 44
		From parts to the whole	8, 12, 16
	Global	Overall picture	
		Non-sequential progress	
		Relations/connections	

For 11 items per dimension, the ILS has a total of 44 items that measure how students process, perceive, receive, and understand instructional information. A single learner has a relative preference along each of the four dimensions but can learn to function in the other directions. The participants gave their preference by choosing one of two endings to a sentence that focused on some aspect of learning. Sample item include "I understand something better after I (a) try it out,

(b) think it through." Each question of the scale option 'a' represents the first continuum of learning preference, and option 'b' represents the second continuum of learning styles (Jiraporncharoen et al., 2015; Omar et al., 2015).

3.4. Procedures

3.4.1. Instrument validation

Researchers have used different subject matter experts (SMEs) to evaluate the relevance of items measuring the construct. For example, Mehari (2022a; 2022b) involved a panel of ten, and Mehari et al. (2024) employed a panel of nine experts and produced valid evaluation scores. Five to ten experts are suggested in most literature (e.g., Lynn, 1986). Therefore, we fulfilled the minimum requirement and purposefully selected five experienced experts. A Lawshe's (1975) statistical approach content validity evaluation method was used to evaluate the relevance of each as well as overall items in measuring the construct. The computational formula is presented as follows:

$$CVR = (ne - N / 2)/(N / 2)$$

CVR = content validity ratio

ne = number of panellists pointing to the item as 'essential.'

N = total number of panelists

The panelists were ranked via a three-point rating system (1 for not essential, 2 for useful but not essential, and 3 for essential). The value of the CVR ranges between -1 and +1. If the value is positive (1), the item is deemed acceptable and clear; if it is negative (2), it should be reworded, modified, or rejected; and if 50% of the panellists of N size assess the item as essential (3), it is deemed necessary and legitimate (Lewashe, 1975).

The CVR for 44 items was one (adjusted to .99 for ease of manipulation), which satisfied the acceptable range ≥.78 (Polit et al., 2007) and more panelists (beyond 50%) perceive an item as ''essential'', the greater the extent or degree of its content validity (Gilbert & Prion, 2016).

The reported CVR to determine the validity of individual items, as rated by a panel of content experts, providing a numeric value for the overall mean of all items in the scale via the content validity index (CVI) statistical technique is also important. Therefore, the score content validity index average (S-CVI/Ave) proportion of relevance of items across experts was .99, exceeding the ≥ .70 (Tilden et al., 1990) or ≥ .8 (Davis, 1992).

3.4.2. Scoring

The students' learning style score ranges from 1 to 11 per dimension. The responses for each item were 1 or -1. For example, if a student prefers an active style in one question of the "active-reflective" dimension, a score of 1 is added to the active dimension, where 1 is subtracted from the reflective style score. For each of the four scales, the smaller total is subtracted from the larger one. This means that if a student scored a total of 3 for "a" and 8 for "b," it was calculated as 5b. Therefore, the scoring for each domain of the learning style is divided into three with two polarities. A score between 1 and 3 represented "balanced." learning style; a score between 5 and 7 indicated "moderate preference and a score between 9 and 11 indicated "strong preference" (Jiraporncharoen et al., 2015).

11a   9a   7a   5a   3a   1a ! 1b   3b   5b   7b   9b   11b

The degree of preference for each dimension is just the algebraic sum of all values of the answers to the eleven questions, as presented in the following equation:

$$Dim \sum_{i=1}^{11} qi^{Dim}$$

Dim - set of dimensions that embrace four pairs of dimensions: active-reflective, sensory-intuitive, visual-verbal, sequential-global

i the vector of indexes composed of (iA/R, iS/I, iV/V, iS/G) describes the attributes in each dimension.

q is the sum of questions belonging to each dimension; thus, Q = (q1, q2,…, q11), and each qi indicates the contribution given by the i-th question within the 11 questions for each Dim to detect whether preference 1 or -1 is substituted into qi. Thus, a student's academic achievement is given a CGPA score of 4 points.

3.4.3. Data collection procedure

Well-experienced research assistants (4) and data collectors (4) were purposefully selected, oriented, randomly assigned, and contacted freshman program dean offices and student group representatives at each sampled university. In cooperation with the student group representatives,

orientations were given to potential participants. Using a random lottery method, questionnaires were administered to willing participants in the classroom setting.

3.4.4. Data analysis

Microsoft Excel 2013 and SPSS-23 were used to manage the data. Before the data analysis, data screening and frequency counting were performed to check the accuracy of proper data entry. Descriptive statistics were used to determine the distribution and level of students' learning styles. Univariate and multivariate multinomial regressions were performed to examine the demographic characteristics associated with students' learning styles. Factors associated with the learning styles in the univariate analysis with p values < 0.2 were included in the multivariable model so that we can limit the potential risk of over adjustment without compromising the identification of potential factors for the learning styles. Crude and adjusted ratios at 95% confidence intervals were used to estimate the strength of potential factor associations with the outcome variables. An alpha value of 0.05 was set for all the statistical tests.

3.5. Ethics and consent

The Center for Educational Research, along with the Office of Research and Dissemination and the Office of Vice President for Research and Technology Transfer at Dilla University, have ensured that the issue under investigation complies with academic research criteria and ethical standards on 13/01/2023 (DU/164/2023). Representatives from the Center for Educational Research, the Office of Research and Dissemination, and the Office of Vice President for Research and Technology Transfer at Dilla University approved the unharmed effect of the data collection tool, assumed the number of participants, and confirmed that collecting verbal consent from participants is sufficient for the present study.

Potential participants were briefed about the aim of the study and the nature of the instrument. Informed consent was obtained from the participants. The confidentiality of the participants was protected by avoiding mentioning their names and other relevant identifiers during the data collection and reporting procedures.

4. Results

4.1. Students' demographic characteristics

Table 2 shows the proportions of participants from each study site. Three response questionnaires from Arbaminch University participants (2) and Wachamo University participants (1) were removed because of inappropriate and incomplete responses. Among the distributed questionnaire sheets, 99.06% were useful for analysis, indicating a very good response rate.

A total of 317 students were proportionally selected from each stratum: Arbaminch (28.4%), Dilla (26.5%), Wachamo (22.7%), and Jinka (22.1%). Both natural science stream students (59.9%) and social science stream students (40.1%) participated. More than half (54.6%) were male, and 45.4% were female. The age of the participants ranged between 18 and 25 years, with a mean of 21.28 years and a standard deviation of 1.65 years. The CGPA also ranged between 1.72 and 3.93, with a mean of 3.13 and a standard deviation of 0.52.

Table 2: Students' socio-demographic characteristics *(N = 317)*

Variables	Label	Number (%)	Mean (SD)
Universities	Arbaminch	91 (28.4%)	
	Dilla	84 (26.5%)	
	Wachamo	72 (22.7%)	
	Jinka	70 (22.1%)	
Stream	NSS	190 (59.9%)	
	SSS	127 (40.1%)	
Sex	Male	173 (54.6%)	
	Female	144 (45.4%)	
Age	Max.	25	21.28 (1.65)
	Min.	18	
CGPA	Max.	3.93	3.13 (.52)
	Min.	1.72	

NSS Natural Science Stream*, SSS* Social Science Stream*, SD* Standard Deviation

4.2. Learning style distribution across demographic factors

A cross-tabular distribution of students' learning styles on the basis of their demographic characteristics was performed, as shown in Table 3. The results indicated that more active (27.76%), reflective (26.81%), visual (24.92%), verbal (29.65%), sequential (27.13%), and global learning styles (27.44%) were distributed among male students than female students. However, more females are inclined to be more intuitive (28.71%). In terms of learning style, both sexes show equal learning preferences (25.87%). With respect to the student stream, most natural science stream

students are inclined to be active in 102 (32.18%), reflective (27.76%), sensing (27.44%), intuitive (32.49%), visual (29.34%), verbal (30.6%), sequential (30.6%), and global learning styles (29.34%).

Table 3: Learning style distribution across demographic factors

Variables	Categories	Outcome variable: Learning style							
		A (%)	R (%)	Sen (%)	I (%)	Vi (%)	Ve (%)	Seq (%)	G (%)
Sex	F	70(22.08)	74(23.34)	82(25.87)	91(28.71)	61(19.24)	83(26.18)	65(20.5)	79(24.92)
	M	88(27.76)	85(26.81)	82(25.87)	88(27.76)	79(24.92)	94(29.65)	86(27.13)	87(27.44)
Stream	SSS	56(17.67)	71(22.4)	51(16.09)	76(23.97)	54(17.03)	73(23.03)	54(17.03)	73(23.03)
	NSS	102(32.18)	88(27.76)	87(27.44)	103(32.49)	93(29.34)	97(30.60)	97(30.6)	93(29.34)
University	JU	37(11.67)	33(10.41)	32(10.09)	38(11.99)	31(9.78)	39(12.30)	35(11.04)	35(11.04)
	AMU	50(15.77)	40(12.62)	44(13.88)	46(14.51)	45(14.2)	45(14.2)	48(15.14)	42(13.25)
	DU	43(13.56)	41(12.93)	38(11.99)	46(14.51)	39(12.29)	45(14.2)	42(13.25)	42(13.25)
	WU	28(8.83)	45(14.2)	24(7.57)	49(15.46)	25(7.89)	48(15.14)	26(8.2)	47(14.83)
Age	Mean±SD	.51±.50	.55±.50	.57±.49	.49±.50	.56±.49	.50±.5	.53±.49	.53±.45

F *female,* M *male,* SSS *social science stream*, NSS *natural science stream*, JU *Jinka University*, AMU *Arbaminch University* DU *Dilla University* WU *Wachamo University, A* active, *R* refelective, *Sen* sensing, *I* intuitive, *Vi* visual, *Ve* verbal, *Seq* sequential, *G* global

4.2. Students' learning style distribution

As depicted in Figure 1 below, slightly more than half of the participants were active learners (50.5%), sensing learners (56.5%), visual learners (55.8%), or sequential learners (52.4%). In other words, slightly more than half of the learners preferred active, sensing, visual, and sequential learning styles than reflective (49.5%), intuitive (43.5%), verbal (44.2%), and global (47.6%) learning styles, respectively. This implies that most of the respondents prefer to learn by trying something that they learned in the course material, practically doing and observing facts, using visual inputs such as drawings, pictures, and diagrams, and using step-by-step procedures. On the other hand, they prefer learning less through thinking and intuitively processing information about the learning material, one-way auditory learning from the teacher to the student, and creating an overall picture of the subject matter.

More students' learning styles fall into the active-reflective dimension (mean = 1.30 and SD = 7.18), followed by the sequential-global dimension (mean = .56 and SD = 8.33), the visual-verbal dimension (mean = -.104 and SD = 7.93), and the sensing-intuitive dimension (mean = -.69 and SD = 8.11).

With respect to the level of learning styles, the majority (32.2%) were balanced active-reflective learners, followed by sequential-global (24.6%), visual-verbal (20.2%), and sensing-intuitive balanced dimensions (12.5%). At the moderate level, most students were sensing (22.4%), visual (20.8%), active (17%), sequential (13.9%), intuitive (12.3%), verbal (10.1%), reflective (8.5%), and global (7.9%). At the high level, the majority (31.2%) of the learners were highly global, followed by reflective (30.6%), sensing (28.1%), verbal (26.1%), intuitive (24.3%), visual (22.7%), sequential (22.4%), and active (11.7%) learners. Overall, active-reflective balanced learners (32.2%) outperform other balanced, moderate, and high-level learners (see Figure 2). These findings indicate that students are multimodal in their learning styles.
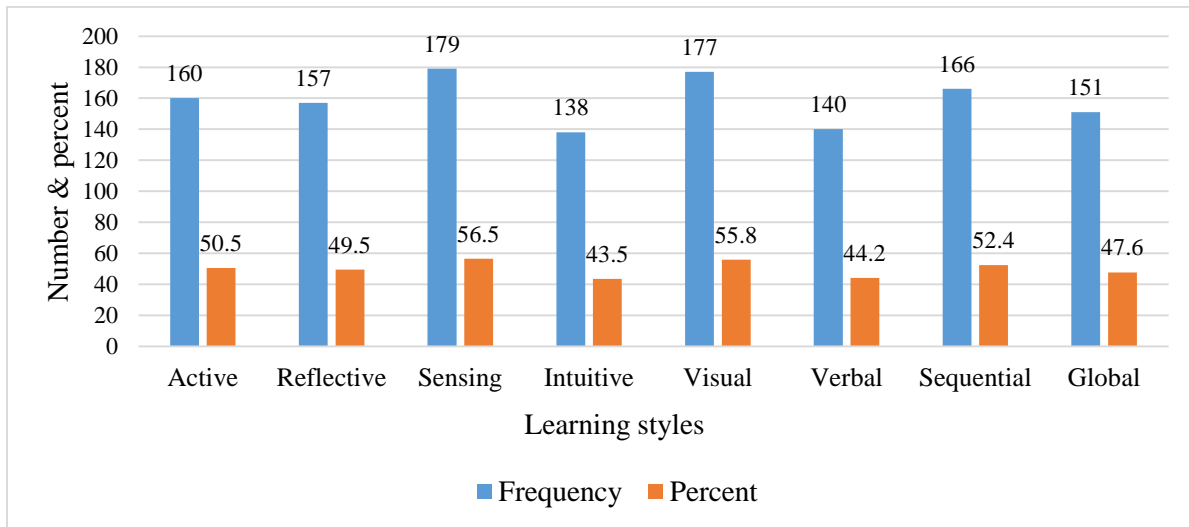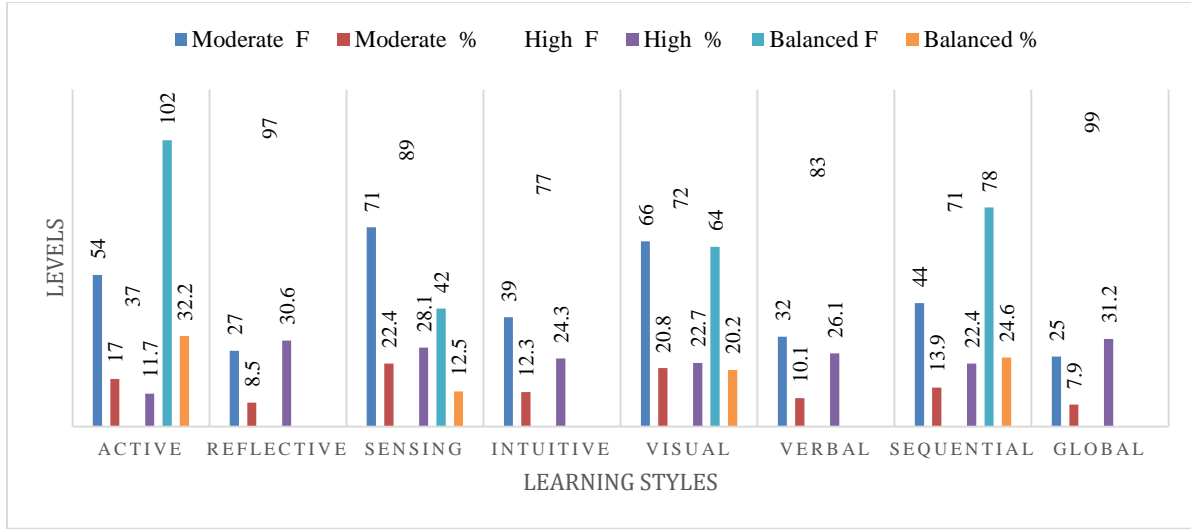

Figure 1: Level of students' learning styles

F frequency, *%* percent

Figure 2: Distribution of students' learning style levels

4.3. Factors associated with learning styles

4.3.1. Assumptions of multinomial logistic regression

Various assumptions were tested for logistic regression analysis. For example, the first assumption is that the response variable must be binary or a dummy. The second assumption is that the observations must be independent, the sample size must be sufficiently large (at least 10 records per predictor variable), and there must be a non-multicollinearity effect. Accordingly, the response variable (i.e., learning style) was a binary variable, the observations were independent, and the sample size was sufficiently large ($n = 317$).

4.3.2. Demographic characteristics associated with learning styles

The results from both the univariate and multivariate multinomial logistic regression models of learning styles are presented in Table 4. According to the univariate analysis, only age was significantly associated with learning style. Students' sex, stream, and university were not significantly associated with their learning styles. In the adjusted model, older age was increasingly associated with reflective learning style (Wald chi-square = 17.51; *df* = 1; AOR = 1.358, 95% CI = 1.18-1.57; *p* =.00), intuitive learning style (Wald chi-square = 15.76; *df* = 1; AOR = 1.343, 95% CI = 1.17-1.55; *p* =.00), verbal learning style (Wald chi-square = 12.15; *df*= 1; AOR = 1.282, 95% CI = 1.12-1.47; *p* =.00), and global learning style (Wald chi-square = 19.81; *df* = 1; AOR = 1.383, 95% CI = 1.20-1.60; *p* =.00). Conversely, students' age was not associated with sensing, visual, or

sequential learning styles. The findings generally indicate that a one-year increase in the students' age was 1.358 times greater for adopting more reflective learning styles, 1.343 times greater for adopting more intuitive learning styles, 1.282 times greater for adopting more verbal learning styles, and 1.383 times greater for adopting more global learning styles.

Table 4: Bivariate and multivariate analyses of factors associated with learning styles

Learning Style		COR (95% CI)	AOR (95% CI)
Reflective	Age	**1.328 (1.16, 1.53)***	**1.358 (1.18, 1.57)***
	Male	.924 (.59, 1.44)	.751 (.47, 1.19)
	Female	1	1
	NSS	.687 (.44, 1.08)	.313 (.10, .98)
	SSS	1	1
	AMU	.915 (.49, 1.72)	2.673 (.73, 9.85)
	DU	1.069 (.57, 2.02)	3.116 (.84, 11.52)
	WU	1.802 (.93, 3.51)	2.079 (1.0, 4.31)
	JU	1	1
Sensing	Age	.976 (.84, 1.14)	.978 (.84, 1.14)
	Male	1.178 (.74, 1.87)	1.180 (.74, 1.88)
	Female	1	1
	NSS	.946 (.59, 1.52)	.570 (.16, 2.03)
	SSS	1	1
	AMU	1.038 (.56, 1.94)	1.835 (.45, 7.54)
	DU	1.022 (.54, 1.95)	1.809 (.44, 7.49)
	WU	.991 (.48, 2.04)	1.161 (.53, 2.57)
	JU	1	1
Intuitive	Age	**1.307 (1.14, 1.50)***	**1.343 (1.17,1.55)***
	Male	.832 (.51, 1.28)	.687 (.44, 1.07)
	Female	1	1
	NSS	.751 (.48, 1.17)	.492 (.17, 1.41)
	SSS	1	1
	AMU	.914 (.50, 1.68)	1.702 (.51, 5.72)
	DU	1.042 (.56, 1.93)	1.934 (.57, 6.54)
	WU	1.704 (.89, 3.26)	1.814 (.88, 3.72)
	JU	1	1
Visual	Age	1.041 (.90, 1.21)	1.036 (.89, 1.20)
	Male	1.042 (.66,1.66)	1.033 (.65, 1.64)
	Female	1	1
	NSS	1.097 (.68, 1.77)	1.160 (.37, 3.64)
	SSS	1	1
	AMU	1.096 (.59, 2.05)	.937 (.26, 3.44)
	DU	1.083 (.57, 2.06)	.926 (.25, 3.43)
	WU	1.066 (.52, 2.19)	.997 (.44, 2.26)
	JU	1	1
Verbal	Age	**1.256 (1.10, 1.44)***	**1.282 (1.12, 1.47)***
	Male	.911 (.59, 1.40)	.781 (.50, 1.22)

	Female	1	1
	NSS	.672 (.43, 1.05)	.301 (.10, .94)
	SSS	1	1
	AMU	.871 (.48, 1.60)	2.696 (.74, 9.77)
	DU	.993 (.54, 1.84)	3.065 (.84, 11.15)
	WU	1.626 (.85, 3.11)	1.928 (.95, 3.92)
	JU	1	1
Sequential	Age	.964 (.83, 1.12)	.966 (.83, 1.12)
	Male	1.065 (.68, 1.67)	1.072 (.68,1.68)
	Female	1	1
	NSS	.996 (.63, 1.59)	.801 (.25,2.61)
	SSS	1	1
	AMU	1.036 (.56, 1.91)	1.305 (.35,4.91)
	DU	1.033 (.55, 1.94)	1.302 (.34,4.95)
	WU	.982 (.49, 1.99)	1.065 (.49,2.34)
	JU	1	1
Global	Age	**1.346 (1.17, 1.54)***	**1.383 (1.20,1.60)***
	Male	.886 (.57, 1.37)	.708 (.45,1.12)
	Female	1	1
	NSS	.706 (.45, 1.11)	.397 (.13,1.18)
	SSS	1	1
	AMU	.906 (.49, 1.68)	2.074 (.59,7.26)
	DU	1.033 (.55, 1.94)	2.358 (.67,8.29)
	WU	1.774 (.92, 3.43)	1.952 (.95,4.03)
	JU	1	1

a. The reference category is active; * Significant association at *p* value = .00

5. Discussion

5.1. Students' learning style distribution

In the present study, active, sensing, visual, and sequential learning styles were the dominant learning styles among first-year university students at the selected study sites. This means that the respondents in our study favor processing lesson information actively, working alone and in groups; perceiving by practically doing and observing course contents; receiving visual inputs such as drawings, pictures, and diagrams via slide projector and blackboard-chock techniques; and preferring more step-by-step processes in synthesizing the course content. This finding is consistent with those of previous studies, which revealed that except sequential learning styles, active, sensing, and visual learning styles are the dominant learning styles (Berková et al., 2020; Cada, 2021; Hebat-Allah et al., 2021; Ghanney et al., 2019; López et al., 2013; Magulod, 2019; Naimie et al., n.d.; Njoku & Abdulhamid, 2016; Omar et al., 2015); sequential learning style is preferable for most learners (Jiraporncharoen et al., 2015; Omar et al., 2015). Consistently, as Mihrka and Schulze

(2016) found that students significantly prefer sensing and visual learning styles over the intuitive and verbal dichotomies. However, they prefer reflective and global learning styles over the active and sequential categories. Students' seniority at university, type of participants, and the context may explain these difference. Furthermore, reflective learning style is a dominant learning style among excellent learners (López et al., 2013), and auditory learning style is found to be the dominant learning style among junior and high school students (Njoku & Abdulhamid, 2016). Considering these similar and contradicting studies with respect to the present finding, the general contexts, participants, and even the learning style models are different. For example, most of the literature employed on high school and college students using VARK (visual, auditory, read/write, and kinesthetic) model of learning styles.

Ultimately, more students fall into the active-reflective learning style dimension in the present study. In terms of learning style level, reflective, sensing, verbal, and global learning styles are more common, followed by active-reflective balanced, intuitive, visual, and sequential styles. In contrast, a small number of respondents fall under reflective, verbal, and global moderate and sensing-intuitive balanced levels. In contrast, Mihrka and Schulze (2016) found that 2nd year university students are balanced in all dimensions of learning styles. The type of participants and contexts the study was done may result is such unlike evidences. This finding generally mean that that students are multimodal learners, as indicated in other scholarly works (e.g., Bouchey et al., 2021). Multimodalists benefit from various instructional styles (Cohen et al., 2010).

5.2. Demographic characteristics associated with students' learning styles

According to the univariate and multivariate multinomial logistic regression model analyses, age was significantly associated with learning style. In the adjusted model, older age was increasingly associated with adopting more reflective, intuitive, verbal, and global learning styles. On the other hand, student age was not significantly associated with the sensing, visual, or sequential learning styles. Consistently, there is no relationship between learning styles (e.g., auditory and visual) and demographic variables (e.g., gender and age) (Fernandez-Caronan et al., n.d.); no relationship between auditory and visual learning style and age via a VARK model (Mohammadi et al., 2015); and no significant relationship between age and an active-reflective pair learning style. In contrast, Naimie et al. (n.d.) reported significant relationships with the sensing-intuition pair. The statistical methods employed and setting may yield such different outcomes.

Students' sex, stream, and university were not significantly associated with their learning styles. Similarly, no significant relationship was observed between learning styles and gender in all four dimensions in the Felder and Soloman learning model (Naimie et al., n.d.). Male and female students are not different in their learning styles using the VARK learning style model (Bin Eid et al., 2021; Nasution, 2019). In contrast, students' gender is related to their learning style (Marantika, 2022; Nuzhat et al., 2013). For example, auditory learning style is associated with students gender (Mohammadi et al., 2015), and male students prefer to use the kinesthetic learning style more than females do, whereas female students prefer the aural learning style (e.g., Sarabi-Asiabar et al., 2014). Berhanu (2014) also found gender differences among graduate students learning styles in the Addis Ababa University context. Finally, students' learning style relationships with their streams and universities were not adequately addressed in the literature.

6. Conclusion and implications for instructional provision

Active, sensing, visual, and sequential learning styles were dominant among first-year university students. This imply that more than half of the students (1) prefer an active learning style (e.g., practicing and working in groups) than contemplating on instructional objectives and work individually; (2) prefer more sensing learning style (e.g., choose conventional and concrete ways and detailed procedures); (3) prefer more visual information (e.g., pictures than spoken words); and (4) prefer more sequential style (e.g., favor detail, step-by-step procedures, and start from parts to figure out the overall picture) to process, receive, perceive, and understand the instructional objectives.

Accordingly, to ensure whether the students better process the learning outcomes or not, the instructional provision must favor practice (field or laboratory) first by the students rather than thinking it through or about it. The instructors and/or the instructional or lesson planning must encourage students to be outgoing, contribute ideas in class, and allow them to fully understand the problem first when doing home works, assignments, or exams. The instruction must also encourage students to know one another; encourage them to brainstorm and study in the group. In such cases, there may be student loafing—disengagement in group activities. When it happens, the instructor as well as the instructional practice need to be cautious and remediate it.

The instructional provision should primarily target realistic, factual, and real-life situations; deal with ideas and theories or concepts; focus on how to do things; use pictures, diagrams, graphs, charts, or maps rather than words, written directions, or verbal information; contain more detailed procedures and parts of a subject than on the overall picture of the course; and pay more attention to clear sequential or step-by-step procedures.

In terms of the level of students learning styles, reflective, sensing, verbal, and global learning styles are more common, followed by active-reflective balanced, intuitive, visual, and sequential styles. This implies that students are multimodal in their learning styles. Accordingly, a single instructional provision must consider multiple types of learning styles. Assuming the extent of students' dominant learning styles and the nature of the course, the instructor needs to design and provide visual, written, factual, or sequential instructions. Therefore, multimodal learners benefit from parts from each and can build a bigger picture or solid practice about the given instructional objective.

Older students are increasingly associated with reflective, intuitive, verbal, and global learning styles. This specifies that as the students grow older, the instruction must be designed to elicit higher orders of thinking such as evaluation, abstraction, and hypothetical thinking. It should be more on spoken/written ways and relational methods, or reduce trial methods of instruction, use of concrete, pictorial, and sequential ways. Generally, growing older at university directly infer the level of seniority. Therefore, as students become seniors, they require more abstract, general, and relational instructions as well as instructors. Unless they become exhausted, show frequent class absenteeism (or attend only for attendance purpose), and fail to master the instructional objectives properly. On the other hand, student age was not significantly associated with the sensing, visual, or sequential learning styles. In addition, students' sex, stream, and university were not significantly associated with their learning styles. Future researchers should further include more socio-demographic factors (e.g., academic achievement) and other psychosocial factors (e.g., studying styles) and examine learning styles with a large sample size.

Declaration of Conflicts of interest

The authors declare no conflicts of interest.

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Data availability

The datasets generated during and/or analyzed during the current study are available from the corresponding author on reasonable request.

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Original Article

Trends and Orientations in Science and Mathematics Education in Ethiopia

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Abstract

The historical and philosophical foundation of science and mathematics education (SME) is not well documented in the Ethiopian context. The writing of this article was initiated from unclosing how the field is conceptualized and enacted. Indeed, there have been various initiatives on STEM (science, technology, engineering, and mathematics). The implication is that STEM education is an integration of the fields including science education and mathematics education. Yet, to what extent is the inclusion? Again, is STEM part of science and mathematics education? In order to answer such questions, accessible data on events, project activities and educational studies pertinent to the subject were collected and reviewed. In this regard, email correspondences and focus group discussions were among the tools. Then, the analyses brought two underlying perspectives: the educational/training practices in subjects and the field as a domain of knowledge and research. In the one hand, issues of curriculum and policy, teaching and learning, textbook research and development, lesson study, context, and teacher training were found prioritized. On the other hand, Science/Mathematics Education, as a field of study and practice, has been evolving in four hubs. The historical foundations, learned experiences and the contemporary issues imply to the existence of different points of views. It is found that STEM education and Science/Mathematics Education are not connected. Thus, there is a need to boost the field as a valuable foundation for viable development.

Key Terms: Mathematics Education, Science Education, STEM, Teacher Education

1. Introduction

The concept of Science and/or Mathematics Education has been addressed differently by academicians and political leaders, internationally. Globally, there are various initiatives in line with SME including: business firms, non-for-profit organizations, foundations, research centers, consortiums, conference series, reputable journals, and programs. For instance, the *Delaware Foundation for Science and Mathematics Education*, in USA, was formed in 1995, embraces

activities of STEM fields, STEM education, and STEM careers. The *Center for Mathematics and Science Education* at California State University, USA, was founded in 1993, is a non-profit organization serving as a liaison between the University, colleges, K-12 schools, and the business community in the areas of mathematics and science education. Besides, *Centre for the Advancement of Science and Mathematics Education* in South Africa, is a dynamic force dedicated to revolutionizing STEM. From these cases, we can see that STEM is included in Science and Mathematics Education.

In Ethiopia, Science and Mathematics have been included as basic subjects in school curricula. Improving instruction of the subjects is regarded as a priority for developing countries (Bethell, 2016; Engida & Areaya, 2008; MoSHE, 2019). The issue has been an area of interest of the global community. It is possible to consider people who involve in, events, programs, publications and career opportunities as fundamental aspects of discussion (Ayalew, 2019). A number of strategic activities (Belay *et al*, 2016); MoSHE, 2019, 2020) have been initiated with the aim of improving the quality of SME (Ahmed *et al*, 2019). Politicians, education leaders and policymakers used to call for a new emphasis on the fields of Science, Technology, Mathematics and Engineering in the nation's schools, from primary school through to postsecondary education (Belay *et al*, 2016). As a result, there was a revision of pre-service teacher education programs and a provision of new in-service training programs for science and mathematics teachers (Ahmed *et al*, 2019).

From the above two paragraphs, it can be implied that STEM education is an integration of the fields including science education and mathematics education. Yet, to what extent is the inclusion? Again, is STEM part of science and mathematics education?

2. Methods

In this study, a qualitative content analysis was employed whereby necessary data were gathered mainly from 24 potential informants (primary sources) via telephone call, email correspondence and focus group discussions. Besides, available or accessible documents on the matter were reviewed. The results were presented in detail and then exhaustive discussions were made with emerging themes. Thus, concluding remarks were noted on the delivery approaches of the field of study, the underling perspectives and points of views, existing supplementary roles, and complementary actions. Subsequently, a forward looking was pointed out in relation to integrated approach and differentiated tracks of studies in the field.

3. Results

3.1. Commencement of Science/Mathematics Education in Ethiopia

In Ethiopia, students' performances in science and mathematics subjects have remained below the basic level of proficiency (Getahun, 2022). Since the historical development of science education system was not explored (Sbhatu, 2021), its status of the as a field of research, practice and scientific domain is not yet organized. Indeed, the title "Science and Mathematics Education in Ethiopia" was addressed in 2008. The current study is intended to disclose an updated report on SME in Ethiopia with a particular reference to the past twenty years. Towards this end, I surveyed diverse events, publications, project works, activities of organizational units or established centers and developed strategies which I think are pertinent to improvement. Science/Mathematics and education/pedagogy co-exist; yet, the idea of "Science Education" "Mathematics education" as a domain of knowledge is a new experience in Ethiopia. The blending of Mathematics and Education has been operational in teacher education and other programs. For instance, Bahir Dar University (BDU) had been running Pedagogical Science major concentration area along with Mathematics/English/Geography/Amharic-language minor (and major later in 2001) fields of studies. The main professional goal of the program was producing competent teacher educators. The curricula for both primary and secondary teachers' education emphasize the need for strong content knowledge and professional pedagogical skills (Ahmed *et al*, 2019). Facilitations of undergraduate, Master's and doctoral programs pertinent to the field "mathematics education" have two decades history in BDU.

3.2. STEM – Science, Technology, Engineering and Mathematics

Basically, STEM is an educational initiative with integrative approach to help students gain the ability to think critically, solve complex problems, and drive advancements in science and technology (MoSHE, 2019). Such a holistic integration indicates awareness to the possibility of being a part of a global society in these turbulent times (Kobayashi, 2019). "Critical thinking", "problem solving" and "project-based learning" could be labeled as contemporary pedagogical approaches. Who is going to maintain the interdisciplinary nature and techniques and methods of integration? On the other hand, "STEM center" is specialized learning facility that offers hands-on experience to local area where students voluntarily and eagerly enroll into various age-appropriate

programs offered, at no tuition fee for the students (MoSHE, 2019). It is a site that provides quality professional development activities and resources to support STEM Education.

In this regard, teachers are target groups. A lesson or unit in a STEM class is typically based around finding a solution to a real-world problem and tends to emphasize project-based learning that means, STEM is an interdisciplinary approach to learning where academic concepts are coupled with real-world lessons. By exposing students to STEM and giving them opportunities to explore STEM-related concepts, they may develop a passion for innovation and, hopefully, pursue a job in a STEM field. A pioneering activity at BDU is *STEM* center which incorporates summer outreach program for talented students, Math Camp programs and Science Shared Campus program. Outreach program for talented students was a two years project financed by Mr. Mark Gelfand aiming to maximize the number of science and technology students with a motto" inside every child there is a scientist".

> *...The training was hands-on-practical laboratory work and conducted in laboratories found in the university compound. The training program included the following core school subjects such as: Physics, Chemistry, Biology, Mathematics, ICT, Electronics, Technical Drawing and English. In addition, extracurricular activities, and educational Trips were also included in the program. A "team teaching" mode was followed which included 1 University instructor, 1 Laboratory Technician, and 1 School Teacher in an instruction. 25 students placed in one class for 3 hrs laboratory work. (Email correspondence with informant 2, by 25th Dec. 2022)*

The project was also aimed at establishing and supporting Science and Technology clubs in schools aimed at attracting and supporting more talented students to involve in the summer training programs and project works. BDU has been also offering annual Math Camp program for interested and talented students. The following narrative conveys its intent.

> *Math camp program was started in July, 2012 in department of mathematics, BDU. The camp takes place June to July in the main campus and stays for two weeks. The aim is to make Mathematics a real fun and pressure-free place. It is not merely a 'Math teaching' session, but a training program that includes computer programming, computer graphics, physical exercises, socialize and leadership development, etc. Students are housed in a dormitory. Students participate in recreational activities (at the dorms, athletic fields, classrooms, etc.). The University runs annual Girl's STEM camp program for talented girl students from grade nine to twelve. STEM Girl's Camp program was started in January, 2014 in STEM Center. The camp takes place during the semester break, in the main campus of BDU and stays for two weeks. (Email correspondence with informant 12, by 25th Dec. 2022)*

Currently, there are several STEM centers in Ethiopia. It is possible to consider STEM education as essential for learners moving beyond memorizing facts and formulae, and ensure that they gain an understanding of the principles of science and mathematics that underlie so much of contemporary engineering practice and technological development (Ahmed *et al*, 2019). On the other hand, *Science Shared Campus* aims at providing laboratory-based training by university instructors on STEM related school subjects and English language, where other school subjects are taught by the nearby governmental school teachers. For instance, Bahir Dar University and Kotebe University of Education, and Hawassa University run such a program.

3.3. BDU - NORHED

BDU has been implementing NORHED [Norwegian Programme for Capacity Development in Higher Education and Research for Development] project in two phases. The first one was: "Advancing Quality in Education in the Primary and Lower Secondary Schools in Ethiopia and South Sudan (August 2016 – August 2021)". The second phase: "Enhancing the Quality of Science and Mathematics Education in Ethiopia (2021-2026). The project has components programs: research, postgraduate programs, staff capacity building and outreach. So far two international conferences on SME were held. The first happened during 23-24 October, 2019 with theme of *Making Science and Mathematics Teaching and Learning Impactful.* The second one was held on Dec. 29-30, 2022 with a theme of *Science and Mathematics Teaching, Learning and Assessment: Lessons from Theory and Practice*. Prior to these events, the College of Science at BDU had hosted two Seminars/conferences (in 2012, 2015) on Statistics, Mathematics and Science education. Thus, there were totally four conferences there. Besides:

> *"Center for Studies in Teaching and Learning of Science and Mathematics" would be established sooner (interview with informant 3, by 30th Dec. 2022).*

This is a great deed as compared to other universities in the country. Although related programs are hosted at both colleges of the university, the promise of institutionalization of BDU-NORHED project would solve the polarization. All in all, BDU is the birth place of Science and Mathematics Education. Yet, the university is late to establish an organizational unit.

3.4. Initiatives at the Ministry of Education

In 2004, secondary schools were using Satellite or Plasma Television as a medium or tool. The use of computer animations and experiments in demonstration sessions were interesting. The

underlying intention was to give all secondary schools in the nation opportunities for uniform and standardized instruction consistent with the curriculum. There was a prior concern that SME had been reduced to eyes-on and ears-on learning at the expense of hands-on learning (Engida & Solomon, 2008). This could potentially be alleviated by aligning the curricula for teacher training program with school curricula and focusing on topics that can promote scientific reasoning, as well as focusing instruction on authentic practices, can contribute to transforming prospective teachers' scientific reasoning ability (Getahun, 2022). It is important to address relationships between conceptions within the SME and conceptions and ideas from other fields (Skovsmose, 2009).

3.5. JICA's Education Sector Development Projects

Japan International cooperation Agency (JICA) in Ethiopia is primarily working on four areas of development: (*i*) agriculture and rural development, (*ii*) industrial promotion, (*iii*) infrastructure development, and (*iv*) Education. Among the projects conducted in Ethiopia was JICA's contribution on: Strengthening Mathematics and Science Education in Ethiopia [SMASEE] (2011-2014), Capacity Development for Improving Learning Achievement in Mathematics and Science Education [LAMS] (2015-2017), and Mathematical Understanding for Science and Technology [MUST] (2019-2023). LAMS aimed to reform Ethiopia's educational assessment systems by strengthening the capacity of officials or five working groups of Mathematics, Biology, Chemistry, Physics, and Assessment and Evaluation (JICA, 2017).

> *By implementing project documents such as SMASEE and LAMS, efforts have been made to improve the learning outcome just by preparing Item pool and work book for selected grade levels. However, there were some of the challenges. For instance, same structure of MSIC [Mathematics and Science Improvement Center] was not organized/established in all regions. Besides, there was lack of attention given to mathematics and Science Education by [different] stakeholders. Scaling up of the results of the training was not effective at the desired level. School and cluster-based trainings were not effective and efficient as expected. (Email correspondence with informant 14, by 21st Dec. 2022).*

JICA's contribution to the education sector development of Ethiopia has been a lot (Belay *et al*, 2016). The practical activities were inclusive of syllabus and textbooks developments, the adaptation of lesson study and making assessment meaningful.

3.6. Mathematics and Science Improvement Center

Following the introduction of SMASEE in Ethiopia, the MoE established a unit MSIC (Mathematics and Science Improvement Center) which was mandated to the improvement of the

teaching and learning of Mathematics and Science Ethiopia. For full functionality of the unit, there have been assigned or appointed leaders and coordinators. The Center/Directorate/Desk belongs to the education development sector. Yet, the MSIC was not upgraded as it was proposed. Rather, it is re-organized under teacher and educational leader development office. Below is a report from a focus group discussion (FGD) member.

> *The Center or Desk has been organizing Science Fairs in Ethiopia. Regions have been fundamentally coordinating the selection of candidates. Then, in collaboration with different stakeholders, we make national level (FGD, informant 5, by 19th Dec. 2022).*

The center (currently desk) has been reaching out 33,000+ trainees, National science fairs, baseline researches (e.g. Status of Laboratory Study Report) and National Conferences on STE(A)M (in 2012 and 2021).

> *Currently, the STEAM [Science, Technology, Engineering, Art and Mathematics] desk is accountable for Teachers and Educational Leaders Development Chief Executive Office. (FGD, informant 5, by 19th Dec. 2022).*

Another attempt by the MoE was the formulation of Mathematics, Science and Technology education policy. The rationales were outlined as follows. There were weaknesses of the status and factors that hindered the attainment of objectives in the fields (Belay *et al*, 2016). It is usually heard that mathematics and science teachers had knowledge and skills gaps in terms of lesson planning, active learning methods, and assessment skills

3.7. Department of Science and Mathematics Education (SMED) at AAU

In 2003, Teacher Education System Overhaul (TESO) was planned and established as a nerve center for Teacher Education reform (Negasi, 2015). It has worked tremendously to fit a critical gap in the education system.

> *The Academic Year 2003/04 was a turning point in the history of the Faculty of Education (now College of Education and Behavioral Studies) at Addis Ababa University (AAU). As per the national Teacher Education scheme, the faculty of education restructured itself to house eight more new Departments. Four of these (Department of Biology Education, Chemistry Education, Physics Education, and Mathematics Education) were headed by an Assistant Dean for SME stream (at Arat Kilo Campus). The restructuring was an opportunity for development in the history of teacher education. It mainly creates a fertile ground for Mathematics and Science teacher educators to appropriately integrate their subject area knowledge with modern pedagogical skills the teaching profession demands. This restructuring created and allowed the stream for Department of Science and Mathematics Education (SMED) to address the educational function of the science and*

> *mathematics fields. There were four departments under the SMED unit running both preservice and in-service undergraduate teacher education. (Email Conversation with informant 6, by 15ᵗʰ Dec. 2022)*

The four departments under the SMED unit running both preservice and in-service undergraduate teacher education were: Department of Mathematics Education, Department of Physics Education, Department of Chemistry Education, and Department of Biology Education. Besides, Sport Science Education has been attached to SMED. On the other hand, TESO had also been implemented at other universities with Faculty of Education. By then, the most pronounced words of the TESO program were "B.Ed" and "Practicum".

> *In 2005, the SMED unit, in collaboration with UNESCO [United Nations Educational, Scientific and Cultural Organization] IICBA [International Institute for Capacity Building in Africa], introduced a Master's program (M.A in teaching Science and Mathematics). Science & Mathematics Education is a potentially rich and virgin area of research, and much more is expected of educators to pursue academic excellence in this regard. In the 2007/08 Academic Year, the SMED stream launched regular post-graduate programs (M. Ed) in Mathematics Education and Physics Education. In 2009, the SMED unit launched a Ph.D. program in SME which is the first of its kind in Ethiopia. The program aimed at offering a terminal (Ph.D.) degree in the areas of Science & Mathematics Education in four tracks: Biology Education, Chemistry Education, Physics Education, and Mathematics Education. This program is primarily, but not exclusively, for those who have M.Ed or M.Sc degree in Biology, Chemistry, Physics, or Mathematics and have been giving services in Universities and higher learning institutions. It also considers other candidates who have been teaching and researching in other private and public higher learning institutes, consultancy organizations, and government and non-government organizations. However, the road was not smooth; there were lots of resistance and denial of the field of SMED. (Email Conversation with informant 6, by 15ᵗʰ Dec. 2022)*

IICBA advocates "Strengthening Teacher Development in Africa" has supported the establishment of MA in SME in 2004. The project served as a pilot program and the first full-fledged M.Ed program was launched in 2007. Then, a benchmark publication on the field of discussion was "Science and Mathematics Education in Ethiopia: Policy, Curriculum and Implementation, 2008". Currently, the SMED department offers Masters, D.Ed., and Ph.D. Degrees in different tracks. The programs are designed to equip graduates with the knowledge, attitudes, and skills necessary for working at colleges, universities, and research institutions in today's dynamic world of work. Starting from scratch, currently, the SMED department at the College of Education and Behavioral Studies produced significant number of suppers performing graduates in Master's degree and many

in Ph.D. who are teaching and researching at different public universities in Ethiopia. The SMED department also has a well-experienced staff, including two Professors.

> *Generally, due to intense individual and teamwork and strong dedication and struggle, SME has matured in Ethiopia. Four departments of BioEd, ChEd, MaEd, and PhyEd were full-fledged departments until the end of 2003 E.C. Later, [the associate dean office] was rearranged as a SMED Program [and sustained] unit until 2005 E.C. Afterwards, it [unit] grew and was acknowledged as a full-fledged department. (Email correspondence with informant 7, by 24th Dec. 2022).*

SME at the College of Education and Behavioral Studies has passed through different statuses: Associate Dean for Department of Science and Mathematics Education, Natural Science Program Unit, and Department of Science and Mathematics Education.

> *Currently, there are 15 academic staff members in the department and out of these are 2 professors; 5 associate professors; and 6 assistant professors. They are actively involved in the teaching-learning, research and dissemination and community service, some of the achievements are: the staff members publish more than 200 articles in reputable journals; the staff members participated in more than 6 thematic research projects, 7 individual research and 1 collaborative research with Durham University. The staff members are acknowledged by 2 university level research awards, 2 University level teaching awards, and 1 outstanding performance at national level. (Email Correspondence with informant 8, by 22th Dec. 2022).*

The above paragraphs imply that "Science and Mathematics Education" as field of study has a good foundation at AAU. A reputable "Friday Seminar/Lecture Series" can be considered as a brand whereby two (online) presentations per week are being delivered by the postgraduate students and invited guests to share their thoughts.

3.8. "Transforming the Pedagogy of STEM Subjects"

Usually, four subjects (Science, Technology, Engineering and Mathematics) are coined together as STEM. However, most educational studies in Ethiopia seem to focus on secondary Mathematics and Science. Yet, what is the difference between the concepts of STEM Education and STEM program?

> *STEM initiatives started as a way to promote education in these related areas so that students would be prepared to study STEM fields in colleges/Universities and pursue STEM-related careers. The first STEM center in Ethiopian is established in Foka Science Center which was financed by Mr. Mark Gelfand, an American Philanthropist to maximize the number of students in science, technology, engineering and mathematics with a motto" Inside every child is a scientist". Then, BDU STEM Incubation Center is then established*

through the support of Mr. Mark Gelfand. The major objective of the center is to provide hands on practical laboratory-based STEM education for school students and teachers. Students selected from summer outreach program are the major beneficiaries of the center. They can get unlimited library, internet, and laboratory accesses. Students' group and individual based project works are also supported by this center. In addition, it is used as a teaching and learning resources center, where, like audio and video files, books, laboratory manuals, learning/teaching software and standardized exam items. (Email Conversation with informant 12, by 25ᵗʰ Dec. 2022).

It is shared via home page of BDU that the center is well equipped with necessary laboratory materials and functioning fully both in the whole academic year and Summer time. The center includes: a laboratory complex and an open-air technology park that will contain STEM based project works for further improvement and transfer of knowledge.

In July 15, 2012, BDU in collaboration with MoE hosted a National Conference on "Present and Future Direction of Science, Technology, Engineering and Mathematics (STEM) Education in Ethiopia." On the occasion, Outreach Program for Talented Students project were officially commenced. The conference was meant to brief participants about STEM education, to discuss strategies that would help to scale up STEM at country level. (Email correspondence with informant 12, by 25ᵗʰ Dec. 2022).

Since Education is formal, non-formal, and informal type, such activities as STEM could enable potential stakeholders to think beyond the minimum learning competencies which are expected of students. However, studies continued to show that students' achievements are still low. Hence, there is a continued capacity building (training) Demand for Mathematics and Science Teachers. In this regard, the Education Bureau of Somali Regional State initiated such gap filling programs. Yet, the challenge is the mentors assigned for are not appreciated by the trainees.

There is a capacity building program for science and mathematics teachers in the region with the collaboration of JigJiga University. However, trainees are heard of complaining the assignment of former instructors in this new program. (Email correspondence with informant 17, by 25ᵗʰ Dec. 2022).

The compliant is crucial in that a continuous professional development program has to be guided by mentors with appropriate experience. A study conducted at another region in Ethiopia showed that there is a low level of scientific reasoning ability among teacher educators, schoolteachers, and prospective teachers (Getahn, 2022). That in turn calls for trainers' professional profiles in knowledge, skill and attitude. Thus, it implies that SME is a full-fledged field of knowledge in its

own right. This might be realized when committed individuals and institutionalized units are there in the country. For instance,

> *The former SMASEE [Strengthening Mathematics and Science Education in Ethiopia] project was institutionalized into MSIC [Mathematics and Science Improvement Center]. It was commenced based on three regions (Addis Ababa, Amhara & Oromia) pilot training of 224 Trainers. Then, the regions began cascading. (FGD, informant 5, by 19th Dec. 2022).*

SMASEE was initiated by the kind support of the Government of Japan. It is clear that different countries dominated modern education in Ethiopia which in turn influenced policy and programs including curricula. This has made the relevance of reforms inadequately tailored to the country's development needs (Tadesse *et al*, 2022). Then, strengthening the STEM workforce can be realized by increasing the number of students who pursue a career in related fields as well as broadening STEM literacy (MoSHE, 2019).

> *SMASEE was proposed mainly in trainings formats. The trainings were facilitated by use of 24 modules corresponding prepared for [teachers of] different grade levels Mathematics, Physics, Chemistry and Biology subjects. (FGD, informant 9, by 19th Dec. 2022).*

It seems that the project was well planned from the very beginning. The following text could be additional reference.

> *The modules were developed based on teacher's knowledge limitations and skill gaps. Besides, documents are prepared for learning of animation. (FGD, informant 5, by 19th Dec. 2022).*

The programs or trainings had been implemented with a follow up and monitoring activities. The next text can be quoted here.

> *The project was led by a steering committee. A survey conducted on the implementation of the project showed its effectiveness. In other words, trained teachers were more effective than untrained ones. The center [MSIC] then facilitating the trainings of more than 33, 000 teachers and laboratory technicians. However, there were drawbacks… like… the local training might be fragmented. For instance, the 5 days long training could be finished in 3 days. (FGD, informant 9, by 19th Dec. 2022).*

As it has been narrated earlier, there have been some initiatives. However, system formation and cascading of programs are the limitations. For instance, there is no nation-wide hub for science and mathematics education. There is no center for the study at Regional or cluster level either. Below is an evidence of contribution of (Project for Capacity Development for Improving) Learning Achievement in Mathematics and Science Education (LAMP) in Ethiopia.

We [MSIC] have been collaboratively working with LAMP team members. After a baseline survey assessment for MUST was conducted, the project team members turn to curriculum and textbook development process. And, thus, our attachment with MUST people has temporarily interrupted (FGD, informant 5, 19th Dec. 2022).

Instructional interventions or (supplementary) teaching-learning supports are supposed to fill observed gaps. Laboratory technicians are needed to push the classroom bounded theoretical content (knowledge) into practical. "Science" education would be meaningful when it has experimentation.

I joined the former MSIC as a Laboratory Technician. I am currently working as a National [Teacher] trainer. The current STEAM desk is organized by a composition of one Head and two trainers plus one Technical Assistant in the respective fields. FGD, informant 10, 19th Dec. 2022).

Most laboratories in Ethiopian secondary schools are short of qualified and committed science teachers (Engida & Areaya, 2008). This is not yet solved. The general name "Technician" is not only laboratory experts but also for skill learning scenarios. For example, the plasma television demands technicians.

… with regard to Technical Assistants for secondary school education, Ambo University had been delivering undergraduate courses. … Schools demand skilled technicians. However, there are [almost] no professional technical assistants in schools. Even the available technical assistants are not getting fair treatments. Equipment and chemicals are managed by a store keeper. On the other hand, the teacher is expected to handle laboratory works. (FGD, informant 11, by 19th Dec. 2022)

Of course, there is an argument on whether teachers themselves have to be skilled with necessary technical requirements of the subject they are teaching of or not. On the other hand, the function of instructional television as medium of instruction or (supplementary) teaching-learning aid was supposed to fill the gap (Engida & Areaya, 2008). Although the STEM programs are being advocated here and there, there are no life time specialists in the area.

The STEAM desk is not fully organized with professionals. (FGD, Des'a, 19th Dec. 2022).

So, the alignment or assignment of sufficient number of individuals in line with to a program designed.

3.9. Teachers and Educational Leaders Development

In the history of teachers' training, the introduction of TESO and establishment of Centers of Excellences in Teachers and Educational leaders' development have played a great role on putting *Teacher Education* as a domain of study. An issue in teacher education is the debate regarding the best way to educate teachers (Negasi, 2015). There had been a time for TESO.

> *In 2008-2009, Haramaya University started M.Ed programs in Biology, Chemistry, Mathematics and Physics subjects. Although the regular program was interrupted, we are implementing MoE's curriculum for summer-in-summer modalities. (Telephone conversation with informant 20, by 25ᵗʰ Dec. 2022).*

Once again, a few years ago, five centers of Excellences in Teacher and Educational Leaders Development were established at Addis Ababa, Bahir Dar, Jimma, Hawassa and Mekelle Universities. Then, there came a total shift to installation of "applied" science programs. The preparation of teachers and educational leaders or school principals was framed by BSc/BA plus PGDT [postgraduate diploma in teaching]. Currently, there are two alternative approaches to teacher education: TESO and Subject Specialist plus PGDT. The first was endorsed in trying to address the serious problems present in the education system. The Ethiopian government has called for a complete TESO (Negasi, 2015).

> *... after the collapse of TESO, there was a total shift in to Science. The PhD program was paused and was in a position to be discontinued. Even the university [AAU] couldn't handle the survival. Thanks to the commitment of individuals, the then Minister of Education and Prime Minister were informed about the international experience and the relevance of "Science and mathematics Education". Again, with the kind collaboration of international partners and using the competency of first batch PhD candidates as evidence, the tertiary degree program was re-commencing. (Interview with informant 7, by 20ᵗʰ Dec. 2022)*

Science and mathematics have a particular reference to Modernity, as the Scientific Revolution provides a portal to the modern worldview. But as already mentioned, Modernity also means colonization, suppression and exploitation. And this includes colonization of ways of thinking and doing. Such an insight also forms part of any critical professionalism within the domain (Skovsmose, 2009). On the other hand, most [Science and Mathematics] teacher educators at Colleges are subject specialists with very little or no pedagogical content knowledge (Ahmed *et al*, 2019). They could be products of an old educational culture that considered subject mastery to be the main foundation of quality learning and teaching. Thus, there is a need to introduce specific

teacher educator training programs that can better provide teacher educators with pedagogical content knowledge [PCK] (Getahun, 2022). The PCK has been a guiding model in the aforementioned *teacher education* programs.

3.10. A College of Science and Mathematics Education at KUE

Following the Government's direction on differentiating the Higher Education Institutes, Kotebe University of Education (KUE) has revised its structure and programs. The <u>College of Science & Mathematics Education – Kotebe University of Education</u> constitutes the Department of Biology Education, Department of Chemistry Education, Department of Information Technology Education, Department of Mathematics Education, and Department of Physics Education. The college trains future primary, secondary and university level teachers and facilitators in subject-area didactics, communication and science studies. Besides, it aspires to develop innovative and user-friendly science instruction and teacher education at all levels.

4. Discussion

We are in the post-postmodernism era whereby neoliberal democracies are dominating the globe. We are in the era of technology and imagination. However, when we take a look at SME, in particular as they are organized in a majority of universities and higher educational institutions all over the world, it appears to many that this education is to a great extent still framed according to the outlook of Modernity (Skovsmose, 2009). Students who enter the first grade of primary school with literacy and numeracy skills have a stronger foundation for formal mathematics and science education (Mullis *et al*, 2021). Policies, Strategies and Frameworks (including 70:30 policy, Science-Technology-Mathematics-Education policy – 2016, and STEM policy – 2021) can be mentioned. Since "STEM Education" is about Critical thinking, Problem Solving, Project-based learning, Interdisciplinary fields and Techniques & methods of integration, it could serve as a domain of research. Considerable research has documented the importance of early childhood learning activities and their relationships with student achievement and other education outcomes (Mullis *et al*, 2021). An integrated STEM education is recommended (MoSHE, 2019) in combining the subjects and use of real-world problems. Thus, the curriculum and corresponding training manual should be the combination of these subjects aligned with each other.

4.1. Professional Development

Political regimes in the history of Ethiopia often employed the power-coercive strategy for reforming education (Tadesse *et al*, 2022). There have been interventions that target on improving the teaching and learning of science and mathematics education. Students with more opportunities to learn and more supportive learning environments consistently have higher mathematics and science achievement than those who do not (Mullis *et al*, 2021). The last decade has witnessed several concerted movements towards an integrated STEM education philosophy (MoSHE, 2019); most of the articles published in relation to Mathematics education in Ethiopia tended to process rather than its disciplinary status (Ayalew, 2019). Science Education would not be special. The dynamics of teacher educational programs over the last two decades has been affecting the discourse and progress of the subject under discussion. That is due to the fact that discourse is a function of knowledge, subjectivity and power. If reforms are introduced through the power-coercive strategy, those who initiate the reform assume the highest power which enables them to decide both on the approach and constituents of the reform (Tadesse *et al*, 2022). However, (science and) Mathematics Education is beyond that. On the other hand, practitioners and scholars in the field are not publicizing their works. Thus, a concern for, study on and practice with concepts, theories, methods, organizations, conferences and literature would be vital. It can be said that the discipline is at a premature stage in Ethiopia. Thus, mathematics education and its various sub-fields need to be promoted in Ethiopia. There have been supplementary and complementary activities in the Science and Mathematics Education, particularly in higher education institutions (HEIs).
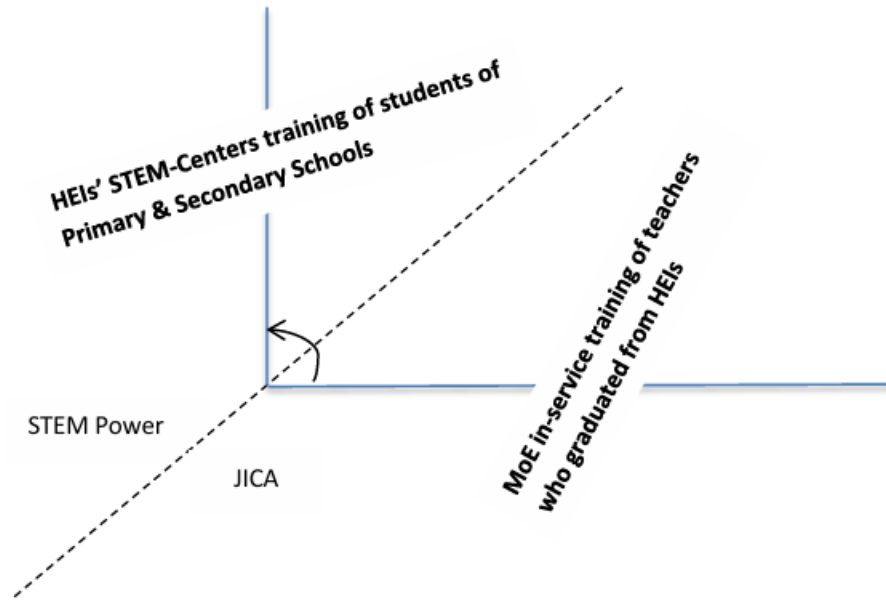
Figure: Complementary Roles of MoE & HEIs on Mathematics and Science Education

The above scenario might be attributed to the externalizing drawbacks and external motivation factors. It should have been a kind of warranty from HEIs' and MoE's sides though. Students who value mathematics and science are extrinsically motivated to learn these subjects because of future opportunities, such as entrance into desirable educational programs or a well-paying career (Mullis *et al*, 2021). In other words, there is vicious circle in that a teacher with limited professional capacity might produce an incompetent student who would be admitted in a HEI and end up with less motivated prospective graduates for future teaching position. In other words, if teacher educators lack sufficient and relevant pedagogical content knowledge, teachers in schools would not have sufficient pedagogical content knowledge (Getahun, 2022). Whereas the domain of MoE is student and the domain of Teacher Training Higher education institutes are teachers, MoE complement teacher's capacity and HEIs complement student's competency. Yet, this vicious circle can be resolved if the unsigned memorandum of understanding is based on a business model. For instance, if a company has defects in its product, it would be in a position to take warranty. Then, an in-service training could be a major component in the community service of a HEI. In this regard, teacher educators must be able to explain and model innovative pedagogical approaches and, in this way, enhance the instructional capacities of their students (Ahmed et al, 2019).

4.2. Professional Identity

Education is highly prized and teaching is a respected profession (Bethell, 2016). Cultivating among students an interest in STEM and encouraging them to study and pursue STEM as a career requires developing a strong teacher workforce (Rogers *et al*, 2015). During the TESO period, the major areas that teachers in Ethiopia should be competent in were the following. subject (s) and the content of teaching; the classroom; areas relating to the school and the education system; and the values, attributes, ethics and abilities essential to professionalism in upholding the professional ethics and producing responsible citizens (Negasi, 2015). Later in 2012, three domains of teaching were proposed: professional knowledge, practice and engagement. On the other hand, STEM center is a facility based at the University backed by an unrivalled team of experts in the fields of STEM (MoSHE, 2019). If the goal of a STEM center is to attract and inspire students towards Science and Applied Science oriented fields, then experts in STEM Education would be needed. Students who enjoy mathematics and science find the subjects interesting and are likely to be more intrinsically motivated in mathematics and science classes (Mullis *et al*, 2021). It is a practical extendable building design that would house labs, administration, equipment storage, and auditorium suitable for science fairs and community meetings.

Focusing on STEM content knowledge and STEM pedagogical content knowledge (PCK) has been the norm of STEM professional development (Rogers *et al*, 2015). *Critical Professionalism* refers to the awareness of the connections between particular fields of knowledge and other fields, of the fact that scientific and mathematical knowledge are bounded to social action, and of the ethical dimensions of producing and applying scientific knowledge (Skovsmose, 2009). Improving the quality of teaching is the most important challenge (Bethell, 2016). So, an attempt to maintain standards could be a solution.

The national standards for teachers (MoE, 2012) in Ethiopia are: know students and how they learn; know the content and how to teach it; plan for and implement effective teaching and learning; create and maintain supportive and safe learning environments; assess, provide feedback and report on student learning; engage in professional learning; and engage professionally with colleagues, parents/care givers and the community. As it is repeatedly argued in this paper, the progress of SME has been determined by the paradigm shifts happened in teacher education. SME had been challenged on what it could mean to move beyond the assumptions of Modernity (Skovsmose,

2009). One key characteristics of the competency-based teacher education approach is that the knowledge base and skills to be mastered by prospective teachers are specified in advance (Negasi, 2015). In this regard, ability performance is assumed to be the most valid measure of teaching competence.

4.3. Progressing the Domain of Knowledge

Areas of research in the field of *SME* could include: General Science Education, Mathematics Education, Physics Education, Chemistry Education, Biology Education, Science Teacher Education, Mathematics Teacher Education, Environmental Science Education, STEM Education, Library and Information Science Education, and Statistics Education.

It has been suggested that one of the key factors contributing to the success of the countries of East Asia which consistently top in students' competencies in Mathematics and Science is the prevailing 'culture' and hard work (Bethell, 2016). One can assume a perspective from where one can identify knowledge-guiding interests included in so-called technical disciplines like science and mathematics (Skovsmose, 2009). On the other hand, SME has been evolving as far as quality of education takes a concern.

There is a need of reshaping the training of science and mathematics educators with $TPCK$ model (Ahmed *et al*, 2019). The abbreviations $TPCK$ correspondingly refer to technology, pedagogy and content knowledge. Since there have been arguments and sometimes disparities on the area of knowledge to prioritize, the order may be reversed like: $C - P - T$. This matters in geometrical point of view; it is considered as orientation. Thus, the $TPCK$ model may be re-conceptualized as $C - P - T$ integrated competency as long as competent graduates are demanded. Besides, Ethiopia has been tempting a competency based (teacher) education. A teacher has to be equipped with appropriate knowledge, attitude, and skills. The three domains of teaching (knowledge, practice and engagement) are expected of teachers (MoE, 2012). Thus, there is a need to consider "beyond knowledge".

Thus, the $(T)PCK$ model of [curriculum development for] Teacher Education can be seen from geometrical orientation point of view as: $T - P - C - K$ or $K - C - P - T$. However, it would be seen algebraically too. That is, chain of T, P, and C on K as: $TPC(K) = T \circ P \circ C(K) = T\big(P(C(K))\big)$ where $\circ$ refers to composition. First, we secure [subject matter] content

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knowledge$C(K)$; then, pedagogy of content knowledge$P\big(C(K)\big)$; finally, the use of technology in the pedagogy of content $T\Big(P\big(C(K)\big)\Big)$. This orientation may answer the question "what matters most?" in teacher education and training.

5. Conclusion

In this study, two underlying perspectives are identified: the educational/training practices in subjects and the field as a domain of knowledge. Many institutes have contributed to the evolvement of SME in Ethiopia. Overall, the pull-push scenario has impacted on the status of field. Accordingly, various *supplementary* roles and *compulsory* actions have been in place in the education system. This study would have potential implications for shaping mathematics and science education policies and curricula. Again, it could serve as spring board for promoting the field in knowledge, research and practice.

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Disclose Conflicts of Interest

This paper is free of conflict of interest.

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Philosophical perspective

Empowering Educators through 'Emancipation': A Philosophical Appraisal on the Concept of '*Power'* in Education

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Abstract

In modern educational system, the word empowerment has long been utilized to denote the process in which individuals within the educational sector advance their skills necessary to effectively solve their own challenges by creating effective strategies. However, in literal sense, the concept of *empowerment* centralizes the role of power as a basic theme and draws attention to *alienation* of an agent form the power to enact the appropriate activity. An educational system which alienates educators from ownership of the activity, above all, will force the agent to develop a psychologically detrimental effect of powerlessness. In relation to alienation of ownership which is the primary cause of powerlessness, educators also experience a sense of meaninglessness, normlessness, isolation, and self-estrangement which prevent them from finding purpose or significance from the activity of teaching and learning. This research primarily investigated the factors and practices which contribute to different forms of alienation in the education sector such as alienation of educators from their work, their learning, teaching process, and from themselves and their students and other teachers. Consequently, it aimed to articulate the fundamental correlation between educators' alienation form the educational system and the negative outcome of the quality of education. The study, therefore, adopted an exploratory research design and employed a qualitative research approach which heavily relies on secondary data sources such as books, scholarly articles, research articles and other publications. Finally, it is argued for the reconceptualization of emancipation in the education sector and its enduring potential in the empowerment of educators.

Key Words: Empowerment, Alienation, Emancipation

1. Introduction: Power and Empowerment

The concept of "empowerment" has been utilized across various disciplines, with each field attributing a unique interpretation aligned with its specific focus. In policy documents on gender equality and empowerment of women, it is widely used to refer the process of gaining access and developing one's capacities with a view to participating actively in shaping one's own life and that of one's community in economic, social and political terms (Jahan, 2010). In relation to management, it is conceived as a motivational practice that aims to improve efficiency by enabling opportunities for participating and engaging in decision making process (Wójcik, 2017). On the other hand, economic empowerment is widely referred as the process of shifting from exploitation to expanding choices and opportunities for achieving independence, stability, skills, and progress in all aspects related to one's economic well-being (Charm, S. et al., 2023).

In education, however, the definition of empowerment assumes a number of factors and takes a diverse understanding. From the students' side, it is conceptualized as the educators' will to give control over the learning process to students, so that learning becomes a collaborative effort, rather than a mere indoctrination of the teacher that is imposed on the students, while Teachers' empowerment, defined, is a process whereby educators develop the capability to take charge of their own professional development and resolve their own problems (Lawson, 2011). As Short (1994) claimed, empowered teachers believe they have the skills and knowledge to act on a situation and improve it. Generally, in education, empowerment has been theorized as the passing over of decision-making to educators in the educational relationship between teachers and student, and administrators and teachers (Deacon & Parker, 1995).

Still some scholars use the concept of empowerment referring to the process which involves an implicit transformation of power from government to the teacher and from the teacher to the student, and the possibility of equalizing of the power discrepancies between them (Deacon & Parker, 1995, p.114). This entails that power and empowerment are intricately connected concepts. At the heart of the process of 'em*power*ment', there is power. The specific apprehension of the nature of power relation in education should be the prior condition in the process of empowerment. Hence, this paper seeks to explore the concept of power from a philosophical perspective, emphasizing its profound role in shaping educational structures and practices. By engaging with the philosophical underpinnings of power, with a particular emphasis to Paulo Freire the discussion

highlights the how power dynamics influence knowledge production, teacher-student relationships, and the broader goals of education.

2. Conceptualizing Power: Philosophical Foundations and Implications in Education

Power is an ancient and ubiquitous concept in philosophy. Great names in philosophy from Plato and Aristotle to Machiavelli and Hobbes devoted a good deal of attention to the concept of power (Dahl, 1957). Before examining the connection between power and education, it's crucial to reassess how some prominent philosophers have defined and conceptualized power.

Plato's conception of power is the derivative of his metaphysical theory of *Forms* and also associates it with the knowledge of these transcendental realities (Smith, 2019). Stating that knowledge and truth as essentially connected concepts. Though Plato (2004) did not use the phrase, in his *The Republic* he underlines that knowledge is power. At the end of the fifth book of the Republic, he presented knowledge, belief and ignorance as powers in which they have something towards which they are naturally predisposed and something they produce. Knowledge pertains to what truly exists, opinion involves things that both exist and do not exist, and ignorance concerns things that do not exist at all (Smith, 2019). Aristotle, a student of Plato, built upon his teacher's foundational ideas while also establishing his own distinct philosophical perspectives conceptualizes *power* as a source for change which orders the physical world insofar as it is a world of changing things subject to causation. He characterizes power as similar to disposition, ability, or tendency.

St. Thomas Aquinas, commonly treated as having a Christianized philosophical view of Aristotle (Omoyefa, 2007), describes power as a principle of operation, whether it be an action or a passion. He further maintains that a principle should not be understood as a subject acting or undergoing an action, but rather by which an agent acts or a patient undergoes an action (Field, 1984). In '*The Soul'*, a translated work of Aquinas;s *De anima,* power is categorized in to three: passive powers, active powers which are capacities to act, and powers which are actions (Rowan,2009, p. 151).

Passive power, according to Aquinas, refers to being's capacity to receive an act from an external agent. For instance, clay has the passive power to be shaped into a pot by a potter. A sculptor's capacity to shape a piece of marble into a statue can be the best example of active power. Active power, on the other hand, refers to the capacity of a being to bring about change or to actualize

something else. Powers which are actions, the last category of power, are related faculties or capacities that are directed toward performing specific acts or functions. These powers, he describes, are inherent in beings and enable them to engage in particular activities (Rowan, 2009).

Even though the first known realist political thinker Niccolo Machiavelli did offer an explicit definition of power in his 'The Prince' as well as 'Discourse to the Method', he asserted it finds itself in the ability of imposing calculated action for staying in power. In contrast, Thomas Hobbes, in his work "Leviathan", describes power as the means to secure personal benefit and achieve future goods. This understanding of power emphasizes the ability and skills to assure personal benefit "*to obtain some future apparent Good*" (Flathman & Johnston, 1997).

The poststructuralist philosopher Michel Foucault and the humanist thinker Hanna Ardent treat power distinctively as a product of relations. According to Foucault, emphasizes that power is not something one possesses; rather, it is generated continuously from moment to moment, or more precisely, within every interaction from one point to another (Foucault, 1978, p. 93). He, therefore, conceives power as fluid within society, which implicates in negative or positive results (Pinto & Perera, 2017, p.5). In a relatively similar manner, Hanna Aredndt argues that power is differentiated from individual strength, force, authority and violence, and goes to define it as a product of collective consent (Arendt, 1969).

The concept of power has indeed been less emphasized in the philosophy of education as compared to fields such as political science, sociology, and feminist theory (Foucault, 1977; Freire, 1970; Giroux, 1988). Historically, philosophers of education such as John Dewey, Maria Montessori, and Jean-Jacques Rousseau have concerted on ideals of democratic education, individual development, empowerment and moral education (Dewey, 1938; Montessori, 1912; Rousseau, 1912). Though these themes are related to power, the explicit analysis of power relations have not been the primary focus of these philosophers (Nyberg, 1981). However, this should not be understood as the concept is totally absent from philosophy of education.

Education, as a collective and multifaceted activity, is fundamentally shaped by the interactions among various stakeholders, including non-governmental organizations working in education, policymakers, school administrators, teachers, and students. These interactions inherently involve power dynamics that influence decision-making, resource allocation, and the shaping of educational

practices and policies. The power relations among these parties not only define their roles and responsibilities but also add layers of complexity to the ontological nature of education.

In his advocacy of the activity of education as political in nature, Paulo Freire in '*Pedagogy of the Oppressed'* extensively discussed the nature of power dynamics in education and the role of education in transforming the unjust power structures within society (Freire, 1970). Influenced by Marx, he viewed society as a dynamic, ever-evolving system through which power is woven. Moreover, like Foucault and Ardent, Freire appears to view power as a collective construct. However, that power, sometimes intentionally, sometimes unintentionally, oppresses, creating social structures, institutions, ideas, and myths that sustain the wealth, way of life, and power of oppressors at the expense of the oppressed.

As a pioneer of critical pedagogy, Freire borrowed his views from critical theory that conceives society as divided and hierarchical based on power relations and education as a tool used by dominant groups to legitimize the unjust power arrangement (Avinash, 2014). For him, knowledge is not neutral, rather reflects historical periods where certain groups wield dominant power over others (Freire & Shor, 1987, p. 27). Hence, he views traditional education, the banking system, as the exercise of domination stimulates the credulity of students, with the ideological intent (often not perceived by educators) of indoctrinating them to adapt to the world of oppression and mirrors the contradiction within society to the learning process;

> *…the teacher teaches and the students are taught; the teacher knows everything and the students know nothing; the teacher thinks and the students are thought about; the teacher talks and the students listen—meekly; the teacher disciplines and the students are disciplined; the teacher chooses and enforces his choice, and the students comply; the teacher acts and the students have the illusion of acting through the action of the teacher…* (Freire, 1970)

Freire's famous metaphor for traditional education as the '*banking method*' makes education as the teacher's sole property than collective engagement that is a manifestation of alienation in education. Freire further argues that education must begin with the solution of the teacher-student contradiction, by reconciling the poles of the contradiction so that both are simultaneously teachers and students.

3. Alienation and Contradiction in Education

In a philosophical context, the term 'alienation' was initially introduced by the German philosopher G. W. Friedrich Hegel to highlight the estrangement of human life that is one of the most important and fruitful legacies of his social philosophy (Sayers, 2011). However, Freirean concept of 'alienation' in education differs from Hegel's philosophical stance, which plays a crucial role in the phenomenological development of consciousness. Instead, it is rooted in Marx's theory.

Marx's idea of alienation centers on his view of labor as an essentially human activity of self-objectification. As Erich Fromm (1961) states, for Marx, the product of labor is labor which has been embodied in an object and turned into a physical thing; this product is an objectification of labor. Since labor is essentially a human activity, it is also s 'species-activity'. Marx implies, here, that man is naturally species-being. Moreover, he argues that man is active and productive being who grasps and embraces the objective world with his own powers. Alienation, therefore, refers to the state in which a man does not perceive himself as an active agent in his hold of the world, but rather finds that the world (including nature, others, and themselves) remains foreign and distant. As Fromm writes, it is when " labor loses its character of being an expression of man's powers; labor and its products assume an existence separate from man, his will and his planning." (Fromm, 2004, p. 83).

In his *Economic and Philosophic Manuscripts of 1844*, Marx goes further to assert that there are four dimensions of alienations in a capitalist form of production. These are ; (a) alienation from the product of labor; a state in which the object the worker has produced owned by another, (b) alienation from the labor process; whereby the process of production becomes no more self-expression but a forced activity (c) alienation from the self or from the human essence; when one an individual feels disconnected from oneself or a loss of self and (d) alienation from alienation other people or from society; refers to the coincidence of separate and competing "enlightened" self-interests.

Paulo Freire (1970), in '*Pedagogy of the Oppressed'*, discusses the condition of *alienation* from the perspective of the relationship between students and teachers in the traditional system of education. However, this notion of alienation in education cannot be fully understood, without revisiting his conception of the nature and purpose of education.

Just as Marx viewed labor as a fundamentally human activity with significant social implications, Freire similarly sees teaching and learning as human experience with profound social consequences. Like, Hannah Arendt who conceives the essence of education as *natality*, his social pedagogy defines education as a social action in which the individuals and society are constructed (Shor, 1993, p.24; Arendt, 1969). In the traditional education which he considered as the 'banking method', nevertheless, education turns out to be a system of delivery for lifeless bodies of knowledge. In another word, education becomes a system whereby educators are alienated from the teaching and learning process; where learning becomes a forced activity. Generally, Paulo Freire (1970) defines alienation in the context of education as a condition where individuals are estranged from their own capacity for critical thinking and self-awareness, resulting in a loss of agency and disconnection from their true potential and social reality.

Sidorkin (2000), an educator and philosopher, claims alienation in education is characterized by individuals distancing themselves from knowledge and learning, finding all aspects related to learning increasingly meaningless. Consequently, leads to a lack of interest in the learning process, which gradually becomes dull and unpleasant. This advocacy of Sidorkin is closely related to the dimensions of alienation which are introduced by the influential American sociologist Melvin Seeman. In fact these dimensions are more applicable to the conceptualization of alienation in education (Erbas, 2014).

In his seminal work, "*On the Meaning of Alienation*," published in 1959, Seeman identifies five categories of alienation which are extracted from the work of Marx, Weber, Durkheim, Adorno: powerlessness; meaninglessness; normlessness; isolation; and self-estrangement (Healy, 2020). Powerlessness, he maintains, refers to the belief that a person's 'own behavior cannot determine the occurrence of the outcomes or reinforcements' one wants (Seeman, 1959). To put it differently, it is a state in which the individual lacks any control over his/ her own product or activity of production. Hence, in the context of education, when students believe that there are not many things that can be done at school in order to affect their future or feel themselves as empty vessels to be filled with facts (in Freirean terms) and when teachers sense their teaching as a forced activity than self-realization or they are estranged from the process and a feeling of powerlessness arises. The contradiction, here, is that learning is an activity of the teacher and the student, but not owned by neither of them. In brief, '*it is their activity, yet not their activity*.'

According to Seeman, meaninglessness pertains to an individual's sense of confusion about the events they are involved in or the lack of clarity regarding what they are supposed to believe. This dimension is derived from 'Adorno's treatment of prejudice' (Healy, 2020). When students perceive that the course content and curriculum are inadequate in preparing them for their future careers or when teachers could not be able to establish a relationship between the studies and the real life experience, a sense of meaninglessness emerges (Erbas, 2014). In Freire's expression, when learning has no 'epistemological relationship to reality', then it becomes meaningless (Shor, 1993). A clear contradiction arises here: students learn but do not understand the purpose of their learning, while teachers teach but lack a clear understanding of why they are teaching.

Low expectations for social inclusion and acceptance often manifest as feelings of loneliness or experiences of rejection and repudiation. This feeling, Seeman argues in his "*On the Meaning of Alienation*", refers to the dimension of alienation called isolation (1959, p 492). In another word, when individuals 'assign low reward value to goals or beliefs that are typically highly valued in the given society', isolation arises (Healy, 2020, p.8). Within the framework of education, this dimension of alienation will contrast the goals and values of education in a given society with the rewards it offers. There is no doubt that education is highly valued in many societies, however a disconnection ascend when it comes to the reward value.

Drawing the aspect of normlessness from Durkheim's idea of anomie, Seeman explains that it is a condition in which 'social norms regulating individual conduct have broken down or are no longer effective as rules for behavior'(1959, p.787) . Individualism becomes so extreme that people stop considering or caring about the concerns, needs, and aspirations of others (Healy, 2020). In relation to the teaching – learning activity, this dimension points to those factors that would stand against the collective nature of education.

Finally, self-estrangement, an aspect which Seeman considers the most problematic for description and usage, conveys a sense of 'the loss of intrinsic meaning or pride in work and the failure to be fulfilled by the activities in which one is engaged.' (1991, p. 351). Pertaining to education, this aspect of alienation alarms educators to be curious about the 'inherent value of education…' which aligns with Aristotelian axiom 'All men by nature have the desire to know" the pride that the learning activity would generate.

For Freire (1973), the fundamental effort of education must be to liberate the society from the existing contradiction for it is a means to construct active individuals and society who question and transform. An education system which orients students and teachers to accept the existing contradiction within a society, contradicts the very purpose of education to empower the impoverished. Hence, as Freire claims, any attempt of empowerment in education necessarily begins by resolving the contradiction within itself. It must start with reconciling the poles of the contradiction, particularly between teachers and students so that both are simultaneously teachers and students (Shor & Freire, 1987).

4. Empowering Education through Re-conceptualizing Emancipation

The concept of emancipation tends to be associated with great names like Jean Jaques Rousseau, Immanuel Kant and Karl Marx in the latter half of the 20th century (Szumlewicz, 2012). In his essay '*What is enlightenment?*'', Kant considers emancipation as a restoration from man's 'self-incurred immaturity', while Rousseau refers to his famous assertion that "man is born free, and everywhere he is in chains". However, this research re-conceptualizes Karl Marx's philosophical account of emancipation which claims for the refurbishment of humanism.

The entire trajectory of Marx's thought, from his early Economic and Philosophical Manuscripts of 1844 to the later works of the critique of political economy, was committed to the goal of human emancipation (Fromm, 2004). According to Marx and Engels (1978), true human freedom is achieved when individuals no longer see themselves as separate from their societal roles or powers. Emancipation is realized fully when people integrate their social and political identities into their daily lives, thus recognizing their individual capabilities as part of a collective social strength (p. 46).

In light of this conception, it can be remarked that at least seven key assumptions underlie Marx's view of emancipation (Susen, 2015). In the context of education, however, emancipation as a means of empowering educators, centers on only three of these assumptions; *restoration*, *transformation*, and *self-initiation*.

Marx's conception of emancipation emphasized that human beings have the capacity to the recover themselves form the detrimental sources of power which alienated them which can be referred to as restoration. Every restorative action should be preceded by the knowledge of the arrangement

and practice of power in a society (Freire & Shor, 1987). Accordingly, every activity which aims at empowering education should primarily focus on the arrangement of power within itself. The power organization between students and teachers, teachers and standardized curriculum, teachers and school administrators, school administrators and policy makers, should be taken in to consideration so as to make a restorative measure.

No great imagination is required to determine that the aim of education is to empowering people (UNESCO, 2017). However, a disempowered and alienated learning cannot be able to empower and transform society. Thus, emancipation as a restoration should also involve a negotiation between the parties which take part in learning that would replenish the students and the teachers with the power to determine their learning and involve their own creativity in the curriculum. This makes emancipation not only empowerment, but also a humanizing activity a de-humanized practice of traditional learning.

The transformative aspect of emancipation is often associated with Marx's the last thesis on Feuerbach '*the philosophers have only interpreted the world, in various ways; the point is to change it.'* (Marx & Engles, 1978). In alienated education, a significant contradiction exists between the study content and real-world problems. Such an epistemological disconnection is the main source of meaninglessness in education. Since education is a human activity, using Marx's own expression, there should be 'the real re-appropriation of the human essence by and for man.' In another expression, education as a necessarily human activity ought to aim at changing the existing condition of man.

A self-initiated emancipation, as Marx maintained, is a genuine emancipation (Susen, 2015, p.149). It is, in fact, a genuine empowerment. This implies that the process of emancipation should not be imposed 'from above'. Pertaining to education, emancipatory project which is imposed '*from above*' to empower students and teachers is like an '*old wine in a new bottle'*. Re-conceptualizing Marx's notion that a class "*in itself*" (which exists as a class) needs to convert itself into a class "for itself", knowledge as a mission of both the students and the teachers, they ought to be aware that their action has a significant role in emancipating education.

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This paper is free of conflict of interest.

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Policy Brief

The Need for a Comprehensive Teacher Education Policy in Ethiopia: A Policy Brief

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Executive Summary

Ethiopia's teacher education system has faced significant challenges over the years, including teachers' recruitment, development, career pathways, retention, and the misalignment between teacher training programs and the realities of classroom teaching. This policy brief addresses the critical need for reform in teacher education in Ethiopia, emphasizing its integral role in enhancing the overall quality of education across the nation. Despite acknowledging the importance of quality teaching in the 2023 Education and Training Policy, it fails to provide comprehensive guidelines for the recruitment, development, and retention of teachers. As Ethiopia strives to achieve its educational goals, including those outlined in the Sustainable Development Goals (SDG) for quality education, the deficiencies in teacher education represent a significant barrier to progress. The brief identifies key gaps in the 2023 Education and Training Policy, which inadequately addresses the critical aspects of teacher education provisions, and alignment with the Ethiopian Education Roadmap. To address these pressing issues, this brief outlines policy options, including the formulation of a dedicated teacher education policy that focuses on effective recruitment, training, and career pathways. Additionally, it recommends strengthening continuous professional development programs to enhance teacher skills and motivation, while ensuring alignment with the national education roadmap. Comparative analyses with successful international teacher education systems, such as those in Finland and Singapore, provide insights into effective strategies that could be adapted to the Ethiopian context. Without significant action in teacher education policy, Ethiopia will struggle to improve educational outcomes and meet its national development goals.

1. Introduction

Teacher education in Ethiopia plays a critical role in shaping the overall quality of the national education system; yet, it remains an area that is not sufficiently emphasized in the 2023 Education

and Training Policy. As Ethiopia strives toward its educational goals, including those set by the Sustainable Development Goal (SDG) 4, which calls for inclusive and equitable quality education for all by 2030, the role of teachers is indispensable (United Nations, 2015). Teachers are the implementers of curriculum, facilitators of student learning, and key agents of change in educational reforms (Darling-Hammond, 2017).

Ethiopia's teacher education system grapples with significant challenges, even as teachers remain the cornerstone of the nation's educational progress. Historically, there has been a lack of a dedicated and comprehensive teacher education policy (Mekonnen, 2022). The 2023 Education and Training Policy, although recognizing the importance of teachers, does not provide clear and actionable guidelines for the recruitment, development, and retention of quality teachers (Ministry of Education, 2023). This neglect has a ripple effect on the overall quality of education, as teacher preparation programs struggle to align with international best practices, and the profession continues to face low status, inadequate resources, and limited professional development opportunities (World Bank, 2021).

In light of these gaps, it is essential to develop a more focused teacher education framework that addresses the needs of both pre-service and in-service teachers. The framework should align with the broader national educational goals and international standards, ensuring that Ethiopian teachers are well-prepared to contribute to the country's educational development and address the learning needs of students across various contexts (UNESCO, 2020). This policy brief aimed to analyze the gaps in the 2023 Education and Training Policy regarding teacher education and propose actionable recommendations to address components of teacher education crucial for ensuring that the teaching workforce is equipped to meet educational demands.

2. Policy Problem

The 2023 Education and Training Policy of Ethiopia present a significant gap in addressing the needs of teacher education. The policy, which is intended to guide the country's education sector for the next decade, provides insufficient focus on the key components required for developing a robust teacher education system. While previous policies and reforms such as the Teacher Education System Overhaul (TESO) and the Post-graduate Diploma in Teaching (PGDT) sought to improve the quality of teacher education, these initiatives have not fully addressed the underlying

challenges. Teacher education in Ethiopia continues to face issues such as limited professional development opportunities, inadequate preparation for teachers in the use of modern pedagogical methods, and poor alignment with the demands of 21st-century teaching.

Furthermore, there are substantial gaps between the 2023 policy and the recommendations outlined in the Ethiopian Education Roadmap, which emphasizes transforming teaching into a respected profession by enhancing teacher competence and motivation. The policy lacks clear strategies for addressing the recruitment, development, and retention of qualified teachers, and it does not provide sufficient incentives or career pathways to attract and retain top talent in the teaching profession. This gap contributes to the persistent challenges faced by Ethiopia's education sector, including teacher shortages, especially in rural areas, low student performance, and inadequate learning outcomes.

Addressing these deficiencies requires a comprehensive and dedicated teacher education policy that aligns with global best practices and addresses the evolving needs of both the teachers and the educational system. Without significant reform in teacher education, Ethiopia's efforts to improve the quality of its education system and meet its national development goals will be severely hindered.

3. Analysis of the Issue

This analysis is informed by insights gathered through key informant interviews with educational experts and a comprehensive review of relevant policy documents, including the 2023 Education and Training Policy, the Ethiopian Education Roadmap and education policies of different countries. The 2023 Education and Training Policy of Ethiopia present significant challenges in addressing teacher education, despite its crucial role in the country's education system. Teachers are the foundation of any educational system, and ensuring their quality and preparedness is essential for achieving national development goals. However, the revised policy fails to prioritize teacher education adequately, highlighting critical gaps in both pre-service and in-service training.

4. Key Gaps in the 2023 Education and Training Policy

The policy includes only a brief mention of teacher education in subsection 4.6, which focuses on the educational levels of teachers, trainers, and educational leaders. While the policy does propose

a continuous professional development program linked to professional licensing, it lacks detailed guidelines and strategies for teacher education. This is in stark contrast to the comprehensive provisions found in the earlier 1994 education policy, which gave more weight to teacher development and recruitment.

Despite recognizing the importance of aligning teacher training with school curricula, the 2023 policy does not provide clear directions for improving the quality of teacher preparation programs or addressing the existing gaps in the recruitment, development, and retention of teachers. Interviews with educational experts reveal a consensus that teacher education is not given the prominence it deserves. One respondent noted the lack of a dedicated section on teacher education in the policy, while another emphasized the need for more in-depth analysis and guidance on the role of teacher educators.

6. Challenges in Teacher Education

Findings from document analysis reveal discrepancies between the 2023 Education and Training Policy and the earlier policy and Ethiopian Education Roadmap. Ethiopia's teacher education system has faced significant challenges over the years, including a shortage of qualified teachers, limited professional development opportunities, and a lack of alignment between teacher training programs and the realities of classroom teaching. The frequent reforms in teacher education models, such as the shift from the Teacher Education System Overhaul (TESO) to the Post-graduate Diploma in Teaching (PGDT), have not been empirically evaluated, leading to instability in the teacher preparation system.

Moreover, the professional development of teachers remains weak. Many teachers, especially those in rural areas, lack access to adequate training resources and support systems. The absence of a comprehensive teacher education policy exacerbates these challenges, leaving the system under-equipped to provide high-quality education to students across the country.

7. Discrepancies with the Ethiopian Education Roadmap

The lack of alignment between the 2023 Education and Training Policy and the Ethiopian Education Roadmap further complicates efforts to improve teacher education. The 2020 Education Roadmap emphasized the need to transform teaching into a profession of choice, focusing on enhancing

teacher competence and motivation. It proposed several system-wide reforms, including the development of clear teacher management policies, improving teacher salaries and working conditions, and ensuring continuous professional development. These recommendations are stated as follows in the roadmap document:

> *"Introduce motivational career structures at all levels, enhance the content and quality of professional development programs, institutionalize CPD at all levels, and align career promotion and incentive with performance and the licensing. And review teachers' salary to make it competitive to that of other professions, Provide adequate benefits such as housing, transport, free medical treatment, adequate pension, low interest loans."* (Ethiopian Education and Training Roadmap, 2020)

However, the 2023 policy does not reflect these recommendations. The disconnection between the roadmap and the current policy framework creates obstacles to implementing effective reforms that could enhance teacher education and, consequently, the quality of education in Ethiopia recruitment, development, career pathways, and retention. This gap was further underscored during key informant interviews, where stakeholders highlighted the absence of actionable measures for aligning teacher education provisions with roadmap recommendations.

8. International Comparisons

When compared to international best practices, Ethiopia's teacher education system lags behind in terms of both policy and implementation. Countries such as Finland, Singapore, and South Korea have made significant strides in improving teacher education by focusing on continuous professional development, teacher incentives, and integrating new teaching technologies (Darling-Hammond, 2017; OECD, 2020). For instance, Finland's emphasis on teacher autonomy and extensive professional development has led to high student performance and teacher satisfaction (Sahlberg, 2011). Similarly, Singapore's model includes rigorous teacher training and substantial financial incentives that attract highly qualified individuals to the teaching profession (Tan, 2019). These countries offer competitive salaries, robust career pathways, and strong professional support systems that contribute to their successful educational outcomes.

Ethiopia, in contrast, struggles with attracting and retaining teachers, and professional development opportunities are limited (World Bank, 2021). The frequent reforms in Ethiopia's teacher education system, often implemented without sufficient empirical support, have contributed to the deterioration of teaching quality rather than improving it (Mekonnen, 2022). This instability is

exacerbated by inadequate resources and support, leading to low teacher morale and high turnover rates.

The 2023 Education and Training Policy's failure to adequately address the needs of teacher education represents a significant obstacle to improving the overall quality of Ethiopia's education system. Without a comprehensive and dedicated policy for teacher education, the country will continue to face challenges in recruiting, developing, and retaining qualified teachers, thereby hindering its progress toward achieving educational excellence and sustainable development (UNESCO, 2020).

9. Policy Options

Table 1: Policy options and characteristics

Policy Options	Key Actions	Pros.	Cons.
Develop a Comprehensive Teacher Education Policy	Formulate a dedicated policy that focuses on teacher recruitment, development, career pathways, and retention.	Provides a focused approach to teacher development and improves the quality of teaching.	Requires time and resources to develop and implement.
Produce a Directive on Teacher Education Provisions	Create a directive that clearly outlines teacher education provisions, focusing on enhancing teacher competence, recruitment standards, training processes, and support systems for teachers throughout their careers.	Establishes clear guidelines and accountability measures, improving the overall quality of teacher education and professional practice.	May lack a comprehensive policy base, which could limit long-term sustainability and integration into broader education policy frameworks.
Align the Current Education and Training Policy with the Ethiopian Education Roadmap	Ensure that the provisions for teacher education are in alignment with the recommendations of the national education roadmap, with an emphasis on enhancing teacher competence and motivation.	Promotes coherence between the national education and the entire education system, leading to more effective implementation and improved outcomes.	Requires significant revisions to existing policies which may be time-consuming and resource-intensive.

10. Conclusion

Teacher education policy is not only necessary but urgent if Ethiopia is to meet its educational goals and advance toward sustainable development. The 2023 Education and Training Policy falls short in addressing the essential components of teacher preparation, professional development, and retention, which are crucial for ensuring that the teaching workforce is equipped to meet 21st-century educational demands.

To address these shortcomings, a dedicated teacher education policy is needed—one that provides clear frameworks for recruiting, developing, and retaining competent teachers, and aligns with Ethiopia's broader educational goals as outlined in the 2020 Education Roadmap. Strengthening continuous professional development (CPD) programs, offering competitive incentives, and revising the curriculum to better reflect the needs of both teachers and students are keys to elevating the profession and ensuring better learning outcomes across the country. By implementing these recommendations, the government can ensure that teachers are better equipped to provide high-quality education, which is essential for the nation's long-term development.

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Original Article

Indigenous Songs for the Indigenization of Early Childhood Education and Care (ECEC): 'Tokkeen Maal' in focus'

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Abstract

After a lengthy disregard and neglect, the importance of indigenous early childhood education and care (ECEC) is well-recognized by scholars in the field of ECEC and international organizations working with children such as UNICEF and UNESCO. As a result of this shift in paradigm, need for the incorporation of indigenous knowledge and practices into ECEC (indigenization) is gathering momentum. The main purpose of this article was therefore to show how 'Tokkeen Maal'- a common counting rhyme used to teach children counting up to ten across Oromia- can be used to indigenize the conduct of ECEC and its pedagogic richness in preprimary and primary education in Oromia and beyond. To this end, the song was subjected to thematic and content analyses. Results of the analyses of the song revealed that it has broad pedagogic/instructional values. Its wholeness, inter-activeness, and joyfulness make Tokkeen Maal a highly viable and worthwhile pedagogic strategy in preprimary and primary school settings. Apart from its pedagogic values, the use of Tokkeen Maal in ECECE helps to nurture children's development of cultural identity, connect schools with the community and uphold children's cultural rights enshrined in the United Nations Child Rights Convention (UNCRC). Overall, it can be thought as a highly viable means of indigenizing early childhood education and care (ECEC) in Oromia and beyond.

Key words: early childhood education and care; indigenization; tokkeen maal; indigenous knowledge; Oromo; child-oriented oral traditions.

1. Introduction

After a lengthy disregard and neglect, the importance of indigenous early childhood education and care (ECEC) is well-recognized by scholars in the field of ECEC and international organizations working with children such as UNICEF and UNESCO. UNESCO promotes indigenous early

childhood care and education (IECCE) and has already developed IECCE curriculum for Africa (Awopegba, Oduolowu, & Nsamenang, 2013). As a result of this shift in a paradigm, need for the incorporation of indigenous knowledge and practices into ECEC is gathering momentum. The main purpose of this article is therefore to show how 'Tokkeen Maal'- a common counting rhyme used to teach children counting up ten across Oromia- can be used to indigenize the conduct of ECEC in Oromia and beyond and its pedagogic richness in pre-primary and primary education.

1.1. Indigenous Knowledge and Its Importance

Following the unprecedented growth of interest in Indigenous Knowledge (IK), literature is replete with different definitions of indigenous knowledge. However, for the sake of space, the researcher reviewed a few definitions that are relevant to education. To begin with, referring to Easton (2004), Soudee (2009) defines indigenous knowledge as " *a particular group's understanding of the surrounding world, ways of sharing information or teaching, and ways of speaking and thinking that are passed down through generations*"(p. 16-17). Similarly, Majoni and Chinyanganya (2014) define IK as it applies to education on the ways of teaching and learning based on the knowledge accumulated by indigenous people over long period in response to different physical, environmental and social problems. Awopegba et al., (2013) define indigenous education "*as the body of context-evolved cultural knowledge, skills, attitudes, practices, and cultural values and aspirations transmitted from one generation to the other*" (p. 21).

Gwanfogbe (2011) traces three significant educational heritages coexisting in Africa that are derived from indigenous African, Islamic–Arabic, and Western-Christian civilizations each of which has its own unique features. African indigenous education is characterized by tacit holistic and integrated curriculum(Awopgba et al., 2013; Gwanfogbe, 2011), and context-based pedagogic strategies such as poetry, reasoning, riddles, praises, songs, story-telling, proverbs, folktales, games, dance, songs, rhymes, and more (Awopegba et al., 2013). Taken together, indigenous education is an aspect of indigenous knowledge that is based on and informed by locally originated knowledge and practices and a locally grown system.

Indigenization of education in general and early childhood education in particular is not the abandonment of western knowledge and values as some may think. Rather, it is a matter of balancing indigenous knowledge and western knowledge and values.

The importance of indigenous knowledge in general and indigenous education in particular cannot be overemphasized. Particularly, the importance and relevance of incorporating indigenous knowledge and practices into early childhood education and care programs is far-reaching. Belay Tefera and Belay Hagos (2016), after reviewing a wealth of literature, have highlighted the importance and relevance of indigenization of early childhood education and care. According to them,(1) indigenization helps to meet the needs of indigenous children and their families; (2) it leads to a more impactful, meaningful and relevant learning ;(3) it enables children to develop their cultural identity as it roots children in their indigenous knowledge and skills; (4) it leads to a preschool that is embedded within the community set up that is less costly in terms of design and conduct, more accessible to the greater majority, more relevant and useful to the children and to the nation, more able to mobilize community resources, and ensure its sustainability in the long run; and (5) it minimizes and/or reduces learning challenges leading to absenteeism, school dropout, failure in the learning process, and disinterestedness in schooling.

Incorporating indigenous knowledge and practices into early childhood education and care, also termed as indigenization (Belay & Belay, 2016) and indigenous early childhood care and education(IECCE) by UNESCO (Awopegba et al., 2013), can be considered as a viable solution for challenges and issues facing African education in general and ECEC in Africa in particular. For example, African education is often criticized for lacking relevance to the realities of Africa. In the excerpt that follows, Obanya(2011) clearly shows how far current education in Africa in general and ECEC in particular is irrelevant to Africa's realities on the ground(p. xxv):

> *African children are the only ones in the world whose socialization begins with acculturation- learning about other worlds in a foreign language- instead of beginning with enculturation- being deeply entrenched into your own world first and foremost.*

Obanya (2011) also rightly notes that it is only in Africa where the educated are de-cultured due to early exposure to education and care that lacks relevance. Cultural irrelevance of education leads to de-enculturation and also denies children their right to cultural identity enshrined in the United Nations Child Rights Convention (UNCRC). Indigenization of ECEC by incorporating indigenous knowledge and practices into ECEC programs can surmount the issue of relevance. Indigenization as it applies to ECEC programs refers to domesticating, customizing and aligning the programs to fit to the social and cultural context of the learners and the larger community.

Education in Africa not only lacks relevance but also quality. As with the issue of relevance, the issue of quality can also be addressed by indigenization of education at all levels. In this regard, Nsamenang and Tchombe (2011) argue that education in African countries is unproductive because it aims at educating African children by separating and alienating them from their own socio-cultural realities. In other words, education that is detached from the socio-cultural realities of the learners is obviously poor in terms of quality. As Belay and Belay (2016) put it: "An inalienable quality of a good ECEC center is the extent to which it is contextually, culturally, socially, and linguistically relevant to the setting it is operating in" (p.107).Therefore, incorporating indigenous knowledge and practices into the fabrics of education unquestionably enhances its quality by connecting it to the reality of learners and the larger community.

Issues of access are other challenges of education in Africa that can be addressed by indigenization. As already pointed out, indigenized education centers are cheaper than 'Western' ones in terms of cost. Indigenization allows the use of locally available resources which cost nothing or little compared to modern ECEC centers. For example, a budget allocated to establish a single modern ECEC can be used to found five to ten indigenized ECEC centers. Overall, the provision of indigenous education is much cheaper and more cost-effective than the provision of Western-style education. Therefore, indigenization of education in general and ECEC in particular allows resource-constrained countries such as Ethiopia to ensure equitable access to ECEC especially in rural areas and among the urban poor where access to ECEC is little or nonexistent at all. Overall, incorporating indigenous knowledge and practices into ECEC- indigenization as Belay and Belay (2016) put it seems a viable strategy to overcome the bottlenecks of the provision of quality, equitable and sustainable ECEC in Africa general and in Ethiopia particular. However, little has been done in indigenizing education in general and ECEC in particular in Africa particularly in Ethiopia. Limited evidence available (e.g., Belay & Belay, 2016) shows a grave lack of ingenuity to indigenize ECEC. Belay and Belay (2016) have expressed the seriousness of problems surrounding indigenization of ECEC in Ethiopia idiomatically as "…indigenization of ECEC was a serious concern that seemed to add 'goiter' on ECCE's existing 'mumps' (i.e. the problem of access)" (p. 1). The main purpose of this article is to contribute to the efforts being exerted to provide quality ECECE by portraying how Tokkeen Maal can be used to indigenize ECEC in Oromia and beyond.

2. Methodological Approach

The author conducted a series of onsite observations of children performing the song at some early childhood settings and finally recorded it. The researcher also repeatedly observed the video recorded. This was supplemented by informal interviews held with early childhood development, care and education (ECD-EC) summer in-service MA students from different parts of Oromia and the author's personal experience. The interviews with students were made to discover to what extent students coming from different parts of Oromia are familiar with the song. All the students interviewed confirmed that they were familiar with the song as a child. The researcher's personal experience was also used as a source of data. As a child, the author used to play this song and still remembers all verses of the song. The data collected were then subjected to content and thematic analysis. The contents and themes that emerged from the both method of analysis were narrated and discussed in relation to existing literature.

3. Results and Discussion

3.1. 'Tokkeen Maal' (What is one) and its mode of play

Oromo as a nation, like many African nations and other indigenous people across the world, is rich in all sorts of indigenous knowledge. Oromo is a nation that has its own culture and language. The language is called Afan Oromo, the language of the Oromo or simply Oromo. The term 'Oromo' refers to the people and their language as well. The Oromo predominantly inhabit Oromia, the most populous region in Ethiopia. In the Oromo culture, children have special place. This is implicated in its age-graded theory of child socialization embedded in the mega-system, called *Gadaa* System which has been registered as an intangible heritage by UNESCO. The Oromo have a vast array of child oral traditions that can be a valuable resource in modern formal schooling. The Oromo child-oriented oral traditions include, among others, proverbs, poems, songs, tales, myths, folktales and riddles. "Tokkeen Maal"-the counting rhythm that the researcher set out to analyze in this article is one of the oral traditions frequented among the Oromo across Oromia to socialize children. The counting rhythm has ten verses since it meant to teach counting from one to ten. It is presented in table 1 along its respective English translation.

Table 1: Counting rhythm with the corresponding description

Verse in Afan Oromo		English translation	
Dursaa/ dursituu	Jalaa-qabduu	Leader	Responder
Tokkeen maal?	Tokkeen tokkuma!	What is one?	One is one!
Lama maal?	Lammaan mucha re'ee! Tokkeen tokkuma!	What is two?	The two teats of a goat; One is one!
Sadii maal?	Sadan suunsummanii, lamaan mucha re'ee, tokkeen tokkuma!	What is three?	The three stoves of fire; the two teats of a goat! One is one!
Afur maal?	Afran mucha sa'aa, sadeen sunsummanii, lamaan mucha re'ee, tokkeen tokkuma!	What is four?	The four teats of a cow; the three stoves of fire; the two teats of a goat; One is one!
Shan maal?	Shanan quba harkaa! Afran mucha sa'aa, sadeen sunsummanii, lamaan mucha re'ee, tokkeen tokkuma!	What is five?	The five fingers of a hand; The four teats of a cow; the three stoves of fire; The two teats of a goat! One is one!
Ja'a maal?	Ja'an jabbii qaraxaa, Shanan quba harkaa! Afran mucha sa'aa, sadeen sunsummanii, lamaan mucha re'ee, tokkeen tokkuma!	What is six?	The six cows for dowry; the five fingers of a hand; the four teats of a cow; the three stoves of fire; the two teats of a goat; One is one!
Torba maal?	Torban torbee sanbataa, Ja'an jabbii qaraxaa, Shanan quba harkaa! Afran mucha sa'aa, sadeen sunsummanii, lamaan mucha re'ee, tokkeen tokkuma!	What is seven?	The seven days of a week; the six cows for dowry; the five fingers of a hand; the four teats of a cow; the three stoves of fire; the two teats of a goat! One is one!
Saddeet maal?	Saddeettan dhala leencaa, Torban torbee sanbataa, Ja'an jabbii qaraxaa, Shanan quba harkaa! Afran mucha sa'aa, sadeen sunsummanii, lamaan mucha re'ee, tokkeen tokkuma!	What is eight?	The eight cubs of a lion; the seven days of a week; the six cows for dowry; the five fingers of a hand; the four teats of a cow; the three stoves of fire; the two teats of a goat; One is one!
Sagal maal?	Saglan yaa'ii Booranaa! Saddeettan dhala leencaa, Torban torbee sanbataa Ja'an jabbii qaraxaa, Shanan quba	What is nine?	The nine councils of the Borana; the eight cubs of a lion; the seven days of a week; the six cows for

| Kudhan maal? | harkaa! Afran mucha sa'aa, sadeen sunsummanii, lamaan mucha re'ee, tokkeen tokkuma!

Kurnan boolla sadeeqaa, Saglan yaa'ii Booranaa! Saddeettan dhala leencaa, torban torbee sanbataa Ja'an jabbii qaraxaa, Shanan quba harkaa! Afran mucha sa'aa, sadeen sunsummanii, lamaan mucha re'ee, tokkeen tokkuma! | What is ten? | dowry; the five fingers of a hand; the four teats of a cow; the three stoves of fire; the two teats of a goat; One is one!
The ten holes for marble game; the nine councils of the Borana; the eight cubs of a lion! The seven days of a week; the six cows for dowry; the five fingers of a hand; the four teats of a cow; the three stoves of fire; the two teats of a goat; One is one! |

The song can be played in a pair or in two groups. That is one individual or group of individuals asks questions and another individual or a group of individuals answers the questions asked. For example, when the first individual or group asks 'tokkeen maal'- means what is one, the second individual/group answers 'tokkeen tokkuma'-means one is one. When the asking individual or group asks 'lama maal' means what is two, the answering individual or group answers 'lammaan mucha re'ee, tokkeen tokkuma' means the 'two breasts of a goat, one is one'. The process goes like this until ten. As can be seen from the examples, the answering individual or group not only answers the new question but also repeats the answers to previous questions. This repetition helps to anchor the meaning of the numbers in the children`s mind. The song is gender-neutral and thus boys and girls can play the song together or separately. From the analysis one can also understand that adults including parents can use the song to foster children's numerical literacy, social interaction, and communication skills by linking it with the socio-cultural life of the people.

3.2. Pedagogic/Instructional Values of 'Tokkeen Maal'

A closer look at the song reveals that it has vast and rich pedagogic/instructional values that are particularly applicable to pre-primary and primary school settings. Some of these pedagogic/instructional values include inclusiveness/wholeness, inter-activeness, and joyfulness. Usage of Tokkeen Maal in the conduct of ECEC also fosters cultural identity and preserves cultural heritage. It also connects schools with the community. Furthermore, it upholds children's rights to

culture enshrined in the United Nations Child Rights Convention (UNCRC). These and other related values of Tokkeen Maal will be highlighted in the next sections of this paper.

3.3. Wholeness of Tokkeen Maal

Although the song is a counting rhythm used to teach children counting, a closer look at it reveals that the song is a whole and *content-rich* song. Specifically, it mainly contains within it mathematics (numeracy), science and social studies. Numbers 1-10 are contained in the song (mathematics). Parts of animal and human bodies are there (life science); for example, the second verse talks about the two breasts of a goat, the fourth about the four breasts of a cow and the fifth about the five fingers of a human hand. In addition, the seventh verses teaches children there are seven days in a week and the eighth verse tells children that a female lion can give birth to up to eight cubs at a time. Moreover, it contains social studies. The social studies aspect of the song is represented by sixth, ninth and tenth verse. Hence, it can be used to teach mathematics (numeracy), science and social studies in an integrated manner. The interchange of question and answer between parties involved in the Tokkeen Maal has also broad contribution to foster children's language development and communicative skills.

The wholeness (or completeness) of Tokkeen Maal as a pedagogic strategy is also reflected in its ability to attend to and foster all aspects of child development and learning. When singing Tokkeen Maal, children learn to count from one to ten by associating the numbers with what are found in their surrounding and their community. This in turn not only facilitates learning, but also it fosters the retention of what has been learned thereby intensifying cognitive development. When singing Tokkeen Maal, children also make physical movements which facilitate their physical development and health. Moreover, when singing Tokkeen Maal, they need to interact with each other and take turn as a result of which they develop social skills such as negotiation and self-regulation.

3.4. Inter-activeness of Tokkeen Maal

Interaction between the teacher and children and among the children is very crucial for children's holistic development and meaningful learning. In fact, the quality of education in general and that of early childhood education in particular is highly contingent on the amount of interaction that takes place in classroom between the teacher and learners and among the learners themselves as well. Tokkeen Maal is highly interactive for it allows maximum interaction among children. Therefore,

incorporating indigenous pedagogic strategies such as Tokkeen Maal into early childhood education and care has manifold benefits one of which is acceleration of learning and development through enhanced interactions among actors in the classroom.

3.5. Joyfulness of Tokkeen Maal

Tokkeen Maal is a joyful counting song. In principle, early childhood learning activities should be joyful. But, making early childhood learning activities and lessons joyful is a difficult task for teachers in developing countries where early childhood education and care centers are poorly designed and not well equipped or not equipped at all. Under such circumstances, it is wise to properly make use of indigenous songs and games such as Tokkeen Maal to make learning joyful and accelerate children's learning and development and foster their total well-being.

3.6. Tokkeen Maal as a means to foster cultural identity and preserve cultural heritage

Aside from its pedagogic values, incorporating Tokkeen Maal into ECEC practice at class-room level has many benefits to the children, their parents and the larger community. Among others, it fosters children's cultural identity development. Indigenous ECEC roots children in their cultural knowledge and skills which in turn facilitates children's cultural identity (Belay & Belay, 2016). Children's psychological development and their total well-being better off when learning is linked to their cultural identity by incorporating indigenous knowledge and pedagogies into the fabrics of ECEC (Awopegaba, et al., 2013). Article 29 of the UNCRC stipulates that "Education of the child shall be directed to the development of respect for the child's parents, and the child's own cultural identity, language and values, as well as for national values of the country in which the child is living." Ali (2011) calls for the amalgamation of African oral traditions into education process for doing so promotes cultural identity and preserves their cultural heritage. Therefore, slotting indigenous dances, games, songs and other oral traditions such as Tokkeen Maal into the design and practices of ECEC not only fosters children's cultural identity and preserves their cultural heritage but also it ensures their rights to cultural identity cherished in the UNCRC.

3.7. Tokkeen Maal as A Bridge between Schools and Community

African education systems are harshly criticized for their detachment from the realities of Africa on the ground. The connection between the learning environment of schools, home and the community is very loose or non-existent at all. Education and schooling that is not rooted in the community and

cultural eco-system in which it operates uproots children from their cultural heritage. One way to root education and schools in the community and eco-culture in which they function is indigenization. Education and schools that are rooted in the community are connected to the community which they serve. Good connection between schools and the community not only enhances the quality of the education and care rendered but it also ensures its sustainability. Therefore, incorporation of Tokkeen Maal into the conduct of ECEC in Oromia as pedagogic strategy narrows the split between ECEC programs and the larger community and abridges them.

3.8. Tokkeen Maal as A Means to Uphold and Promote Children's Rights to Culture

According to the UNCRC (1989), children are holders of the rights to culture. Parents, school, community, and organizations and individuals working with children are duty bearers and thus required to uphold and promote children's right to culture to discharge their duty. Incorporating indigenous knowledge and practices such as Tokkeen Maal in ECEC services means upholding and promoting children rights to culture enshrined in the UNCRC in one way or the other.

4. Concluding Remarks and Way forward

The relevance and importance of education in general and ECEC in particular is not overemphasized. The primary purpose of education is "intergenerational transmission of cultural heritage" (Obanya, 2011). But, how does education transmit cultural heritage from generation to generation when it is imported in its entirety? In other words, education and ECEC misses its primary purpose when it is not rooted in the community and eco-culture where it functions. There might be many possible ways of rooting education particularly ECEC into the community to which it is directed. One highly viable way is incorporating the traditions, beliefs and practices of that community into educational process at curriculum and classroom level. This practice is termed as indigenization, or indigenous education (or indigenous early childhood care and education). Indigenization of education and ECEC does not mean a total rejection of Western knowledge and values. Rather, it is blending indigenous knowledge and western knowledge and values in a balanced manner to provide African children with education that prepares them for local and global life without removing them from their cultural identity and heritage.

In this paper, the author sought to showcase how to indigenize ECEC using Tokkeen Maal as a case study. To this end, the author pointed out some pedagogic richness and other benefits of Tokkeen

Maal and argues that Tokkeen Maal is a highly viable vehicle for indigenizing preprimary and primary education in Oromia and beyond and thus should be included early childhood education and care guide books. The author does not claim that the discussion of the benefits of Tokkeen Maal as a vehicle to indigenize ECEC is exhaustive and calls for extensive research that will have been supported by comprehensive primary data. Future research will benefit from opinions and data collected from all stakeholders of ECEC that are generated through multiple means of data collection including onsite observation of ECEC centers.

Disclose Conflicts of Interest

This paper is free of conflict of interest.

Authors' Contribution

All authors contribute equally.

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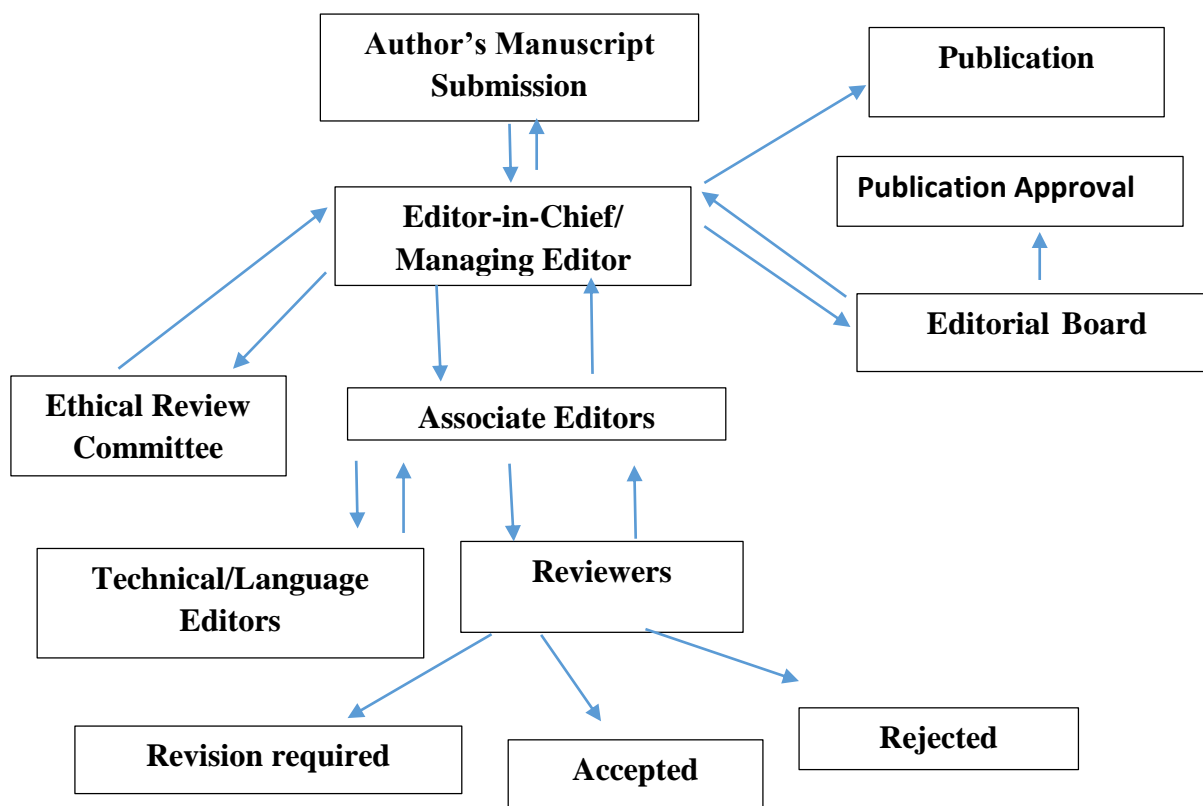
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