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Original Research

Mathematics Teachers' Teaching Styles and Students' Learning Styles Preference in Secondary Schools of Southwest Shoa Zone

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Abstract

This research aimed to identify the most popular methods of mathematics instruction and student and teacher preferences in secondary schools in the South West Shoa Zone. The study used descriptive correlational study designs and mixed-methods research methodologies. The survey included 302 instructors and 319 pupils from five randomly selected secondary schools with 12th graders, and was conducted using availability sampling methodology. The study aimed to understand the best teaching methods for students and teachers in secondary school math. Five principals were interviewed using availability sampling, and data was gathered through document analysis, questionnaires, and interviews. The results showed that secondary school math teachers use a moderate amount of expert, formal authority, and personal model pedagogy within the teacher-centered method. However, the student-centered approach is not being implemented effectively, with only 3.43 percent of students preferring auditory or visual learning and 2.45 percent preferring kinesthetic learning. The relationship between students and teachers in mathematics is moderate, considerable, and favorable. Teachers are encouraged to identify students' preferred learning styles and implement various activities to tailor classes to their interests and increase motivation to master the subject.

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INTRODUCTION

The goal of mathematics curricula has been to give students the foundational knowledge and abilities in mathematics that they will need for higher education. These include understanding mathematical concepts, refining mathematical reasoning and problem-solving techniques, applying these abilities outside of the classroom, improving their scientific knowledge, and acting responsibly. According to Bell and Bass (2002), the primary goal of mathematics education is to persuade students to be ready for the mathematical issues that they will face in the real world rather than just to enjoy learning the fundamentals of mathematics.

Ethiopia's education sector development strategies state that mathematics is one of the most important courses for all students to

learn since it is useful in everyday life and serves as a tool for science and technology (Yizengaw, 2004). The provision of mathematical knowledge to students has been the aim of mathematics curriculum. Teachers therefore need to continuously enhance the manner they instruct their students. In addition to equipping students to be researchers and problem solvers, innovative teaching techniques can assist students in connecting mathematics to real-world scenarios.

In order for students to be able to engage in the economies of today and tomorrow, it is expected that they will utilise their knowledge, new perspectives, and skills to apply mathematical reasoning to the problem (Gutierrez, 2002). We recognise that, from this vantage point, it is preferable to employ contemporary teaching methods rather than conventional ones when instructing mathematics in order to further the nation's development. Inquiry-based learning, cooperative learning, simulation, and discovery-based methods are a few examples of creative teaching techniques that Prince and Feider (2006) claim are more effective than traditional methods in which teachers use "chalk and talk."

According to Park (2001), teachers should adapt their style of instruction to the preferred learning style of their students for challenging tasks and use a variety of teaching tactics to reinforce the material being taught. According to (MOE, 2003), maths teachers aren't always effective at teaching in the classroom when it comes to boosting students' learning styles and techniques through the use of the active learning approach.

Learning mathematics may not benefit from the same learning strategy that works well for studying English or history. Thus, the teachers need to understand the effective teaching style according to the context of the syllabus and teacher guide. Niess (2005) states that it is not only important to consider the content of the mathematics curriculum but also to know how students learn mathematics.

Finding efficient teaching techniques and strategies that impact students' learning activities is one of the issues faced by educators. When a teacher's teaching style and a student's learning style align, the latter is easier for the former to comprehend and remember (Damvandi, 2011). This indicates that when the teaching style of mathematics teachers matches with students learning preferences, the students understand more about the content of mathematics and solve the problems they face.

The ability to apply the syllabus and teachers' guide appropriately to their lesson plan is one of the key issues faced by mathematics teachers. This reality is connected to their professional obligations as well as their educational and content expertise. According to Searson and Dunn (2001), learning styles primarily depend on an individual's personal qualities, which can be further classified into environmental, sociological, and physiological categories. Two significant works that broaden the field's understanding of nature and the complexity of knowledge that educators bring to the classroom in order to instruct pupils are arranged by Odili (2009).

Statement of the Problem

Students learning preference is a function of many variables, including teachers' teaching style, teachers' qualifications, and teachers' experience. All teaching is centred on professional methodology, especially in the area of presentation, skills, and techniques'. No matter how serious the students in the study are, if the teaching style is poor, it will affect the learning procedure (Lage, Platt & Treglia, 2000).

The teaching style depends on the subjects and the content going to be taught. According to McCormick and Leask, 2005), a teacher's style is a way of expressing themselves that strikes a balance between creating a guiding vision for our instruction and being adaptable to various subject areas. Different scholars' research shows that the majority of the learning preferences of their students were directly related to the problem of mathematics teachers' teaching style. Unal (2017) reports that mathematics teachers preferred methods that required less involvement and effort. This shows the ability and interest of teachers' teaching style that they want to teach their learners, and it is a good implication of how much the students are motivated to learn. Kennedy (2016) also says teaching style depends on the teacher's own needs, professional goals, and personal opinion. Motivation and commitments of others for their professions help students become interested in learning.

According to a study by Ethiopia's Ministry of Education, the National Curriculum Guide Line (MoE, 2003), teachers of certain subjects may not always be adept at utilising active learning techniques in the classroom to maximise student success by promoting learners' learning styles and strategies. When it comes to teaching mathematics, the bulk of issues with students' learning preferences are directly tied to the manner in which teachers teach the subject. Furthermore, to the best of my knowledge, no prior research has been done on the teaching methods of math teachers or the preferred learning styles of pupils in a secondary school in the southwest Showa Zone.

Therefore, secondary school mathematics teachers teaching styles influencing the students learning style preferences were misunderstandings of teachers teaching style match or miss-match with students learning preferences, knowledge, and skill gaps to select different teaching styles, experience, preparing instructional planning, diagnosis of student learning preferences, professional commitments, and to realise that effective mathematics teaching styles in secondary schools related to students learning style preferences are the main gaps that the researcher wants to fill.

So that, based on the above facts, the researcher exploring types of teaching styles used by mathematics teachers and students' learning preferences', the relationships between mathematic teachers teaching styles and students learning style preferences, and the challenges that influence' mathematics teachers teaching styles, it is necessary to conduct an observed study in secondary schools in the South West Shoa Zone.

Examining mathematics teachers' pedagogical approaches and how to incorporate them into mathematics lessons at South West Shoa Secondary School ought to

be the goal of this research. Specifically, the study has investigated the influence of teachers teaching styles on the learners' learning style preferences in mathematics subjects. It also looks at the relationship between the learning preferences of the secondary school pupils in South West Shoa Zone (SWSZ) and the teaching styles of mathematics teachers. The independent variable, teacher teaching styles, would be determined by assessing the teaching styles that teachers perform in selected secondary schools. The dependent variables, grade 11 and 12 students' learning styles and preferences in mathematics subjects, were assessed by assessing their preferences for learning mathematics.

Research questions

1. What styles of teaching do mathematics teachers in South West Shoa's secondary schools employ?
2. What are the learners' mathematics learning style preferences in the secondary schools in South West Shoa?
3. What connection exists between students' preferred learning styles and the styles used by mathematics teachers?
4. What are the challenges of mathematics teachers' using different teaching styles?

Matrials and Methods

The strategy that connects particular methodologies with philosophical presumptions is known as research design (Creswell & Creswell, 2017). Thus, research design refers to both the general strategy for gathering information to address the research questions and the particular procedures or techniques for data analysis that the researcher plans to employ. A descriptive-correlational research design was used for this investigation. Rather than assuming cause-and-effect linkages, a descriptive correlational research approach aims to characterise the correlations between the variables (Lappe, 2000). When the researcher has no control over the independent variables that are thought to affect the dependent variable, a descriptive correlational design can be used to describe the relationship between one event and another (Lappe, 2000). Ever since, it has made an effort to collect high-quality data by gathering information that is currently available. It should have well-crafted descriptive correlation questions that explore the relationship between the learning preferences of the students and the teaching styles of the mathematics teachers. These questions should be a balanced questions.

To gather the required information and convey facts and opinions, mixed-method research using qualitative and quantitative methods was employed. The researcher used both quantitative and qualitative methodologies to achieve this goal. To enable the results to be generalised, data collection and analysis were done using the quantitative technique. Additionally, it offered more thorough responses to the fundamental research questions. The information collected from the quantitative study was triangulated and supported by the qualitative data from the document analysis and interview data. By combining quantitative and qualitative research approaches, the mixed-methods approach is utilised to comprehend a study problem. Due to the simultaneous collection and triangulation of both quantitative and

qualitative data, a concurrent mixed-method (research strategy) was employed in this study. Sources of Data and the Research Population

This study's data came from primary as well as secondary sources. Teachers, students, and directors of secondary schools served as the primary data sources. Furthermore, secondary data was gathered from records pertaining to the topics being studied, such as student rosters and other records. The entire population to whom a researcher hoped to apply the study's findings is known as the study population. Students in grades 11 and 12, math teachers, and principals of secondary schools in the southwest Shoa zone comprised the study's population. In southwest Shoa, there are 29 government secondary schools and eleven (11) woredas. Sampling Techniques and Sample Size

The South West Shoa zone is geographically vast, with eleven woredas; the researcher limited his investigation to five woredas. The researcher chose to employ cluster sampling approaches in order to obtain representative samples for this investigation. The sample woredas are chosen using cluster sampling procedures. The method is preferred by the researcher because it makes geographically dispersed participants' samples more representative (Taherdoost, 2016). So the researcher used the cluster sampling technique by dividing the zone into three (3) subzones. These sub-zones are: Woliso, Bacho, and Sodo.

Under this consideration, Woliso and Bacho's sub-zones contain four (4) woredas each, and the Sodo sub-zone contains three (3) woredas. From these, the researcher has selected one woreda from the Sodo subzone, two woredas from the Bacho sub-zone, and two woredas from the Woliso sub-zone by using simple random sampling techniques. Five (45.45%) of the eleven woredas in the south-west zone were chosen by cluster and basic random sampling methods. According to Gay and Arirasian (2003), descriptive research on the population frequently uses a sample that is 10%–25% of the target population. There are 13 secondary schools in these five woredas, and five secondary schools that provided grade 12 national examinations were selected using the availability sampling technique.

In these secondary schools, there are 32 mathematics teachers, five directors, and 1916 grade 11 and 12 students. From the available data, 32 (100%) teachers and 5 (100%) directors were taken as samples for the study. In addition to this, of the total population of grade 11 and 12 students in these five secondary schools, 319 (16.65%) were selected as the sample size for the study.

The formula for sample size determination is: (Yemane, 1967), where n is the sample size of the study, N is the total population of the students, z is the confidence level (z = 1.96), E is a precision error (E = 0.05), p is the success proportion, and q is the failure proportion (p = 0.5). Generally, the sample size of the study was 32 mathematics teachers, 319 grade 11 and 12 students, and 5 secondary school directors, and the total sample size will be 356.

Data-gathering instruments

The questionnaire, interview, and document analysis are the methods used in this study to collect data. Students, instructors, and principals were among the respondent

populations included in the study's scope. The researcher has used questionnaires and interview guides for primary data sources, and document analysis is used for secondary source data collection. By considering the necessary materials that are used to collect the factual information from the respondents', we should be making sure about their efficiency and effectiveness.

Methods of data analysis and interpretation

The teacher's chosen teaching style and the students' preferred learning techniques were ascertained using a quantitative analysis of the questionnaire data using frequencies, means, and standard deviations. The combination technique was also used to assess the data from the questionnaire and semi-structured interviews, after it had been compared to the information obtained from document reviews. The narrative statement contained the findings from the examination and contrast of the quantitative and qualitative data that were gathered through interviews. In order to describe the features of the respondents' demographic background, frequency and percentage were used. The study employed the mean and standard deviation to assess the frequency of distinct teaching styles among mathematics instructors.

Furthermore, the Pearson correlation coefficient was utilised to illustrate the nature of the association between the preferred learning technique of students and the teaching style of teachers. When testing statistical measurements of a link between two variables, the Pearson correlation coefficient gives information about the direction and degree of that association.

A perfect correlation can be described as one that is near positive or negative (±1), depending on the size of the value. A positive or negative coefficient value (± 0.50) between positive and negative (± 1) indicates a significant association. There is no association when the score is zero, but there are medium correlations when the values fall between positive or negative (± 0.30) and positive or negative (± 0.49).

Thus, the Pearson correlation coefficient was calculated using SPSS version 21, a statistical programme for social science. In the end, data from the document review was analysed, recorded, and assessed using the narrative description. This data was then cross-checked and validated against information gathered through semi-structured interviews and questionnaires.

RESULTS AND DISCUSSIONS

As indicated in the below Table1; the mean results and standard deviation of responses of the teacher respondents, for item 1(M=3.88; SD=0.87); item 2 (M = 3.59; SD = 1.62); item 3 (M = 4.25; SD=0.80); item 4 (M=3.94; SD=0.84) and item 5 (M=4.28; SD=1.08) the experts teachers teaching styles used by the mathematics teachers in the secondary schools at high extent. Additionally, items 6 (M = 3.09; SD= 1.42) shows moderate implementation of mathematics teachers' using expert teaching style. Furthermore, the mean result of item 7 (M =1.59; SD= 0.79) shows low implementations of expert teaching style. Generally, the grand mean (M=3.41; SD=0.44) shows in secondary schools mathematics teachers use expert teaching styles at a moderate level.

Table 1

Teachers' response regarding the uses for "Experts" teaching style by mathematics teachers

No	Items	N	Mean	SD
1.	Definition, postulates, and theorems are most important in teaching mathematics.	32	3.88	0.87
2.	It's crucial that I impart my knowledge and experience to the kids.	32	3.59	1.62
3.	It's critical that students have a more comprehensive understanding of the topic by studying the mathematics I bring up in class.	32	4.25	0.80
4.	It's crucial to learn mathematics for your future.	32	3.94	0.84
5.	One of the main components of my class meetings is lecturing.	32	4.28	1.09
6.	I use my expertise to settle disputes around content.	32	3.09	1.42
7.	There is more material on mathematics than I can cover in the time I have	32	1.59	0.80
	Garand means of Expert teachers teaching style	32	3.41	0.44

Source: Field survey 2021; Mean value of 4.50 - 5.00 = very high extent, 3.50-4.49 = high extent, 2.50-3.49 = moderate extent, 1.50-2.49 = low extent and 1.00 - 1.49 = very low extent

The teaching styles used in secondary schools "Formal Authority"

The responses' regarding formal authority' teachers teaching style used by teachers in a mathematics class in Secondary Schools of South West Shoa Zone was presented and analyzed. As presented in Table 2 the mean values for item 1 (M= 3.72; SD=1.02); item 4(M= 3.53, SD= 1.59); item 5(M=3.59, SD=1.16); item 6 (M=4.25; SD=0.80) and item 7 (M=3.53; SD=1.41) indicate the teacher respondents replied that the formal authority teaching style were used at high extent by mathematics teachers in the secondary schools under study. The mean values for items 3 (M=3.16; SD= 1.08) and item 2 (M=2.94; SD=1.08) indicate the teacher respondents recognized that the mathematics teachers' implementation of the formal authority teaching styles is at a moderate level. However, the mean value for item 8 (M= 1.59; SD=0.76) indicates that the mathematics teachers' extent of use formal authority teaching style is low. In general, the respondents agreed that the mathematics teachers in the secondary schools use formal authority teaching style to a moderate extent (M = 3.29; SD = 0.50).

Table 2

Responses from teachers about the application of "Formal Authority" teaching methods in mathematics

No	Items	N	Mean	Std. Deviation
1.	When it comes to my math kids, I have high expectations.	32	3.72	1.02
2.	When a student's performance is subpar, I give them critical	32	2.94	1.08

Table.2 continues..

3.	My expectations and standards are perceived by students as being fairly tight and strict.	32	3.16	1.08
4.	Determining what subjects and how they should be taught them	32	3.53	1.59
5.	I give extremely specific instructions on how I want arithmetic assignments to be completed.	32	3.59	1.16
6.	I wish to achieve extremely specific aims and objectives in	32	4.25	0.80
7.	The syllabus outlines my precise expectations for what I want students to do in math class.	32	3.53	1.41
8.	My objectives and standards assist kids in acquiring the discipline they need to learn	32	1.59	0.76
	Grand mean		3.29	0.50

Source: Fieldwork (2021). *Mean value of 4.50 - 5.00 = very high extent, 3.50-4.49 = high extent, 2.50-3.49 = moderate extent, 1.50-2.49 = low extent and 1.00 - 1.49 = very low extent*

The Teaching styles used in secondary schools "Personal Model"

The following Table 3 presents and analyzes the replies regarding the Personal Model instructors' teaching style that was employed by instructors in a mathematics class in Secondary Schools of South West Shoa Zone. Table 3 presents the status of mathematics teachers' use of personal model teaching styles. Accordingly, the mean values of the mathematics teachers' responses for item 1(M= 4.25, SD= 1.30); item 2 (M=3.72,

Table 3

Teachers' response regarding mathematics teachers uses "Personal mode" teaching style

No	Items	N	Mean	Std. Deviation
1.	What I say and do demonstrates to pupils how and what to do to grasp the material in mathematics by modeling acceptable methods	32	4.25	1.30
2.	I frequently utilize examples from my own experiences to highlight points in the subject	32	3.72	1.42
3.	Pupils frequently receive written and verbal feedback on their performance.	32	3.81	1.51
4.	Many pupils start to view the subject matter in the same way that I do.	32	3.63	1.52
5.	Students are encouraged to develop their opinions about the mathematical topic issues through class activities.	32	3.81	1.40
6.	What I say and do demonstrates to pupils how and what to do to grasp the material in mathematics by modeling acceptable methods for them to think about certain topics.	32	3.69	1.33

Table. 3 continues…

7.	I frequently utilize examples from my own experiences to highlight points in the subject, and I frequently demonstrate to pupils how to apply different ideas and concepts.	32	3.78	1.45
	Personal Model Teachers Teaching style	32	3.54	0.61

Source: *Field survey (2021). Mean value of 4.50 - 5.00 = very high extent, 3.50-4.49 = high extent, 2.50-3.49 = moderate extent, 1.50-2.49 = low extent and 1.00 - 1.49 = very low extent*

SD=1.42); item 3 (M=3.81, SD=1.51); item 4 (M=3.63; SD=1.52); item 5 (M=3.81; SD=1.40); item 6 (M=3.69; SD=1.33) and item 8 (M=3.78, SD=1.45) show high extent of the implementation of personal model teachers' teaching styles. Generally, the grand mean and standard deviation (M=3.54, SD= 0.61) of the response of the respondents indicates mathematics teachers' high extent/level implementation of personal models teaching style in the secondary schools.

The teaching styles used in secondary schools

The responses' regarding facilitators' teachers' teaching style used by teachers in a mathematics class in Secondary Schools of South West Shoa Zone was presented and examined in the following Table 4.

Table 4

Teachers' response regarding their using "Facilitators" teaching style

No	Items	N	Mean	Std. Deviation
1.	Many student learning styles are taken into account in my teaching objectives and strategies.	32	2.50	1.24
2.	taking the time to talk with the students about how to do better on both group and individual projects.	32	2.59	1.13
3.	Small-group conversations are used to assist students in honing their critical thinking skills.	32	2.47	1.22
4.	directing pupils' work on their tasks by posing queries and offering other solutions.	32	2.34	1.29
5.	Students are encouraged to take charge of their education through mathematics activities.	32	2.41	1.34
6.	To fulfil criteria, students have a selection of activities to choose from.	32	2.50	1.02
7.	Students received one-on-one assistance and motivation, which improved their performance in mathematics.	32	2.19	0.86
	The grand average of facilitators' instructional methods	32	2.43	0.61

Source: field survey (2021)

Mean value of 4.50 - 5.00 = very high extent, 3.50-4.49 = high extent, 2.50-3.49 = moderate extent, 1.50-2.49 = low extent and 1.00 - 1.49 = very low extent

Table 4 presents the responses of the teachers regarding mathematics teachers' use of facilitators' teaching style in secondary schools. Accordingly, the mean values for item 1 (M = 2.50, SD = 1.24); item 2 (M = 2.59, SD = 1.13); and item 6 (M = 2.50, SD = 1.02), show a moderate extent and level of implementation of the facilitators' teaching style. On the other hand, the mean values of items 3 (M = 2.47, SD = 1.22), 4 (M = 2.34, SD = 1.29), 5 (M = 2.41, SD = 1.34), and 7 (M = 2.19, SD = 0.86) revealed a low extent of implementation of the teaching style by the mathematics teachers in the secondary schools. Generally, it is understood that the grand mean value of responses of the teachers regarding their using facilitators' teachers' teaching styles (M = 2.43, SD = 0.61), shows a low extent of implementation. Grasha (1996) explains that the implementation of this style would offer a great deal of flexibility in their teaching and more prepared them for "student-centered approach and also focused on the personal nature of the student-teacher interaction. Therefore, it can be argued that the mathematics teachers were not in a position to effectively implement facilitatory teaching styles in the secondary schools under study.

The teaching styles used in secondary schools

Table 5 presents the responses' of teachers concerning delegators' teachers' teaching style used by the teachers in a mathematics class in the Secondary Schools of South West Shoa Zone. As presented in Table 5, the mean values for items 4 (M = 2.59, SD = 1.21), 6 (M = 2.50, SD = 1.19), and 7 (M = 2.75, SD = 1.02), indicate the delegators' teaching style implemented at a moderate extent and level in the secondary schools. However, the mean values for items 1 (M = 2.16; SD = 0.77); 2 (M = 2.31; SD = 0.97); 3 (M = 2.44; SD = 1.32); and 5 (M = 2.47; SD = 1.14). The respondent teachers said the delegators' teaching style was implemented at a low extent and level in the secondary schools studied.

In general, the grand mean and standard deviation (M = 2.46; SD = 0.52) show the respondents agreed that mathematics teachers in secondary schools use delegators' teaching style at a low level. According to Grasha (1996) the delegator style does much to stress the student as an independent learner, but it is possible to recognise that, as a result, low-level independent learners have a preference to learn mathematics in secondary schools. This shows a lack of encouragement from teachers to promote students, independent learners, in learning mathematics.

Table 5

Teachers' responses regarding their using for "Delegators" teaching style

No	Items	N	Mean	Std.
1.	Students typically work on mathematics problem activities alone with little supervision from me.	32	2.16	0.77
2.	Students design one of the more self-directed learning experiences.	32	2.31	0.97
3.	Developing the ability of students to think and work independently is an important goal.	32	2.44	1.32

Table.5 continues…

4.	Students take responsibility for the teaching part of the class sessions.	32	2.59	1.21
5.	Students set their steps for completing independent as well as group work.	32	2.47	1.14
6.	The approach of my teaching is similar to a manager of a workgroup who delegates tasks and responsibilities to subordinates.	32	2.50	1.19
7.	The students expecting me as a resource person who is available to students whenever they need help.	32	2.75	1.02
	Delegators' Teaching style	32	2.46	0.52

Summary of the uses of mathematics teaching styles at variable levels

The following Table 6 presents a summary of teachers' responses concerning the question listed under the five Grasha teachers teaching styles used by teachers in a mathematics class in secondary schools in the South West Shoa Zone.

Table 6

Uses of teaching styles at Variable level

No	Variables	N	Mean	Std.
1.	Expert teachers teaching style	32	3.41	0.45
2.	Formal authority teachers teaching style	32	3.29	0.49
3.	Personal model teachers teaching style	32	3.54	0.61
4.	Facilitators teachers teaching styles	32	2.43	0.61
5.	Delegators teachers teaching	32	2.46	0.52

Source: Field survey (2021).*Mean value of 4.50 - 5.00 = very high extent, 3.50-4.49 = high extent, 2.50-3.49 = moderate extent, 1.50-2.49 = low extent and 1.00 - 1.49 = very low extent*

As we can see from the above table, the personal model teachers' teaching style (M = 3.54, SD = 0.61) was implemented at a high level, and expert (M = 3.41, SD = 0.45), and formal authority (M = 3.29, SD = 0.49), were implemented at a moderate level. Whereas the implementation of facilitators (M = 2.43, SD = 0.61), and delegators (M = 2.46, SD = 0.52) as teaching styles was found below.

An interview conducted with secondary school principals confirmed that mathematics teachers did not use a variety of teaching styles depending on students learning experiences, preferences, and saturations. One of the school principals reported that:

Mathematics teachers' uses of teaching styles most of the time depend upon teacher-centere approaches. Sometimes they try to implement student-centred approaches while they do not identify the learning preferences' of their students (school principal, # 2). Therefore, the interview of the principles shows that mathematics teachers do not consistently use different teachers' teaching styles, and identifying students learning style preferences rather than the common understanding of teachers depends on the level of students' capacities, like low learners, medium learners, and fast learners. This understanding by itself does not show the learning preferences' of

learners. On the other hand, there is no awareness or standardised criteria to identify the learning preferences of students in secondary schools in the southwest Shao zone.

According to Khandaghi and Farasat (2011), the five Grasha and Reich man teachers' teaching styles could approximately be divided into two styles: teacher-centred style (direct), which consists of expert, authority, and personal model, and learning-based style (indirect), comprising facilitator and delegator. The study revealed that the teaching style of mathematics teachers used to teach mathematics in secondary schools in the Southwest Shao Zone was teacher-centere rather than student-centred. But Rossetti and Nembhard (1998) state that a new teaching approach such as active learning methods based on investigation, discovery, cooperative learning, and simulation is more effective than a traditional approach where teachers apply chalk and talk. In other words, the teaching styles of mathematics teachers in secondary schools were the traditional approach that needed more attention to modify their teaching style to active teaching approaches.

Learners learning style preferences of mathematics in secondary schools

The following Table 7 presents the students' responses who responded to mathematics learners learning style preference and were asked to answer the question listed in VAK. The three (3) learning style preferences' checked in VAK include visual (V), auditory (A), and kinesthetic (K). The highest score in the given mean result would be that the students prefer that particular learning style of mathematics.

Learners learning style preferences "Visual learners"

The following table presents the students' responses who responded to mathematics learners learning style preference and were asked to answer the question listed in visual learning styles in mathematics class.

The Table 7 shows that the mean results for items 1 (M = 3.85, SD = 1.24), 4 (M = 3.82, SD = 1.27), 5 (M = 3.82, SD = 1.31), 6 (M = 3.50, SD = 1.37), and 7 (M = 3.76, SD = 1.35). The student respondents said the visual learning style preferences of learners are at a high level in learning mathematics. In another way, the mean values for items 3 (M = 2.81, SD = 1.48), and 8 (M = 2.99, SD = 1.39), revealed that the learners' preference for visual learning style is moderate in learning mathematics.

Table 7

Learners' responses regarding their preference for "visual" learning style in mathematics class

No	Items	N	Mean	Std.
1.	To remember the concept of mathematics better; I prefer to write it down.	319	3.85	1.24
2.	I take detailed notes during the mathematics teacher's lectures.	319	1.91	0.78
3.	Using color-code help me to learn mathematics	319	2.81	1.48
4.	Looking at the mathematics teacher to understand what s/he says.	319	3.82	1.27
5.	When the mathematics teachers lecture and write on the blackboard I understand it better.	319	3.82	1.31

Table 7 continues..

6.	Charts and diagrams help me to understand what mathematics teachers teaching.	319	3.50	1.37
7.	I prefer to study mathematics in a quiet place.	319	3.76	1.35
8.	It's difficult for me to understand mathematics concepts when someone tells me.	319	2.99	1.39
	Average mean	319	3.30	0.67

Source: Field survey (2021)
Mean value of 4.50 - 5.00 = very high extent, 3.50-4.49 = high extent, 2.50-3.49 = moderate extent, 1.50-2.49 = low extent and 1.00 - 1.49 = very low extent

Additionally, the mean value for item 2 (M = 1.91; SD = 0.78), shows learners' low-level preference for visual learning styles. Therefore, the average mean of visual learning style (M = 3.30, SD = 0.67) shows the learners' preference for visual learning style is moderate in learning mathematics. But the students pay too much attention to the discussion and miss the meaning of the topics, which are difficult to visualize. Therefore, it is hard to visualise everything through the topics, so the teachers should try to meet the learning preferences of their students.

Learners learning style preferences "Auditory learners"

In the following Table 8 offerings, the students' respondents were asked to answer the question itemised in auditory learning styles in mathematics class.

Table 8

Learners' responses regarding their preference for "auditory" learning style in mathematics class

No	Items	N	Mean	Std.
1.	I remember mathematics concepts better if I discuss them with someone.	319	3.87	1.26
2.	To learn mathematics I listen to prefer the lecture mathematics teachers rather than reading.	319	3.70	1.31
3.	Background sound helps me think and learn mathematics.	319	3.50	1.29
4.	I like to listen to music when I study or work in mathematics.	319	3.37	1.48
5.	I can understand what people say about the concept of mathematics even when I cannot see the definition.	319	3.49	1.23
6.	Easily remember theorem and postulate in mathematics that I hear	319	3.52	1.27
7.	When mathematics teachers teach mathematic I prefer to listen to his /her sound more than to see the blackboard.	319	3.51	1.37
8.	If someone tells me how to solve mathematics problems, it is clear for me better than having to read the same thing to myself.	319	3.56	1.30
	Auditory learning style preference	319	3.56	0.81

Source Field survey (2021)*Mean value of 4.50 - 5.00 = very high extent, 3.50-4.49 = high extent, 2.50-3.49 = moderate extent, 1.50-2.49 = low extent and 1.00 - 1.49 = very low extent*

The above table analysis was made to identify the auditory learning style preferences of the learners in the secondary schools studied. The mean results for item 1 (M = 3.87, SD = 1.26); item 2 (M = 3.70, SD = 1.31); item 3 (M = 3.50, SD = 1.29); item 6 (M = 3.52, SD = 1.27); item 7 (M = 3.51, SD = 1.37); and item 8 (M = 3.56, SD = 1.30) indicate the learner respondents are saying the auditory learning style preference of the learners is high in learning mathematics. On the other hand, the mean values for items 4 (M = 3.37, SD = 1.48), and 5 (M = 3.49, SD = 1.23), show the respondents are saying the auditory learning style of their preferences is moderate. Generally, the average mean and standard deviation (M = 3.56 and SD = 0.81) of the responses of the learners indicate that auditory learning style preferences of the learners are high in learning mathematics in secondary schools.

Learners learning style preferences "Kinesthetics learners"

The Table 9 presents the students' responses to mathematics learners learning style preferences. They were asked to answer the question listed in kinesthetic learning styles in mathematics class.

Table 9

Learners' responses regarding their preference for "kinesthetic" learning style in mathematics class

No	Item	N	Mean	Std. Deviation
1.	I need frequent breaks when I work or study mathematics.	319	1.62	0.73
2.	I need to eat something when I read or study mathematics.	319	1.67	0.77
3.	If I have a choice between sitting and standing, I had rather stand to learn mathematics.	319	1.67	0.80
4.	I get nervous when I sit still too long in mathematics class.	319	3.24	1.50
5.	I play with my pens during the lectures on mathematics.	318	1.67	0.78
6.	I move my hands when I want to describe the concept of mathematics.	319	3.62	1.33
7.	I draw lots of pictures in my notebook during mathematics class.	319	1.73	0.84
8.	I tend to solve problems through a more trial-and-error approach, rather than from a step-by-step method.	319	3.54	1.42

Source: Field survey (2021). Mean value of 4.50 - 5.00 = very high extent, 3.50-4.49 = high extent, 2.50-3.49 = moderate extent, 1.50-2.49 = low extent and 1.00 - 1.49 = very low extent

As we can see in Table 9, the learner respondents' responses to items 6 (M = 3.62, SD = 1.33), and 8 (M = 3.54, SD = 1.42) revealed that the kinesthetic learners learning style preferences are high. The mean value for item 4 (M = 3.24; SD = 1.50) indicates the extent of students' preference for kinesthetic learning style is moderate. The learners responses for items 2 (M = 1.67, SD = 0.77), 3 (M = 1.67, SD = 0.80), 5 (M = 1.67, SD =

0.78), and 7 (M = 1.73, SD = 0.84) show that the extent of the learners preference for the kinesthetic learning style is low in learning mathematics in secondary schools. Therefore, the grand mean value of the variable (M = 2.45; SD = 0.45) indicates that the extent of the learners learning preferences for kinesthetic learning style is low. But kinesthetic learners learn best through touch, movement, imitation, and other physical activities. As a result, this style of learning is one of the active teaching methods wanted to be implemented, so it needs more attention from mathematics teachers in secondary school to provide students with self-learning.

Summary of learners learning style preferences at variable level

The following table presents a summary of the learners' responses that were answered in mathematics. Learners learning style preferences were requested to answer the question given in VAK learning styles in mathematics class. Table 10 shows that, when it comes to studying mathematics in secondary schools in the southwest Shoa zone, auditory learning style preferences were rated as high (M = 3.56, SD = 0.81), while visual learning was rated as moderate (M = 3.30, SD = 0.67).

Table 10

Learning style preference at Variable level

No	Variables	N	Mean	Std. Deviation
1	Visual Learners	319	3.30	0.67
2	Auditory Learners	319	3.56	0.81
3	Kinesthetic Learners	319	2.45	0.45
	Valid N (listwise)	319		

Source: Field survey (2021)

Mean value of 4.50 - 5.00 = very high extent, 3.50-4.49 = high extent, 2.50-3.49 = moderate extent, 1.50-2.49 = low extent and 1.00 - 1.49 = very low extent

Nonetheless, student respondents rated their liking for the kinesthetic learning approach as low (M = 2.45, SD = 0.45). According to Dunn (1993), a learner's style refers to how they focus, absorb, and remember new and challenging knowledge. By having students complete a learning styles questionnaire and by watching them participate in a variety of activities in various contexts, teachers can therefore develop an impression of their students' preferred learning styles. As a result, it is reasonable to propose that educators ascertain the students' preferred methods of learning. In other aspects, knowing the different learning styles of students aids teachers in creating lesson plans that are excessively customised to each student's learning preferences. According to the study, students' choices for studying mathematics are influenced by the teacher-centered approaches used by math teachers.

Table 11

Teachers teaching styles relation with students' learning preference in mathematics class

Correlations			
		Students Learning styles	Teachers teaching style
Students Learning styles	Pearson Correlation	1	.490**
	Sig. (2-tailed)		.004
	N	319	32
Teachers teaching style	Pearson Correlation	.490**	1
	Sig. (2-tailed)	.004	
	N	32	32

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

Source: *Field survey (2021). ±1.0 = Perfect Correlation, ± 0.60 to ± 0.99, = Strong correlations, ± 0.30 to ± 0.59, = Moderate correlations, ± 0. 1 to ± 0.29, = Weak correlations and 0 = No Correlation.*

The link between maths professors' pedagogical approaches and students' preferred methods of learning. The association between teaching style and learning styles—which are regarded as the favoured viewpoints for word learning in mathematics—is seen in the Table 11. Rather than being talents, the two factors might be measured in terms of styles. It also helps to comprehend how maths professors currently teach and what kinds of learning styles students like in secondary schools in the southwest Shoa zone. The Pearson correlation coefficient was utilised to achieve this. A metric used to quantify the degree of linear relationship between two variables is Pearson's correlation. It displays the direction, strength, and importance of the correlations between the variables. (Awla, 2014) states that a correlation is ±1.0 = perfect, ± 0.60 to ± 0.99 = high, ± 0.30 to ± 0.59 = moderate, ± 0.1 to ± 0.29 = weak, and 0 = no connection. Consequently, Table 11 presents the findings.

The correlation results in the table revealed that the relationship between mathematics teachers teaching styles and students' learning preferences is r = 0.49**, p =.004, n = 319. This shows that there is a moderately significant, positive relationship between mathematics teachers' teaching styles and students' learning style preferences in secondary schools in the Southwest Shoa Zone. Teachers need to match their teaching style to students' preferred learning style for the difficult task and reinforce the learning content by observing diverse teaching strategies (Park, 2001). Additionally, Lawless and Pellegrino (2007) suggested that the integration of a variety of teaching styles would be the most helpful factor in improving the effectiveness of teaching and learning practices. Therefore, the study revealed that the relationships between mathematics teachers' teaching style and students learning preferences at a moderate level need more attention to change.

The challenges of teachers' teaching styles in mathematics class

The challenges of mathematics teachers based on the teaching styles they used to teach mathematics in secondary schools in the southwest Shoa zone were presented and analysed in the following Table 12. Therefore, the result was analysed by considering the responses of the respondents that indicate the highest percentages show the challenges of mathematics teachers' teaching styles that affect teaching mathematics.

Table 12

Teachers responses regarding the challenges of teachers teaching styles in mathematics class

No	Items	F(%)	Response levels			
			Low	Medium	High	Total
1	Availability of adequate resources helps to use a different teaching style	F	23	8	1	32
		%	71.90	25	3.10	100
2	It is possible to balance diverse learning styles for learners within the allotted time.	F	27	5	0	32
		%	84.40	15.60	0	100
3	I am successful with the students' interest and motivation to learn mathematics class.	F	22	7	3	32
		%	68.80	21.80	9.40	100
4	Students' attitudes towards mathematics affected their learning style preferences.	F	25	3	4	32
		%	78.20	9.40	12.40	100
5	School environments encourage me to identify different teaching styles	F	24	8	0	32
		%	75	25	0	100
6	The problems of large class size to use different teaching styles	F	20	5	7	32
		%	62.50	15.60	21.90	100
7	The contents and its syllabus of mathematics are beyond the abilities of the students	F	0	4	28	32
		%	0	12.40	87.60	100
8	There is in-service training to modify trends of traditional teaching mathematics.	F	26	4	2	32
		%	81.30	12.40	6.30	100

Sources: Field survey (2021)

To measure the challenges of mathematics teachers' teaching styles, the responses collected on a five-point Likert scale are aggregated into three levels: low, medium, and high. Accordingly, it was identified that the availability of time to implement a variety of teaching styles (84.40%) was a chronic challenge in the schools. In addition, in-service training and knowledge on teaching styles (81.3%); students' attitude towards mathematics (78.20%); school environments (75%); inadequacy of resources (71.9%); and interest and motivation of students (68.80%) were reported as low levels as a series of challenges to mathematics teachers teaching styles chronologically. On the other hand, it

was identified that there was a high level of content difficulty (87.60%). In addition to this, large class sizes were identified as the least challenging factor that affects implementing different teaching styles in the classroom.

Interviews conducted with secondary school principals regarding mathematics teaching style challenges revealed that teachers' pre-preparation, the ability of teachers to understand the learning preferences of their students, a lack of resources to use different teaching aids, and the time allotted to cover mathematics subjects relative to the content and its syllabus were the major challenges that affected the use of different teaching styles. In line with this, one of the principals said that:

The students' discipline and their interest, the influence of politics, the shortage of mathematics teachers, the current COVID-19 pandemic virus, and the education policies that change from old to new without the distribution of new curriculum materials are some challenges that affect mathematics teachers teaching styles. (School principal, #5)

Generally, it was learned from the findings of the study that the problems of content difficulty, lack of allotted time to cover the content, the absence of adequate resources, the absence of in-service training to use a variety of teaching styles, the problem of the school environment, and the interest and motivation of students to learn mathematics are identified as serious challenges that negatively affect the implementation of different teaching styles and thus need the attention of stakeholders (teachers, students, and school directors) to improve the quality of mathematics teachers teaching styles.

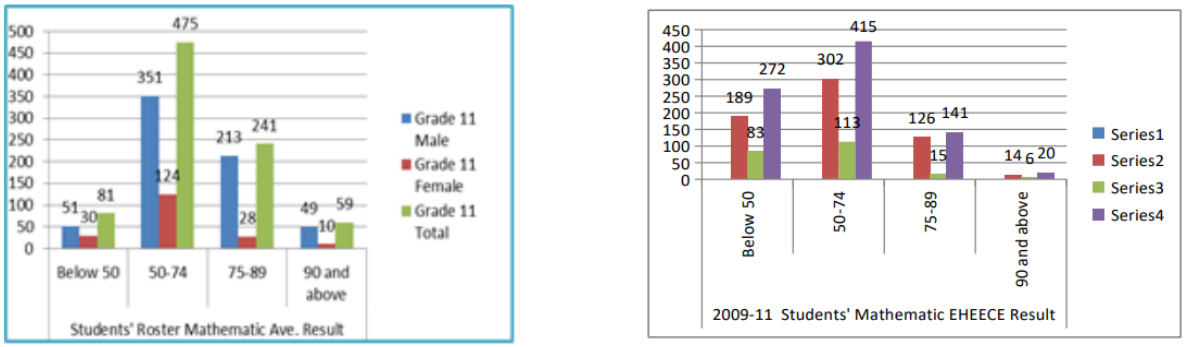

Figure 1. *Grade11and 12 students' mathematics result from. Sources: Student rosters from five schools (2019-2021)*

Figure 1 indicates that the document analysis of students' mathematics performance depends on their roster and Ethiopia Higher Education Entrance Certificate of Examination (EHEECE) for three consecutive years, starting from 2009–20011 E.C. It is possible to see grade 11 students mathematics performance was 81 (9.46%) of their average below, 50; 475 (55.49%) between the averages of 50 and 74; 241 (28.15%) between 75 and 89; and 59 (6.89%) between 90 and above averages.

Again, when we look at the performance of grade 12 mathematics students based on

EHEECE 2009-2011, we see that 272 (32.08%) have an average below 50, 415 (48.93%) have an average of 50-74, 141 (16.62%) have an average of 75-89, and 20 (2.36%) have an average of 90 or higher. Therefore, the result indicates that students' learning mathematics achievement in grades 11 and 12 was poor. It is possible to suggest that the learners do not have the basic knowledge that helps them through their progress.

According to Damvandi (2011), when a teacher's teaching style aligns with a student's preferred learning style, the student's comprehension and recall improve. This theory suggests that it might happen as a result of a mismatch between mathematics professors' preferred teaching styles and those of their students. Furthermore, as persistent inconsistencies between the classroom teaching style and the majority of learners' learning styles can lead to subpar academic performance and a negative attitude towards a subject, poor mathematics presentation may also be associated with the teacher's style of instruction (Wilson, 2011).

As a result, the bulk of pupils in grades 11 and 12 have poor performance in mathematics. In secondary schools, this must be done by aligning teachers' pedagogical approaches with students' preferred modes of learning in order to promote comprehension and improve retention.

CONCLUSIONS

The findings of the study revealed that mathematics teachers' teaching style in secondary school implements a personal model at a high level, whereas experts and formal authorities, teaching styles are at a moderate level, which is grouped under the teacher-centred approach. However, the facilitators' and delegators' teaching styles, which are grouped under the students'-centered approach, were implemented at a low level. On the other hand, the majority of the students' averages (3.43) prefer visual and auditory learning styles at a moderate level and kinesthetic (2.45) learning styles at a low level. This implies that mathematics teachers do not promote active student learning activities in secondary schools. The qualitative data also revealed that students' academic performances' in mathematics were low.

There is a moderate, significant, and positive relationship between mathematics teachers' teaching style and students' learning style preferences' in secondary schools (0.49**). The most challenging of the mathematics teachers in mathematics class identified by the study were lack of time and in-service training; students' attitude and their motivation to learn mathematics; lack of resources; content difficulty; and the problem of the school environment.

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CONFLICTS OF INTEREST

The authors declare that there is no conflict of interest regarding the publication of this paper.

DATA AVAILABILITY STATEMENTS

The data of this study are available from the corresponding author upon request.

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