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PERCEIVED FACTORS AFFECTING STUDENTS' MATHEMATICS PERFORMANCE IN NORTH SHOWA ZONE SECONDARY SCHOOLS IN ETHIOPIA

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ABSTRACT: This paper examines the perceived factors affecting students Mathematics performance in North Showa administrative zone Secondary schools in Amhara regional state in Etiopia. Data from eight schools that involved 3 general secondary schools, 4 general secondary and preparatory schools and 1 preparatory school were collected. The participants were 153 teachers and 334 students. A Questionnaire was used as an instrument for data collection. Quantitative method of data analysis was employed to analyze the data. Specifically percentage and Chi-square were implemented to analysis the data. The research takes teachers qualification, teaching method, students' motivation and learning environment as a study variable. The study revealed that most of the teachers 91.03%, 71.9%, and 79.58% ha negative perception about teachers' qualification, teaching method and students' motivation to learn mathematics respectively. Most of the students (76.26%) have negative perceptions about teachers' qualification to teach Mathematics. Most students (61.22%) also have negative perceptions about the teachers' method of teaching mathematics. Many students (62.66%) have negative perceptions of the learning environment. Almost half of the students, i.e. 51.18% believe that students are motivated to learn mathematics. From the results it is concluded that mathematics teachers are not well qualified to teach mathematics, teachers follow poor teaching methodology to teach mathematics, students are not motivated to learn mathematics and the learning environment is not attractive for the students. As a result Debre Berhan University and the Zonal and woreda/district education bureaus should alleviate these problems by giving trainings for teachers and students and by providing necessary teaching aids for the schools.

1. INTRODUCTION

1.1. Background of the study

Mathematics is the pillars of all sciences (1, 2, and 3*) and* is also a crucial subject for the development of science and technology. With the growing role of science, mathematics and technology in modern life, the objectives of personal fulfilment, employment and full participation in society increasingly require that all adults be mathematically, scientifically

and technologically literate. S0 today, all adults need a solid foundation in mathematics to meet their goals. Therefore, it is imperative to understand what factors affect students' mathematics performance.

One of the core priorities of *Education Sector Development Progra m*(ESDP-IV) of Ethiopia in the education system is to strengthen science and technology (4).The ministry (4) added that to transform Ethiopia into a middle-income country in 2025,it demands transformation of the economy through application of science and technology as instruments to create wealth. In line with the key priorities of the current Growth and Transformation Plan, a large demand is expected for middle and high level human resources (4). It is therefore critically important to emphasize science and technology so as to produce capable citizens who can contribute to make the country competitive in the increasingly knowledge-based global economy. It has become mandatory for the education system to manifest overall improvement in sciences, mathematics, engineering and technology. This calls for a continued expansion and equitable access to high-quality general education with promising foundations in science and mathematics and special efforts to improve the science literacy level of the population. Education with science and mathematics as its major components determines the level of prosperity and welfare of the people and the nation (4). The promotion of science, mathematics, engineering and technology education (science and technology) will be visible at all levels of the education system (general education, TVET and higher education)(4). In addition to this the ministry of education documented the following:

> *Within general education (grades 1-12), science and mathematics education is essential for cultivating a generation of scientists and for poverty reduction of the population. Greater understanding of the relevance of science and mathematics education for development is the foundation of any effort to improve science and mathematics. The purpose is to prepare students as citizens who make decisions about social issues that involve science and technology and as workers whose occupations increasingly involve science and technology. Page, 11*

The MOE has developed a strategy of improving science and mathematics education particularly applicable to general education. Its goal is to enhance the quality of science and mathematics education and advance the performance of students. This will serve as a basis and bridge for creating a virtual link with the curricula of TVET and higher education. Hence,

students will possess the necessary skills, general knowledge, awareness and problem solving competencies in sciences and mathematics when they are streamed into either TVET or the fields of engineering, technology, natural and computational science studies at advanced level in higher education. As a result, concerted efforts will be devoted under ESDP IV to enhance science and technology through introducing high quality curricula at primary and secondary schools, through efficient implementation of the TVET outcome and/or competency based strategy and through effective promotion of the policy of 70:30 higher education intake ratios in favour of science & technology.

Given the magnitude of the increase in primary education on one hand, and the expansion of higher education on the other, secondary education in Ethiopia holds a very pivotal position. It absorbs the young children that come out of the primary education and produces competent young boys and girls for Higher Education. Moreover, the country has recognized that the development of the country very much depends on the development of science and technology, and hence on Science and Mathematics education. Ethiopia has recently designed a strategy through which 70% of the university enrolment would be in science and technology. This scenario has created a unique and challenging situation whereby Science and Mathematics (S&M) secondary education is put to the spotlight. On the other hand S&M secondary education faces numerous challenges that call for immediate improvements (5). Mathematics is offered separately all the way from KG through secondary schools, and science is given as environmental science (integrated form) in the first cycle of primary (Grades 1 to 4). However, it is offered as integrated science in Grades 5 & 6, and separately as Biology, Chemistry and Physics thereafter (*6).*

Science education in Ethiopia is believed to suffer from lack of qualified teachers, shortage of teaching material and equipment, etc. and Mathematics education has had a bad reputation because many students do not like the subject and many students find it difficult. Findings of National Learning Assessment carried out every four years show that student performance in S&M is very low (*6).* It is also believed that failure in Science and Mathematics contributes to repeating class years and eventually leads to dropping out of school.

According to *Eshetu et al.(6)*the root causes of these problems were indicated in the recent need assessment and curriculum evaluation studies which relate to teachers' and students'

complaints on the existing S&M curricula. The findings suggest that the existing curriculum encourages passive learning, there is a grave shortage of facilities, class sizes are often large (up to 120) that make learning inconvenient, mathematics and science are perceived as rather difficult subjects, most of the contents are not presented in their simplest forms and are beyond the understanding level of students, continuous assessment methods and active learning are not given enough emphases and the current national examinations do not encourage competition among students and do not add quality because the grading system is “Norm Referenced”.

In addition the causes of students’ academic performance can be teaching practices, teachers attribution, classroom climate, students attitude towards mathematics, students anxiety(3), students belief about mathematics learning (7), socio-economic status, gender, prior Mathematics achievement, parental support, peer influence (2). These and other related problems have resulted in very high rates of failure in S&M subjects contributing significantly to drop out rates.

1.2. Statement of the Problem

The study conducted by the Ministry of Education has shown that the problems of mathematics instruction are diverse and multidimensional: Some of the mathematics instruction problems include the traditional teaching approaches followed by mathematics teachers, the existing wrong perceptions and conceptions on mathematics, lack of reference materials, poor preparation of mathematics teachers, lack of professional development programs developed in the school systems, and the absence of encouraging students' prior experiences. The other fundamental problem that also occurs in secondary mathematics instruction is the inability to provide opportunities for the students to use their own learning styles and strategies in the learning of mathematics (8).

However, no studies have been conducted teachers and students perception of what factors are affecting secondary school students’ science and mathematics performance in North Showa Administrative Zone. Thus this study attempts to find out students and teachers perception of factors affecting secondary school students’ science and mathematics performance in North Showa Administrative Zone secondary schools by raising the following research questions:

1. What is the perception of teachers on students' motivation to learn mathematics and students poor performance?
2. What is students' perception on students' motivation to learn mathematics students' poor performance?
3. What is the perception of teachers on students' poor academic performance of mathematics and teachers' method of teaching?
4. What is the perception of teachers on students' poor academic performance of mathematics and teachers' qualifications?
5. What is students' perception on teachers' qualification and students' poor academic performance of mathematics?
6. What is students' perception on their poor academic performance of mathematics and teachers' methods of teaching?

2. RESEARCH METHODOLOGY

2.1. Design of the study

An approach of quantitative survey study was employed to investigate teachers and students perception of what factors are affecting secondary school students' mathematics performance in North Showa Administrative Zone secondary schools.

2.2. Participants

The participants of this study were secondary school students and teachers of North Shewa zone of Amhara region in Ethiopia. There are 34 secondary and preparatory schools in the zone.Eight schools that involved 3 general secondary schools, 4 general secondary and preparatory schools and 01 preparatory school were selected. From these schools 53 teachers and 334students were selected as a research participant.

2.3. Instruments

To collect pertinent information to the study a self-administered questionnaire scale was used. The Questionnaire was developed by reviewing relevant literature and previously used standardized instruments and protocols. The questionnaire was primarily close-ended. The questionnaire contains four scales namely students/teachers perception on teachers qualification, teachers method of teaching, students motivation and learning environments.

2.4. Procedures of data Collection

These questionnaires were administered individually by the investigators to students and teachers when they have free time and was filled and returned at the spot for the purpose of confidentiality.

2.5. Data Analysis

This study used quantitative approach of data analysis. The data that was gathered through the close-ended questionnaire/scales was analysed through appropriate statistical methods (Percentage and chi-square) using SPSS version 21.

3. RESULTS AND DISCUSSIONS

3.1. Students' Perception on Teacher Qualification

Table1: Frequency of students' perception on Teacher qualification

	SDA	DA	ND	A	SA
Lack of teachers competency is one of the causes of students poor mathematics performance	91 (23.5)	58 (15)	60 (15.5)	92(23.8)	86(22.2)
Most of mathematics teachers do have sufficient knowledge to teach mathematics	132(34.1)	85(22.0)	98(25.3)	47(12.1)	25(6.5)
Teachers do understand the contents of the subject they are teaching	113(29.2)	77(19.9)	93(24.0)	55(14.2)	49(12.7)
Teachers are interested when they are teaching mathematics	125(32.3)	70(18.1)	87(22.50	54(14.0)	51(13.2)

As can be seen from table 1, for most of the statements, the majority of the responses are on the disagree side, which implies that most of the students contend negative perception about teachers qualification to teach mathematics. Students agree that lack of teachers' competency is the major cause for students' poor mathematics performance. In addition students also disagree with the idea of teachers do have sufficient knowledge to teach mathematics, teachers understand the content of mathematics and teachers are interested to teach mathematics.

The chi-square test also confirms that students perceive that teachers' qualification affects students' mathematics performance. As can be seen from the table below, calculated X^2 (30.39) is greater than the critical or table value of χ^2 9.49 with $df = 4$).

Table 2: Chi-square test of students' perception on Teacher qualification

Rating scale	Observed(O)	Expected (E)	$(O-E)$	$(O-E)^2/E$
SDA	115.25	77.4	37.85	18.5093346
DA	72.5	77.4	−4.9	0.31020672
ND	84.5	77.4	7.1	0.65129199
A	62	77.4	−15.4	3.06408269
SA	52.75	77.4	−24.65	7.8504199
χ^2				**30.3853359**

3.2. Students' Perception on Method of Teaching

Table 3: Frequency of students' perception on Method of teaching

	SDA	DA	ND	A	SA
Most of mathematics teachers do have sufficient knowledge to teach mathematics	125(32.3)	99(25.6)	80(20.7)	51(13.2)	32(8.3)
Students have high interest to learn mathematics	51(13.2)	71(18.3)	124(32.0)	85(22.0)	56(14.5)
Teachers are using creative and new teaching styles	79(20.4)	59(15.2)	85(22.0)	82(21.2)	82(21.2)
Teachers are facilitating debates to teach mathematics for their students	57(14.7)	65(16.8)	76(19.6)	92(23.8)	97(25.1)
Most teachers are applying participatory method of teaching to teach mathematics	78(20.2)	74(19.1)	62(16.0)	96(24.8)	77(19.9)

As can be seen from the above table3, for most of the statements, the majority of the responses are on the disagree side, which implies that most of the students contend negative perception about teacher's method of teaching to teach mathematics. Most of the students believe that, mathematics teachers do not have sufficient knowledge to teach mathematics, students do not have high interest to learn mathematics, teachers are not

using creative and new teaching styles, and teachers are not applying participatory method of teaching to teach mathematics. The chi-square test shows even though students perceive that teachers' method of teaching negatively affects students' mathematics performance, the perception is not significant. From the table 4 below calculated χ^2 (2.16) is less than table value χ^2 (9.49). This indicates that students perceive that teachers' method of teaching does not affect poor academic performance among students.

Table 4: Chi-square test of students perception on Method of teaching

Rating scale	Total	Observed(O)	Expected (E)	$(O-E)$	$(O-E)^2/E$
SDA	390	78	77.4	0.6	0.00465116
DA	368	73.6	77.4	−3.8	0.18656331
ND	427	85.4	77.4	8	0.82687339
A	406	81.2	77.4	3.8	0.18656331
SA	344	68.8	77.4	−8.6	0.95555556
χ^2					**2.16020672**

3.3. Students' Perception on Students Motivation

Table 5: frequency of students' perception on Students motivation

	SDA	DA	ND	A	SA
Students are interested to learn mathematics	36(9.3)	42(10.9)	108(27.9)	103(26.6)	98(25.3)
Most students like to get better marks from mathematics exams	18(4.7)	18(4.7)	49(12.7)	123(31.8)	179(46.3)
Students believe that learning mathematics is a praise by itself	70(18.1)	60(15.5)	129(33.3)	63(16.3)	65(16.8)
In general students interest of mathematics is high	51(13.2)	58(18.0)	125(32.3)	88(22.7)	65(16.8)
Most students like if their future carrier have a link with mathematics	55(14.2)	51(13.2)	108(27.9)	82(21.2)	91(23.5)

When we see students' perception on students' motivation to learn mathematics, most of the respondents disagree with this idea (see the above table). Most of the students confirmed that, students are not interested to learn mathematics and students do not expect to get better marks from mathematics exams.

A chi-square test is also conducted to see the perception of students on students' motivation to learn mathematics. The result of the chi-square test shows that students are not motivated to learn mathematics. As can be seen from the table below calculated χ^2 (43.69) is greater than table χ^2 (9.49 with $df = 4$). This indicates that students perceive that students are not motivated to learn mathematics.

Table 6: Chi-Square test of students' perception on Students motivation

Rating scale	Total	Observed(O)	Expected (E)	$(O-E)$	$(O-E)^2/E$
SDA	230	46	77.4	-31.4	12.7385013
DA	229	45.8	77.4	-31.6	12.901292
ND	519	103.8	77.4	26.4	9.00465116
A	459	91.8	77.4	14.4	2.67906977
SA	498	99.6	77.4	22.2	6.36744186
χ^2					**43.6909561**

3.4. Teachers' Perception on Teachers' Qualification

Table 7: frequency of Teacher perception on Teacher qualification

	SDA	DA	ND	A	SA
Lack of teachers competency is one of the causes of students poor mathematics performance	23(43.4)	12(22.6)	6(11.3)	7(13.2)	5(9.4)
Most of mathematics teachers do have sufficient knowledge to teach mathematics	32(60.4)	17(32.1)	3(5.7)	0	1(1.9)
Teachers do understand the contents of the subject they are teaching	15(28.3)	19(35.8)	8(15.1)	8(15.1)	3(5.7)
Teachers are interested when they are teaching mathematics	21(39.61)	17(32.1)	5(9.4)	4(7.5)	6(11.3)

As can be seen from table 7, for most of the statements, the majority of the responses are on the disagree side, which implies that most of the teachers contend negative perception about teachers qualification to teach mathematics. Teachers believe that, lack of teachers' competency is the major cause for students' poor mathematics performance. In addition teachers also disagree with the ideas of teachers do have sufficient knowledge to teach mathematics, teachers understand the content of mathematics and teachers are interested to teach mathematics.

The chi-square test also confirms that teachers perceive that teachers' qualification affects students' mathematics performance. As can be seen from the table below, calculated χ^2 (27.04) is greater than the critical or table value of χ^2 (9.49 with $df = 4$).

Table 8: Chi-square test of Teacher perception on Teachers' qualification

Rating scale	Total	Observed(O)	Expected (E)	$(O-E)$	$(O-E)^2/E$
SDA	91	22.75	10.6	12.15	13.9266509
DA	65	16.25	10.6	5.65	3.0115566
ND	22	5.5	10.6	-5.1	2.45377358
A	19	4.75	10.6	-5.85	3.22853774
SA	15	3.75	10.6	-6.85	4.42665094
χ^2					**27.0471698**

3.5. Teachers' Perception on Method of Teaching

Table 9: Frequency of Teacher perception on Method of teaching

	SD	D	ND	A	SA
Most of mathematics teachers do have sufficient knowledge to teach mathematics	25(47.2)	17(32.1)	8(15.1)	2(3.8)	1(1.9)
Students have high interest to learn mathematics	5(9.4)	10(18.9)	25(47.2)	7(13.2)	6(11.3)
Teachers are using creative and new teaching styles	10(18.9)	16(30.2)	12(22.6)	13(24.5)	2(3.8)
Teachers are facilitating debates to teach mathematics for their students	6(11.3)	10(18.9)	11(20.8)	18(34.0)	8(15.1)
Most teachers are applying participatory method of teaching to teach mathematics	11(20.8)	16(30.2)	7(13.2)	15(28.3)	4(7.5)

As can be seen from the above table 9, most of the teachers contend negative perception about teachers' method of teaching to teach mathematics. Most of the teachers believe that, mathematics teachers do not have sufficient knowledge to teach mathematics, students do not have high interest to learn mathematics, teachers are not using creative and new teaching styles, and teachers are not applying participatory method of teaching to teach mathematics.

The chi-square test shows even though teachers perceive that teachers' method of teaching negatively affects students' mathematics performance, the perception is not significant. From the table 1 below calculated χ^2 (5.28) is less than table χ^2 (9.49). This indicates that teachers perceive that teachers' method of teaching does not affect poor academic performance among students significantly.

Table 10: Chi-square test of Teacher perception on Method of teaching

Rating scale	Total	Observed(O)	Expected (E)	$(O-E)$	$(O-E)^2/E$
SDA	57	11.4	10.6	0.8	0.06037736
DA	69	13.8	10.6	3.2	0.96603774
ND	63	12.6	10.6	2	0.37735849
A	55	11	10.6	0.4	0.01509434
SA	21	4.2	10.6	-6.4	3.86415094
χ^2					**5.28301887**

3.6. Teachers' Perception on Students' Motivation

Table 11: Frequency of Teacher perception on Students motivation

	SD	D	ND	A	SA
Students are interested to learn mathematics	17(32.1)	15(28.3)	13(24.5)	6(11.3)	2(3.8)
Most students like to get better marks from mathematics exams	3(5.7)	17(32.1)	5(9.4)	17(32.1)	11(20.8)
Students believe that learning mathematics is a praise by itself	20(37.7)	12(22.6)	15(28.3)	4(7.5)	2(3.8)
In general students interest of mathematics is high	21(39.6)	20(37.7)	6(11.3)	4(7.5)	2(3.8)
Most students like if their future carrier have a link with mathematics	12(22.6)	15(28.3)	20(37.7)	3(5.7)	3(5.7)

When we see that teachers' perception on students' motivation to learn mathematics, most of the respondents disagree with this idea (see the above table 11). Most of the teachers confirmed that, students are not interested to learn mathematics and students do not expect to get better marks from mathematics exams.

A chi-square test is also conducted to see the perception of teachers on students' motivation to learn mathematics. The result of the chi-square test shows that students are not motivated to learn mathematics. As can be seen from the table below calculated χ^2 (43.69) is greater than table χ^2 (9.49 with $df = 4$). This indicates that students perceive that students are not motivated to learn mathematics.

Table 12: Chi-square test of Teacher perception on Students motivation

Rating scale	Total	Observed(O)	Expected (E)	$(O-E)$	$(O-E)^2/E$
SDA	73	14.6	10.6	4	1.50943396
DA	79	15.8	10.6	5.2	2.5509434
ND	59	11.8	10.6	1.2	0.13584906
A	34	6.8	10.6	-3.8	1.36226415
SA	20	4	10.6	-6.6	4.10943396
χ^2					**9.66792453**

3.7. Teachers' perception on learning Environment

Table 13: Frequency of Teacher perception on Learning Environment

	SDA	DA	ND	A	SA
Adequate workshops, seminars and in-service trainings are preparing for teachers	7(13.2)	2(3.8)	3(5.7)	14(26.4)	27(50.9)
The number of students in a class make students monitoring difficult	4(7.5)	5(9.4)	4(7.5)	17(32.1)	23(43.4)
Adequate teaching learning materials are provided for teachers	6(11.3)	3(5.7)	8(15.1)	23(43.4)	13(24.5)

The result of the above table indicates that, most of the teachers agree with the idea of learning environments affects students' mathematics performance. Teachers attested that, adequate workshops, seminars and in-service trainings are not preparing for teachers, the

number of students in a class makes students monitoring difficult and Adequate teaching learning materials are not provided for teachers

The chi-square test that is conducted to see the effect of learning environments also confirmed that, learning environment affects students' mathematics performance. As can be seen from the table below calculated χ^2 (25.61) is greater than table χ^2 (9.49 with $df = 4$). This indicates that teachers perceive that learning environment affects students' mathematics performance.

Table 14: Chi-square test of Teacher perception on environment

Rating scale	Total	Observed(O)	Expected (E)	$(O-E)$	$(O-E)^2/E$
SDA	17	5.7	10.6	-4.933	2.29601677
DA	10	3.3	10.6	-7.267	4.98155136
ND	15	5.0	10.6	-5.6	2.95849057
A	54	18.0	10.6	7.4	5.16603774
SA	63	21.0	10.6	10.4	10.2037736
χ^2					**25.60587**

4. SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

4.1. Summary

The aim of this research was to assess the factors that affect students' mathematics performance based on students and teachers perception in North Showa secondary schools. For this purpose, scales were developed to indicate the factors that affect students' mathematics performance. Therefore, by using the indicators we identified problems and recommended possible remedial interventions that help to improve the implementation of teaching mathematics in secondary schools. This study was initiated because the quality of mathematics education increasingly becomes a public concern. Moreover, the DebreBerhan University research and community service had identified quality education specifically science and mathematics education as one of its major themes that need empirical investigation.

To achieve this goal eight secondary were schools were selected. From these schools 53 teachers and 334 students were included in the study. The sampling method was dictated

by practical considerations; the major selection method was mainly availability sampling for teachers and random sampling for students.

In this study, data collection instruments included questionnaire/scales and document analyses were employed to obtain sufficient evidence on factors affecting mathematics performance in secondary schools. The collected data was analysed qualitatively.

Regarding the perception teachers about factors affecting students' mathematics performance, teachers perceive that teachers' qualification, teachers' method of teaching, students' motivation to learn mathematics and learning environment affects students' mathematics performance.

When we see the perception students about factors affecting students' mathematics performance, students also perceive that teachers' qualification, teachers' method of teaching, students' motivation to learn mathematics and learning environment affects students' mathematics performance.

4.2. CONCLUSIONS

In general the following conclusions are drawn from the present study.

1. Regarding the perception students and teachers on teachers qualification affecting students' mathematics performance, the majority of the responses are on the disagree side, which implies that most of the students and teachers perceive that teachers qualification is one of the factors for students poor academic performance.
2. The data obtained through the questionnaire which was constructed to measure students and teachers perception of method of teaching as a factor that affect students mathematics perception indicate that moth students and teachers perceive this variable affects students mathematics performance.
3. In confirming the idea of students motivation may affect students mathematics performances, both students and teachers perceive that the variable has an impact on students mathematics performance
4. The respondents of this research were asked to indicate their perception of learning environment may affect students' mathematics performance. Most of the teachers agree that, learning environment affects students' mathematics performance.

4.3. RECOMMENDATIONS

In light with the findings and the conclusion arrived, the following recommendation are forwarded.

1. This study revealed that the variables teachers qualification, students method of teaching, and students motivation affect students mathematics performance. So the schools the woredas, and Debre Berahn University should change this situation by preparing in-service trainings for teachers and awareness creation for students.
2. This study also revealed learning environment like availability of resources, number of students in a class and absence of workshops, seminars and in-service trainings are still problems for secondary school mathematics teachers. As a result, schools the woredas, and Debre Berahn University should change this situation by preparing in-service trainings for teachers and by allocating adequate resources for the teaching learning process.

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