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The Extent of Bachelor Science Graduated Mathematics Teachers Have Understanding of Basic Elementary Geometry Concepts

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Abstract

The purpose of this study was to investigate BSc-graduated mathematics teachers' understanding of some basic elementary geometry concepts. To conduct the study, a descriptive survey design and an inferential T-test were employed. The study included 53 participants—43 males and 10 females—who came to attend the Post Graduate Diploma in Teaching (PGDT) program at Dilla University Ethiopia in 2018–19 and were chosen using convenience sampling techniques. A 15-item achievement test on basic elementary geometry concepts in mathematics was used as an instrument for the study. The findings revealed that, out of 15 concepts, 1.55 and 1.85 were answered by female and male teachers, respectively. where they are perceived as difficult to understand and solve by BSc-graduated mathematics teachers. There was no significant difference between teachers in gender understanding and solving elementary basic concepts in geometry ($p = 0.372$ greater than $p = 0.05$ level of significance). As a result, it is recommended that extremely important BSc holders in mathematics teachers skill up through their professional development program, stakeholders and the MOE step up conscription efforts, and universities take action such as a workshop to fill the gap.

1 Introduction

1.1 Motivation and Background of the Study

Ethiopia is one of the developing countries in Africa in terms of science and technology, agriculture, industry, irrigation, and education. In such a country, the role of mathematics is very important in all aspects. The knowledge of the mathematician can be utilized in various fields. Mathematics is one of the great unifying themes in today's world of science. It is a language, a science, an art form, and a tool of tremendous power. Every area of mathematics has its own unique applications to different career options. For example, algebra is very important for computer science, cryptology, networking, and the study of symmetry in chemistry and physics. Analysis (including differential equations) is used in chemistry, biology, and physics, engineering, the motion of water (hydrodynamics), molecular structure, and option price modeling in business and economics models (Asnake, 2016).

Geometry is a device that is used a lot in science and art as well. As an illustration, it can be said that architects and engineers use geometric shapes a lot; geometrical characteristics are used quite a bit in physics and chemistry. Geometry helps students gain much more awareness about the world in which they live and appreciate its value. For example, the shapes of crystals and the orbits of space objects are geometric. Geometry is a tool

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that will help students have fun and even make them love mathematics (Serin, 2018). It is required that a teacher, who will be in charge of teaching and training students, have comprehensive knowledge and understanding of the geometry subject (Serin, 2018). Geometry is one part of the syllabus of high school courses. Worldwide the teaching of geometry has been the subject of several studies. According to Melo & Martins (2015), Geometry is still quite absent from the classrooms, especially in the early years.

1.2 Statement of the Problem

According to Melo & Martins (2015), the basic elementary geometry concepts are plane and space, which basically contain definitions and properties; polygons (general definitions, classifications, and properties; polygons' composition; relationship between triangle elements; congruence and similarity criteria; circumference relative position between two circumferences and between a straight line and a circumference; relationship between polygons and the circumference; measurement of base units length; plane figure area; prism volume; volume of cylinders, cones, and spheres; area of a surface; area of a surface.

A mathematics teacher's meaningful understanding of geometry could help them to develop confidence to teach their students and solve and appreciate real-life problems with their students. However, the literature reveals that high school mathematics teachers have a lot of misconceptions and a lack of understanding when teaching some geometric concepts. The predominance of teachers who are not qualified to teach could be one of the reasons for the poor academic performances of students in mathematics. Research shows us that the influence of teachers is the single-most important factor in determining students' achievement (Iheanachor, 2007). Iheanachor (2007) indicates that the impact of a teacher (for good or for bad) is cumulative; having a student with less exposure to qualified teachers, therefore, seems far less likely to achieve academic success than those with more.

It is also essential to carry out research on gender differences and achievement in basic elementary geometry. In recent research, gender differences and achievement in basic elementary geometry have piqued the interest of a number of researchers. According to some studies, females perform slower in mathematics, and mathematics is a masculine subject that only a few people study (Kurumeh & Iji, 2009). Some studies reported a significant difference in favor of male students by indicating that male students have higher mathematical reasoning ability or perform better than female students (Wushishi & Usman, 2013; Wushishi & Usman, 2013). As cited in Asnake (2016), Popola (2008) states that there is no significant difference in the mathematics achievement of male and female students. This study therefore investigated the understanding of BSc-graduated teachers and examined gender differences in some basic elementary geometry concepts.

1.3 Purpose of the Study

The main purpose of the study is to investigate mathematics teachers' knowledge or understanding of some basic elementary geometry concepts. The study focuses on the ability of mathematics teachers to teach high school geometry. Currently, the graduates of mathematics and natural science teachers are found to be the least competent to teach their subjects (MOE, 2016a), as cited in (Tirussew, Amare, Jeilu, Tassew, Aklilu, & Berhannu, 2018).

Students may lose the benefit of the investigative process in mathematics because mathematics teachers are the least competitive, which can be used to foster a relatively informal atmosphere in a mathematics classroom where communication and debate are encouraged. It has been stated that "mathematics classrooms were once envisaged as silent places" for communication between children (Quinnell, 2010).

Thus, it seems that teachers' roles in teaching geometry lessons in high school are immense. Teachers, on the other hand, appear resistant to applying themselves and the principles of geometry lessons. There is no research evidence for why the majority of Ethiopian BSc-graduated teachers feel uncomfortable with this method of teaching geometry lessons. As a result, more research on assessing the extent of understanding of basic geometry concepts among BSc-graduated teachers is required. There-

fore, this study seeks an answer for the following research questions:

1.4 Research Questions

1. To what extent do BSc-graduated teachers understand and solve some basic elementary geometry concept questions?

2. Does the comprehension and ability to solve simple, elementary geometry problems differ significantly between male and female BSc graduates?

1.5 Objective of the Study

General Objective

The overall goal of this study is to determine how well BSc-graduated teachers understand basic elementary geometry concepts.

Specific Objectives

The specific objectives of the present study are:

1. to explore the extent to which BSc-graduated teachers understand and solve basic elementary geometry concept questions,

2. to assess the gender difference in understanding and solving basic elementary geometry questions among BSc-graduated teachers

1.6 Hypothesis

H_o: There is no significant difference between the two genders of BSc graduate teachers in understanding and solving some basic elementary geometry questions.

1.7 Significance of the Study

This study will benefit different parties. The study will benefit BSc in Mathematics graduating teachers by helping them become aware of the principles and practice of geometry lessons and implement them accordingly. Moreover, it will help them move one step ahead from where they are in their professional career. BSc in Mathematics-graduating teachers are also expected to reflect on their practice and test theories and hypotheses in practice so as to become reflective practitioners. Students also benefit from the quality instruction teachers deliver and improve their learning process, social skills, and achievement when teachers act in principled and informed ways.

2 Methods

2.1 Population and Sample

This research was carried out on BSc in Mathematics-graduated PGDT trainers. The study's population consists of mathematics-graduated teachers. There were 53 PGDT trainers who collected 43 males and 10 females by convenience sampling techniques; all of them have participated in the study.

2.2 Design of the Study

A quantitative case study was designed by the researcher to investigate the level of understanding of basic elementary geometry concepts among BSc-graduated mathematics teachers. Quantitative data was analyzed based on descriptive and inferential statistics.

Descriptive statistics: The data obtained from the participants was initially examined to get descriptive statistics of the percentage, mean, and standard deviation. Inferential Statistics:- Using the $t-test$, the data were analyzed to determine whether there is a significant difference between the genders on basic elementary geometry concepts. A significant difference between two genders has been tested at the 0.05 level of significance.

This research was designed to investigate the extent of BSc-graduated teachers' understanding of basic elementary geometry concepts.

Instruments: a test that was prepared by the researcher from Grade 8 and Grade 10 Mathematics textbooks, according to Ethiopian education system in 8^{th} grade levels basic geometry concepts such as Similar Plane Figures, Similar Triangles, Further On Circle, Angles in the Circle, Geometry and Measurements (Theorems on the Right Angled Triangle, Introduction to Trigonometry and Solids Figures) (Gebreyes & Basavaraju, 2016) and in 10^{th} grade levels basic geometry concepts such as Co-

ordinate Geometry, Trigonometric function, Plane Geometry and measurement of surface area and volume of prism and cylinder, pyramid, cone and spheres are included (Bansal, Rachel Mary, Mesay, Gizachew, & Tesfa, 2010), which all achievement test of concepts of elementary geometry are included in Grade 8 Mathematics and in Grade 10 Mathematics textbook with detailed notes. Seven open ended questions with fifteen items of achievement test were prepared. The achievement tests was constituted question one from plane figures, question two from Trigonometric function, question three from Angles in the Circle, question four from Plane Geometry, question five, six and seven with three items each were from measurement of surface area and volume of cone, pyramid and prism. And validity of the test was examined by two of his colleagues.

Correlation is the test-retest estimate of reliability; we can obtain considerably different estimates depending on the interval. To give an element of quantification to the test-retest reliability, statistical tests factor this into the analysis and generate a number between zero and one, with 1 being a perfect correlation between the test and the retest (Jack & Norman, 2009). Perfection is impossible and most researchers accept a lower level, 0.7, 0.8 or 0.9, depending upon the particular field of research. A test-retest was performed in a 30-minute interval to determine the reliability of test instruments, and the correlation was 0.998, indicating that the test instrument is reliable.

2.3 Data Analysis Technique

The prepared tests were distributed by the researcher and then collected for analysis. Thus, the collected data were organized, interpreted, and analyzed using a percentage, mean, standard deviation, and $t - test$ of the test, followed by analyses from which summaries and conclusions were drawn. A numerical value was multiplied by corresponding values assigned to the degree of agreement. To obtain the rating, the sum of the products of the value and frequency was divided by the total number of respondents. Then all rating means within a category were added and then divided by the number of cases to determine the ground mean. An interpretation was made based on the ground mean, and conclusions were drawn on the fundamental questions. The standard deviation was used to show how far responses had been scattered from the grade mean. To assess the significant difference between two genders' deviations from basic elementary geometry concepts, a $t - test$ was conducted and a detailed analysis was made.

2.4 Presentation and Analysis of Data

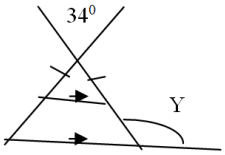
In this section, the analysis and interpretation of data are presented, along with the major findings.

2.5 Characteristics

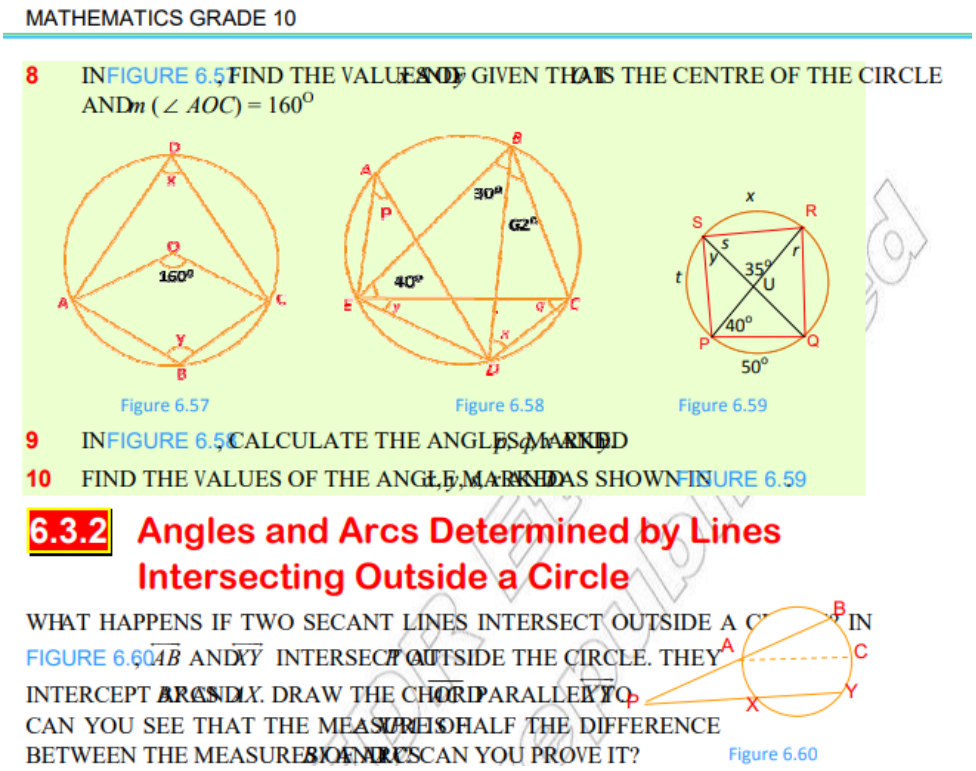
A characteristic of the subjects is that they are BSc-graduated mathematics teachers who take the training for PGDT in 2019 at Dilla University. BSc-graduated mathematics teachers were given some basic, elementary geometric questions. Analyses of BSc-graduated mathematics teachers' responses to the question items are presented as follows:

- **For question number one**: To what extent BSc graduated teachers understand and solve the following basic elementary geometry concept question?

Table 1: BSc teachers' understanding and ability of analysis basic angle and line properties

Item Q1	Male				Female				Total			
	Incorr		Corr		Incorr		Corr		Incorr		Corr	
	f	%	f	%	f	%	f	%	f	%	f	%
1. From the following figure, find the value of Y 	40	93.1	3	6.9	8	81.8	2	18.2	48	90.7	5	9.3

As it can be seen from Table 1, it provides information on the degree of male and female BSc-graduated teachers of mathematics who can solve basic elementary geometry angle questions. When asked to find the value of tem, one (93.1%) of the male mathematics teachers and one (81.8%) of the female mathematics teachers, for a total of 90.7%, did not correctly answer that it it to $y = 107^0$. Even though all the required properties that help to sole the equation—vertically opposite angle, base angle of an isosceles triangle, and supplementary angle—are mostly used in grades eight and ten, for instance, in grade ten the following problems need the above concepts to solve them.


MATHEMATICS GRADE 10

8 IN FIGURE 6.57, FIND THE VALUE OF GIVEN THAT IS THE CENTRE OF THE CIRCLE AND $m(\angle AOC) = 160^O$

Figure 6.57 Figure 6.58 Figure 6.59

9 IN FIGURE 6.5 CALCULATE THE ANGLES MARKED

10 FIND THE VALUES OF THE ANGLES MARKED AS SHOWN IN FIGURE 6.59

6.3.2 Angles and Arcs Determined by Lines Intersecting Outside a Circle

WHAT HAPPENS IF TWO SECANT LINES INTERSECT OUTSIDE A CIRCLE? IN FIGURE 6.60, $\overline{AB}$ AND $\overline{XY}$ INTERSECT OUTSIDE THE CIRCLE. THEY INTERCEPT ARCS AX AND BY. DRAW THE CHORD $\overline{BX}$ PARALLEL TO $\overline{XY}$. CAN YOU SEE THAT THE MEASURE OF $\angle P$ IS HALF THE DIFFERENCE BETWEEN THE MEASURES OF ARCS AX AND BY? CAN YOU PROVE IT?

Figure 6.60

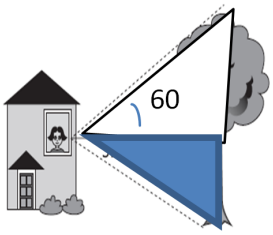
(Bansal*et al.*, 2010)

Figure 1: Sample problems in Grade 10 geometry lesson

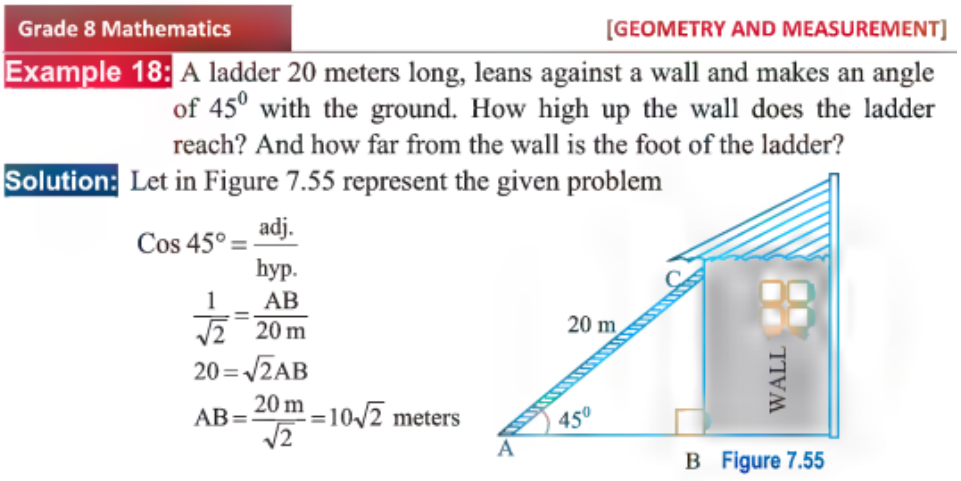
This demonstrates that BSc in mathematics teachers do not understand one or more of the following concepts: equality of vertically opposite angles, congruency of the base angle of isosceles triangles, and the sum of the straight angle is 180^0.

- **For question number two**: To what extent BSc graduated teachers understand and solve the following basic elementary geometry concept question?

Table 2: BSc Mathematics teachers' ability to synthesis simple geometric concept with trig in real world

Item Q2	Male				Female				Total			
	Incorr		Corr		Incorr		Corr		Incorr		Corr	
	f	%	f	%	f	%	f	%	f	%	f	%
Lula is standing in the building and looking out of a window at a tree. The tree is 20m away from Lula. Lula's line of sight to the top of the tree creates a 60^0 angle elevation, and her line of sight to the base of tree creates a 30^0 of depression. What is the height of the tree? 	43	100	0	0	10	100	0	0	53	100	0	0

As it can be seen from Table 2, it provides information on the degree of male and female BSc-graduated teachers of mathematics who can solve basic elementary geometry elevation questions. When asked to find the height of the tree, 100% of male mathematics teachers and 100% of female mathematics teachers, i.e., 100% of the total mathematics teachers, did not correctly answer that the height of the tree is 20m $\tan(60^0)$ + 20m $\tan(60^0)$ = $\frac{80\sqrt{3}}{3}$. However, trigonometric concepts are introduced with a brief note and examples in grade eight lessons, as illustrated by the following example from the grade eight text book as shown in figure 2.



Grade 8 Mathematics [GEOMETRY AND MEASUREMENT]

Example 18: A ladder 20 meters long, leans against a wall and makes an angle of 45^0 with the ground. How high up the wall does the ladder reach? And how far from the wall is the foot of the ladder?

Solution: Let in Figure 7.55 represent the given problem

$$\text{Cos } 45° = \frac{\text{adj.}}{\text{hyp.}}$$

$$\frac{1}{\sqrt{2}} = \frac{AB}{20\text{ m}}$$

$$20 = \sqrt{2}AB$$

$$AB = \frac{20\text{ m}}{\sqrt{2}} = 10\sqrt{2} \text{ meters}$$

Figure 7.55

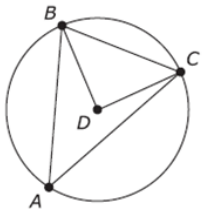
(Gebreyes & Basavaraju, 2016)

Figure 2: Sample problems in Grade 8 geometry lesson

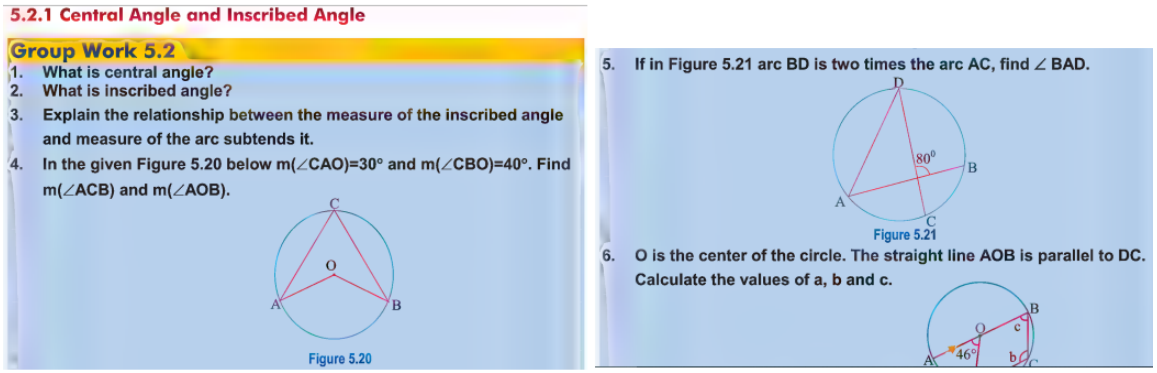
This shows that BSc in mathematics teachers have an inadequate understanding of applying simple trigonometric functions.

- **For question number three**: To what extent do BSc-graduated teachers understand and solve the following basic elementary geometry concept question?

Table 3: BSc teachers' understanding of property of inscribed triangles in a circle

Item	Male				Female				Total			
Q3	Incorr		Corr		Incorr		Corr		Incorr		Corr	
	f	%	f	%	f	%	f	%	f	%	f	%
The figure shows $\triangle ABC$ inscribed in circle D. If $m < CBD = 34$, then find $m < BAC$ 	41	95.3	2	4.6	9	90.9	1	9.09	50	94.4	3	5.6

As it can be seen from Table 3, it provides information on the degree of male and female BSc-graduated teachers of mathematics who can solve a basic elementary geometry inscribed angle in a circle question. When asked to find the inscribed angle, $m < BAC$(95.3%) of male mathematics teachers and (99.9%) of female mathematics teachers, i.e., 94.4% of the total mathematics teachers, did not correctly answer the inscribed angle $m < BAC$, where the answer is 56^0. For instance, the above concepts are found in grade 8 lessons as shown in the figure 3 below.



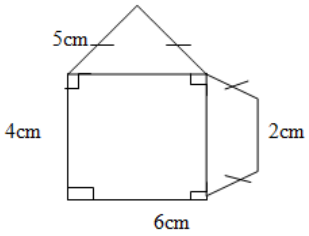
(Gebreyes & Basavaraju, 2016)

Figure 3: Additional sample problems in Grade 8 geometry lesson

This demonstrates how poorly BSc math teachers comprehend the characteristics of an inscribed angle in a circle, at its center, and on a circle.

How well instructors who have earned a BSc degree do comprehend and respond to the following elementary geometry topic question?

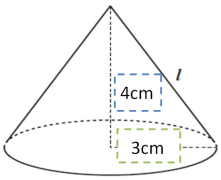
Table 4: BSc teachers' understanding of surface area of regular triangles and quadrilateral

Item Q4	Male				Female				Total			
	Incorr		Corr		Incorr		Corr		Incorr		Corr	
	f	%	f	%	f	%	f	%	f	%	f	%
Find a total area of the following figure 	43	100	0	0	10	100	0	0	53	100	0	0

As shown in Table 4, it provides information on the degree of male and female BSc-graduated mathematics teachers. When asked to find the total surface area of the figure, 100% of male mathematics teachers and 100% of female mathematics teachers, i.e., 100% of the total mathematics teachers, did not correctly answer the total surface area of the figure, where its answer is $36 + 6\sqrt{6}cm^2$. This shows that BSc in mathematics teachers have a lack of skill and understanding in finding the total surface area of a rectangle, a triangle, and a trapezoid.

- **For question number five**: What extent BSc-graduated teachers understand and solve the following basic elementary geometry concept question?

Table 5: BSc teachers' understanding of right circular cone

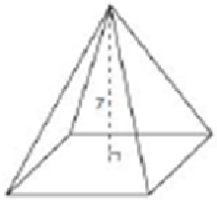
Item Q5	Male				Female				Total			
	Incorr		Corr		Incorr		Corr		Incorr		Corr	
	f	%	f	%	f	%	f	%	f	%	f	%
The altitude of a right circular cone is $4cm$.  If the radius of the base is $3cm$, then find												
Slant height	43	100	0	0	9	90.9	1	9.1	53	98.15	1	0.02
Lateral surface area	43	100	0	0	11	100	0	0	54	100	0	0
Total surface area	43	100	0	0	11	100	0	0	54	100	0	0
Volume of cone	43	100	0	0	11	100	0	0	54	100	0	0

As it can be seen from Table 5, it provides information on the degree of male and female BSc-graduated teachers of mathematics in solving the basic solid geometry of conic sections, including slant height, lateral surface area, total surface area, and volume of the cone. When asked to find the slant height of the cone, 100% of male mathematics teachers and 99% of female mathematics teachers, i.e., 98.15% of the total mathematics teachers, did not correctly answer the question where the answer is $10cm$. Lateral surface area of the given cone (100%) of male mathematics teachers and (100%)

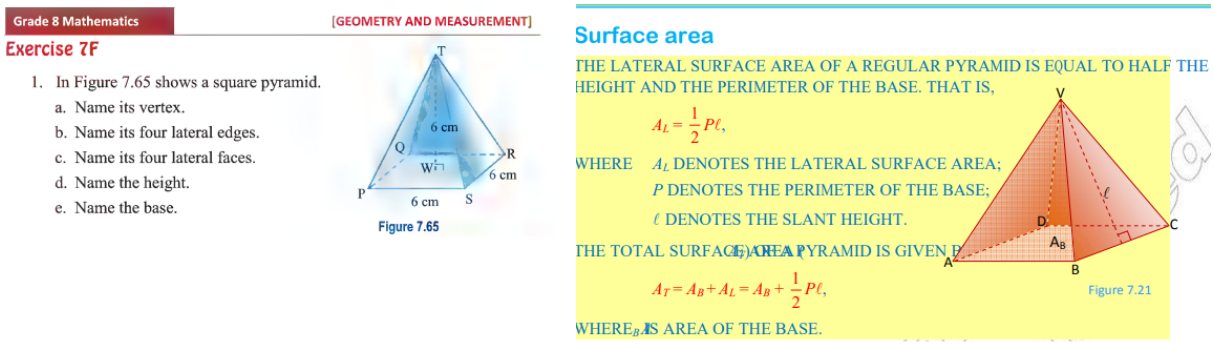
of female mathematics teachers, i.e., 100% of the total mathematics teachers, did not correctly answer the lateral surface area of the given cone where its answer is $60cm^2$, and the total surface area of the given cone (100%) of male mathematics teachers and (100%) of female mathematics teachers, i.e., 100% of the total mathematics teachers, did not correctly answer the total surface area of the given cone where its answer is $96cm^2$, This shows that BSc in mathematics teachers have a huge gap in skill and understanding of finding the basic solid geometry of a conic section's slant height, lateral surface area, total surface area, and volume cone.

- **For question number six**: To what extent do BSc-graduated teachers understand and solve the following basic elementary geometry concept question?

Table 6: BSc teachers' understanding of pyramid

Item	Male				Female				Total			
Q6	Incorr		Corr		Incorr		Corr		Incorr		Corr	
	f	%	f	%	f	%	f	%	f	%	f	%
The pyramid shown below has a square base, a length of $8\sqrt{2cm}$ with altitude of $7cm$,  then find												
Slant height	43	100	0	0	10	90.9	1	9.1	53	98.2	1	1.8
Lateral surface area	43	100	0		10	100	0	0	53	100	0	0
Total surface area	43	100	0		10	100	0	0	53	100	0	0
Volume of cone	43	100	0		10	100	0	0	53	100	0	0

As it can be seen from Table 6, it provides information on the degree of male and female BSc-graduated teachers of mathematics who can solve the basic solid geometry of a pyramid section's slant height, lateral surface area, total surface area, and volume cone. When asked to find the slant height of the pyramid, 100% of male mathematics teachers and 99% of female mathematics teachers, i.e., 98.15% of the total mathematics teachers, did not correctly answer the slant height of the pyramid where its answer is $144\sqrt{2}cm^2$. The lateral surface area of the given pyramid was correctly answered by 100% of male mathematics teachers and 100% of female mathematics teachers, i.e., 100% of the total mathematics teachers. The total surface area of the given pyramid was correctly answered by 100% of male mathematics teachers and 100% of female mathematics teachers, i.e., 100% of the total mathematics teachers did not correctly answer the total surface area of the given pyramid where its answer is 62 + $144\sqrt{2}cm^2$. But all the above concepts are found in grade eight and ten lessons, for instance.



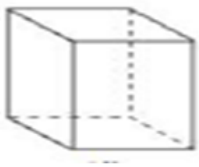
(Gebreyes & Basavaraju, 2016; Bansal, Rachel Mary, Mesay, Gizachew, & Tesfa, 2010)

Figure 4: Sample problems in Grade 8 &10 geometry lesson

This shows that BSc in mathematics teachers have a huge gap in skill and understanding of finding the basic solid geometry of a section pyramid of slant height, lateral surface area, total surface area, and volume cone.

- **For question number seven**: To what extent do BSc-graduated teachers understand and solve the following basic elementary geometry concept question?

Table 7: BSc teachers' understanding of rectangular prism

Item Q7	Male				Female				Total			
	Incorr		Corr		Incorr		Corr		Incorr		Corr	
	f	%	f	%	f	%	f	%	f	%	f	%
The rectangular prism shown below has a base, a length of $6cm$, width $8cm$ and height $10cm$, then find 												
Diagonal of rectangular prism	40	93.0	3	7.0	10	100	0	0	50	94.4	3	5.6
Total surface area of prism	41	95.3	2	4.7	10	100	0	0	51	96.3	2	3.7
Volume of prism	38	88.4	5	11.6	10	90.1	1	9.9	47	88.9	6	11.1

As it can be seen from Table 7, it provides information on the degree of male and female BSc-graduated teachers of mathematics who can solve the basic solid geometry of a diagonal of a rectangular prism, the total surface area of the prism, and the volume of the prism. When asked to find: a diagonal of a rectangular prism, 93% of male mathematics teachers and 100% of female mathematics teachers, i.e., 94.0% of the total mathematics teachers, did not correctly answer the diagonal of rectangular prism where its answer is $10sqrt2cm$; the total surface area of a given rectangular prism, 95.3% of male mathematics teachers and 100% of female mathematics teachers, i.e., 96.3% of the total mathematics teachers, did not correctly answer answered the total surface area of given rectangular prism where its answer is $416cm^2$, the volume of prism of the given rectangular prism (88.4%) of male mathematics teachers and (90.1%) of female mathematics teachers i.e. (88.9%) of the total mathematics teachers did not correctly answer the volume of prism where its answer is $480cm^2$.

This shows that BSc in mathematics teachers have a huge gap in skill and understanding of finding the basic solid geometry of a diagonal of a rectangular prism, the total surface area of the prism, and the volume of a prism.

- **For research question number two** (Does the comprehension and ability to solve simple, elementary geometry problems differ significantly between male and female BSc graduates?)

Table 8: Group Statistics

Group	Code	N	Mean	Std. Deviation	Std. Error Mean
Female	.00	11	1.5455	1.63485	.49293
Male	1.00	60	2.0500	1.85422	.23938

As Table 8 shows, the mean result on basic elementary geometry questions for BSc-graduated mathematics female teachers is 1.55 out of 15, and their standard deviation is 1.63. And the mean result on basic elementary geometry questions for BSc-graduated mathematics male teachers is 2.05 out of 15, and their standard deviation is 1.85.

Table 9: Independent Samples $t-test$

		Levene's Test for Equality of Variances		$t-test$ for Equality of Means						
									95% CI of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
FM	Equal variances assumed	.008	.931	-.843	69	.402	-.50455	.59827	-1.70	.689
	Equal variances not assumed			-.921	15.130	.372	-.50455	.54798	-2	.663

3 Discussion

The current study includes an analysis to determine the extent to which BSc-graduated mathematics teachers understand basic elementary geometry concepts. The results of this study indicate that participants had difficulty solving basic elementary geometry questions. Teachers use basic elementary geometry mathematics knowledge; students learn basic geometry concepts such as similar plane figures, similar triangles, further on the circle, angles in the circle, geometry and measurements (theorems on the right-angled triangle, introduction to trigonometry, and solids figures) in 8^{th} grade levels, and basic geometry concepts such as coordinate geometry, trigonometric function, plane geometry in 10^{th} grade levels (Gebreyes & Basavaraju, 2016). However, all BSc-graduated Mathematics teachers would undoubtedly know enough to correctly answer those basic elementary geometry questions; it is communal content knowledge that is useful not only for the work of teaching geometry.

Students' learning is influenced by teacher knowledge and teaching performance because mathematics teachers' meaningful understanding of geometry can help them develop confidence to teach their students (Iheanachor, 2007). The competency and knowledge of teachers in using and teaching mathematics are influential factors that can influence students' conceptual understanding in problem-posing (Rober, Capraro, & Capraro, 2018). It is necessary to support teachers' professional development. The findings in this study show that there is a disconnect between the qualifications of BSc-graduated mathematics teachers and the teachers' knowledge of basic elementary geometry concepts. And From table 9, the significance level is 0.372,

greater than 0.05, which indicates there is no significant difference in gender between BSc-graduated mathematics teachers on understanding and solving basic elementary geometry questions, which agrees with the null hypothesis.

4 Conclusion

In Ethiopia, all BSc mathematics graduates become high school teachers after they take an additional one-year pedagogy course. The focus of this study was on BSc-graduated mathematics teachers. In the present study, the results showed that BSc-graduated mathematics teachers do not have sufficient understanding and skills to solve basic elementary geometry questions, even what they teach in grades 8-10. If a teacher does not explain and solve different elementary basic geometric equations, it's not possible to teach the operations to pupils. The data also revealed that the majority of teachers are unfamiliar with the properties of vertically opposite angles, alternate interior and exterior angles, straight angles, the sum of triangle angles, the area of a triangle, the area of a rectangle, the perimeter of a triangle and a rectangle, the volume of a cylinder, the volume of a prism, and the height of a pyramid, as well as the slant high, diagonal, and altitude of solid geometry.

5 Recommendation

The study revealed that BSc-trained math teachers lack the knowledge and abilities needed to answer simple questions in elementary geometry.

Through professional development programs, teachers should increase their knowledge. Therefore, it is crucial that the MOE and the stakeholders intensify their efforts to encourage conscription.

Universities must act, like a workshop, to fill the vacuum in mathematical education. Further research is required to determine how well-versed in fundamental mathematical ideas BSc-educated mathematics teachers are.

Conflict of Interest

The authors is affiliated with Dilla University as teaching and research staff. He declared that has thoroughly read and approved the manuscript to be published in this journal.

Ethical Approval

Consent was sought form the research participants. Confidentiality was maintained in reporting information.

References

Asnake, M. B. (2016). Extent of Under Graduating Class Understanding on Basic Exponentand Polynomial Questions of Pre- Calculus Mathematics: Acase of Anethipian University BSC Mathematics Graduating Students. *BEST: International Journal of Humanities, Arts, Medicine and Sciences (BEST: IJHAMS)* 4(1) , 1-8.

Bansal, C., Rachel Mary, Z., Mesay, D., Gizachew, A., & Tesfa, B. (2010). *Mathematics student Text Grade 10*. Addis Ababa: MOE Ethiopia.

Gebreyes, H., & Basavaraju, V. (2016). *Mathematices Student Textbook Grade 8*. Addis Ababa: MOE, Ethiopia.

Iheanachor, O. U. (2007). The Influence of Teachers' Back Ground, Professional Development and Teaching Practices on Students' Achievement in Mathematics in Lesotho. *Thesis*.

Keith, J. (2002). *Aspects of Teaching Secondary Mathematics*: perspectives on practice, Chapter: 8, pp 121-139. Southampton: Rout Ledge.

Kurumeh, M., & Iji, C. (2009). Improving Student's Achievement in solving Algebraic Word Problem Using Aesthetic Value Approach. *Journal of the Mathematical Association of Nigeria* 34(1) , 37-45.

Melo, H. S., & Martins, M. (2015). Behaviors and Attitudes in the Teaching and Learning of Geometry. *European Scientific Journal /SPECIAL/ edition ISSN: (Print) e – ISSN*, 1857 – 7881.

Quinnell, L. (2010). *Why are Mathematical investigations importante?* Casuarina: Charles Darwin University.

Rober, Y. L., Capraro, M., & Capraro, M. (2018). Mathematics Teachers' Subject Matter Knowledge and Pedagogical Content Knowledge in Problem Posing. *International Electronic Journal of Mathematics Education* Vol. 13, (2) 75-90, https:/doi.org/10.12973/iejme2698., 75-90.

Serin, H. (2018). Perspectives on the Teaching of Geometry: Teaching and Learning Methods. *Journal of Education and Training* 4(1) , 131-140.

Tirussew, T., Amare, A., Jeilu, O., Tassew, W., Aklilu, D., & Berhannu, A. (2018). *Ethiopian Education Development Roadmap*. A.A: MOE.