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Competence landscape of grade 9 mathematics teachers: Basis for an enhancement program

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Abstract

The investigation attempted to find out the competence evidence among the grade 9 mathematics teachers in the secondary schools of Dumaguete City, Philippines. Survey and correlational methods of research were employed with the aid of questionnaire-checklist to profile the teachers' number of years in teaching Mathematics, training and seminars attended, educational attainment and measure their competence levels in mathematics curriculum competencies set by the Department of Education in the country. Data collected were treated using frequency counting, percent, weighted mean, standard deviation and Spearman Rank-Order Correlation. Results revealed that mathematics teaching was dominated by teachers with at least 6 years of teaching experience, with more locally attended seminars and training, and a higher percentage of those who pursued graduate education. The study revealed further that the teacher-respondents were highly competent in content for patterns, algebra and geometry. Moreover, the demographic profile of the teachers significantly translated their competence in content and pedagogy.

Keywords: Competence, content, pedagogy, enhancement program.

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1. Introduction

Teachers prepare lesson plans every day with the assurance to deliver the lesson effectively to the students. They also study their lessons, conduct research for enhancement, solicit ideas from experts, attend training and seminars both in pedagogy and content and undergo further studies. These things are crucial to be capable and competent teachers. In the past decades, mathematics education had been experiencing constant change due to professional leadership of the National Council of Teachers of Mathematics, the world's largest mathematics education organisation, and due to public or political pressure. Also, the federal legislation commonly referred to as the No Child Left Behind Act presses for higher levels of achievements and increased teacher accountability. These signify the importance of competent mathematics teachers to provide learning and experiences to the students to be mathematically competent (Graham, 2001).

Roxas (2015) pointed out that the most significant factor in creating interest in mathematics is a systematic, well-rounded, competent and inspiring teacher. This teacher is the instrument in developing the learner's potentials and capabilities in the field of mathematics to become productive and globally competitive. In the Philippine context, the Department of Education (DepEd) has been implementing the K to 12 Basic Education Curriculum since 2012. The curriculum has been changed into spiral progression across all the subject areas. In the Mathematics curriculum, various disciplines have been taught across grade levels, such as number and number sense, measurement, patterns and algebra, geometry and statistics and probability. These disciplines were separately introduced in different grade levels in the old mathematics curriculum. The present curricular reform necessitates that teachers have to find ways to equip themselves with the changes that have been underscored in the new curriculum since the training and seminars conducted for teachers were not sufficient enough to be competent in teaching the learning competencies in grade 9 mathematics.

However, three observations were identified by the researchers. First, through self-assessment, the researchers found out that there are some learning competencies which are challenging to teach, and at the same time, learners have difficulty in learning them. They also wanted to know if other teachers in the different secondary schools of Dumaguete City have encountered the same problem. Second, students' performance of grade 9 mathematics in the Division of Dumaguete City during the mid-year and year-end examinations was low, ranging from 40 to 60 Mean Percentage Score (MPS) which is too far from the mastery level of 75 MPS. Last, Grade 10 students have difficulty in recalling learning in grade 9 mathematics competencies that are useful in some problems in the Grade 10 mathematics learning competencies. Importantly, it was further observed that the learning competencies in grade 9 mathematics curriculum are most challenging to learn by the students than the other grade levels in the junior high school. It implies that teachers teaching grade 9 mathematics must be highly competent both in pedagogy and content to provide quality and effective learning.

Hence, this investigation was set up to find out the competence evidence among the grade 9 mathematics teachers in the secondary schools of Dumaguete City, Philippines. Specifically, the study profiled the teachers' number of years in teaching mathematics, training and seminars attended, educational attainment and measured their competence levels in mathematics curriculum competencies set by the DepEd in the country. Significantly, it also attempted to establish the relationship between the demographic profile of the respondents and their competence levels. In so doing, upshots of the research provide a basis in crafting an enhancing program for grade 9 teachers.

1.1. Theoretical framework

The study is anchored on the following theories: Kolb's Experiential Learning Theory (ELT) and Burch's Conscious Competence Theory (CCT). Kolb's ELT is a method where a person's skills and job requirements can be assessed in the same language that is commensurability can be measured. The theory states that the learning involves the acquisition of abstract concepts that can be applied flexibly in a range of situations. It explains further that learning is a process whereby knowledge is created through the transformation of experiences. The theory works on two levels, namely, the learning cycle and the learning styles. However, this study focused on the learning cycles, which consist of four stages, namely, concrete experience, reflective observation, abstract conceptualisation and active experimentation. Effective learning can be seen when the learner progresses through the cycle. The learner can enter the period at any stage of the cycle with a logical sequence.

According to Kolb (1976), the experience stage is where new experience or reinterpretation of existing experience happens. The learner's skills or activities are observed and collected. In the reflective observation stage, a learner reflects on the background on a personal basis. The observed and collected experiences (new or re-existing) are reviewed, processed and reflected. The third stage, abstract conceptualisation allows the learners to form new ideas based on the reflection, or this stage could be a modification of the existing abstract ideas. Moreover, active experimentation is the stage where the learner applies the new ideas or modified of existing plans to the surroundings to see if there are any changes in the next appearance of the experience. The learning cycle happens in short duration or in an extended length of time.

The current study is strongly connected to Kolb's ELT because it utilised the experiences of the teacher-respondents, such as teaching experiences, training and seminars attended and educational attainment. These experiences are collected and gathered during the first stage of Kolb's learning cycle. In the second stage, the teacher-respondents reflect on their self-evaluation on their competence level in the learning competencies which the assessment of the teachers comes from the acquisition of knowledge and their experiences to deliver the knowledge to the learners. In the third stage, the experiences were correlated with the competence level in the learning competencies of the grade 9 mathematics curriculum. It is also where new ideas and re-existing of concepts were created and modified as a solution for the challenging findings. The strategies and executions of plans happened on the fourth stage of the learning cycle.

The researchers believed that the experiences of the teacher-respondents and their competence level of the content and pedagogy are learning experiences that can create new ideas or modification of existing knowledge. These can be applied through an enhancement program which produces an outcome that would be beneficial to teachers and students' performance inside the classroom. The entire study followed the model of the learning cycle of Kolb's ELT, as shown in Figure 1.

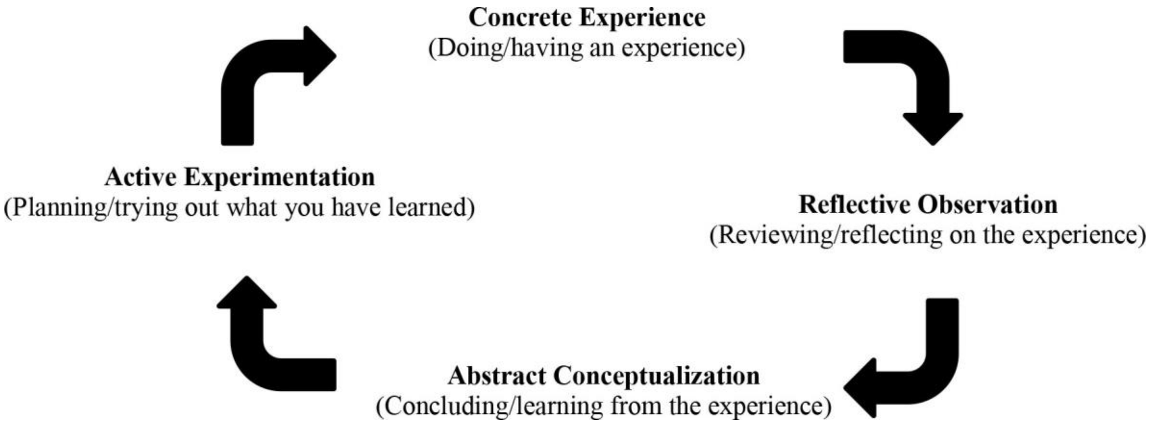

Figure 1. Kolb's experiential learning style theory

The second theory, Burch's CCT, relates to the psychological states involved in the process of progressing from incompetence to competence in a skill. Burch develops the Conscious Ladder. The model stressed on two aspects, namely, consciousness level (awareness) and skills level (competence). According to Burch's model, as shown in Figure 2, people move from one step of the ladder to the next as people move up with their awareness and competence, thus improving their performance through time.

According to the model, the persons move through the following levels as they build competence in a new skill. The first level is unconscious incompetence, where people do not know that they do not have this skill, or that they need to learn it. The second stage is conscious incompetence, wherein people at this level know that they do not have the expertise. Third, conscious competence level is where people know that they have this skill. Finally, the unconscious competence level is where they do not see that they are using this skill. It seems natural and is part of their performance (Burch, 2014).

The cited theory strongly supports the processing and determining the competence level of the teacher-respondents. The teachers' competencies are determined and classified according to the level as unconsciously incompetence, consciously incompetence, consciously competence and unconsciously competence. The model is significant to organise the teachers' competence level and to show the movement landscape of the teacher's progress through time and experiences. It guides teachers to upgrade their competence level.

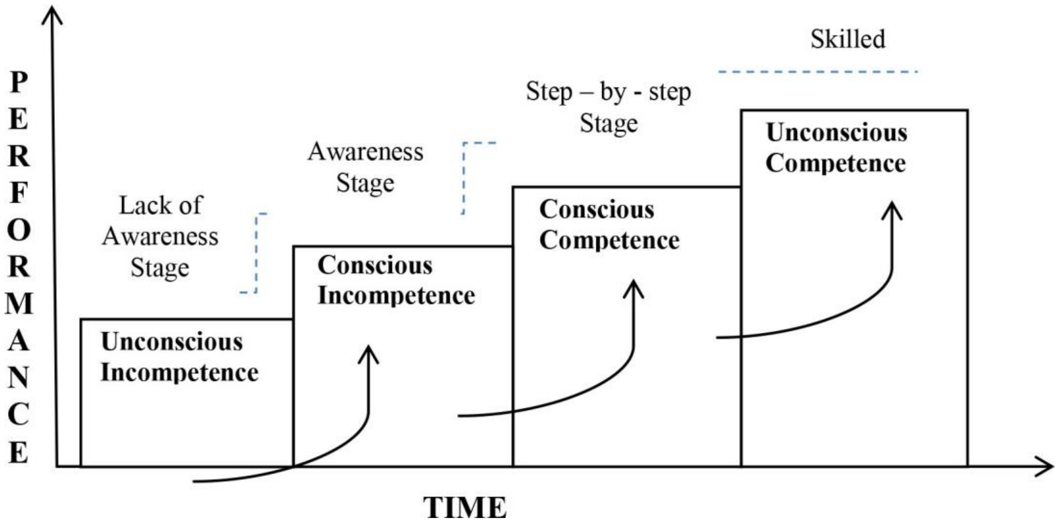

Figure 2. Burch's conscious competence model

2. Methods

Survey and correlational methods of descriptive research were used in the study. Survey method was employed to determine the profile of the respondents as well as their level of competence, while the correlational method was utilised to determine the relationship between the level of competence and the demographic profile. Thirty grade 9 mathematics teachers in Dumaguete City, who gave their consent of the survey and utilised the DepEd Curriculum, were the respondents of the study.

The research questionnaire made by the researchers was in consideration with the competencies found in the Curriculum Guide for Mathematics Grade 9 of DepEd (Department of Education, 2016) which was validated by one (1) expert from Negros Oriental State University (NORSU), one (1) from Foundation University (FU) and (2) from DepEd Dumaguete City Division. The reliability testing was conducted to the 11 Public Secondary Schools in the districts of Dauin, Bacong, Valencia, Sibulan and San Jose of the Division of Negros Oriental and three Private Secondary Schools of the Municipality of Bacong and Valencia. Cronbach's alpha of 0.731 was obtained and indicated that the 48 items in the instrument were reliable. The instrument composed of two parts. The first part included the profile of the respondents such as highest educational attainment, years of teaching experience and the number of seminars and training attended. On the other hand, Part II comprised the areas of Mathematics Teachers' Level of Competence in the Grade 9 Mathematics Curriculum.

Permission to administer the questionnaire to the secondary school teachers was asked from the Schools Division Superintendents of the Division of Dumaguete City and Negros Oriental, Philippines. Informed consent was also obtained from the respondents and made them aware that they can withdraw their participation when they opted to refuse. Data gathering was administered personally by the researchers to the respondents to ensure the high return of the responses and the reliability of the results. Interview from a teacher per school from 14 schools, who were purposively selected, was conducted to substantiate the analysis and interpretation of the collected data further.

Frequency count and percent were used to profile the respondents along with educational attainment, the number of years of teaching mathematics and training and seminars attended related to mathematics. Weighted mean was employed to determine the competence level of the teachers.

Table 1. The weighted mean was interpreted using the descriptions as presented below:

Scale	Verbal description range of values	Interpretation
5	High Competence-HC (4.21–5.00)	The teacher-respondent has 90%–100% mastery level of the learning competency. It means that the teacher at this level exceeds the fundamental knowledge and core understanding (Content) and can transfer the learning competency automatically and flexibly through the delivery of the lesson (Pedagogy).
4	Above Average Competence-AAC (3.40–4.19)	The teacher-respondent has 85%–89% mastery level of the learning competency. It means that the teacher at this level had developed fundamental knowledge and core understanding (Content) and can transfer the learning competency automatically through the delivery of the lesson (Pedagogy).
3	Average Competence-AC (2.60–3.39)	The teacher-respondent has 80%–84% mastery level of the learning competency. It means that the teacher acquires the fundamental knowledge and core understanding (Content) and can transfer the learning competency accordingly through the delivery of the lesson (Pedagogy).
2	Below Average Competence-BAC 1.80–2.59	The teacher-respondent has 75%–79% mastery level of the learning competency. It means that the teacher at this level meets the standard of the fundamental knowledge and core understanding (Content) and can transfer the learning competency with little supervision through the delivery of the lesson (Pedagogy).
1	No Competence-NC 1.00–1.79	The respondent has below 75% mastery level of the learning competency. It means that the teacher at this level struggles the fundamental knowledge and core understanding (Content) but needs help throughout the delivery of the lesson (Pedagogy).

Standard deviation was also used to determine the degree of homogeneity and heterogeneity of the responses on the level of competence where $SD < 3$ is homogenous, and $SD \geq 3$ is heterogeneous (Aiken & Susane, 2001). The scoring was as follows:

A. For a number of years teaching Mathematics

Number of years teaching Mathematics	Score
1–5 years	1
6–10 years	2
11–15 years	3
16–20 years	4
More than 20 years	5

B. For educational attainment

Educational Attainment	Score
Baccalaureate Degree	1
With units in Non-Math Related graduate studies	2
With units in Math Related graduate studies	3
With CAR in Math Related graduate studies	4
Full Fledged Master's Degree Holder	5

The following guide in interpreting the value of ρ, suggested by Cohen, West, and Aiken (2014) was used.

Value	Size of Correlation/Interpretation
±0.50 to ±1.00 Large	High positive/negative correlation
±0.30 to ±0.49	Medium Moderate positive/negative correlation
±0.10 to ±0.29	Small Low positive/negative correlation
±0.01 to ±0.09	Negligible Slight positive/negative correlation
0.00	No correlation

3. Results and discussions

Table 2. Demographic profile in terms of number of years of teaching Mathematics

Years of teaching mathematics	Frequency	Percentage
1–5 years	14	46.66
6–10 years	5	16.67
11–15 years	5	16.67
16–20 years	3	10.00
More than 20 years	3	10.00
Total	30	100.00

Table 2 shows the group of respondents based on the implementing rules and regulations applicable to DepEd on the grant of loyalty award (DepEd Order 105, s. 1992). Table 1 revealed that about 54% of the grade 9 mathematics teachers were in the service for more than five years. It means that mathematics teachers in grade 9 are mature enough in their profession. Furthermore, the interview supported that most of them were coming from private secondary schools. The finding is also supported by the Catholic Education Association of the Philippines report on May 28, 2013 which revealed that many of the private school teachers transferred to a public school due to higher pay. This phenomenon caused private schools the annual hiring of new teachers (n.a., 2013). In a similar vein, the continued mass recruitment of teachers in the public schools, which started in 2015 when the first Grade 10 turned to Grade 11, made many experienced teachers moved from private institutions to public schools due to higher pay.

Table 3. Demographic profile in terms of the number of training and seminars attended related to Mathematics for the past three years

Number of training and seminars attended by the teachers related to mathematics	Local		Regional		National	
	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage
1	7	23.33	6	20.00	1	3.33
2	7	23.33	6	20.00	1	3.33
3	4	13.33	1	3.33	0	0
More than 3	6	20.00	0	0	0	0
None	6	20.00	17	56.67	28	93.34
Total	30	100.00	30	100.00	30	100.00

Table 2 shows that the bulk of teachers were only sent to local seminars and training. Observation of the researchers supported that those classroom teachers were only sent to locally conducted seminars and training because the division cannot afford to send teachers to regional and national activities due to budget constraints. DepEd Order No. 13 s. 2016 asserted that all seminars attended by the teachers are taken from the school's Maintenance and Other Operating Expenses (MOOE). Small schools have a small allocation on a budget of the MOOE. Hence, seminars and training are not the priority. Likewise, teachers are closely monitored to engage in more significant time in classroom activities. However, Biasong (2009) averred that seminars are much needed in the teaching profession to enhance competence.

Table 4. Demographic profile in terms of highest educational attainment

Highest educational attainment	Frequency	Percentage
Baccalaureate degree	10	33.33
With units in Mathematics related graduate studies	9	30.00
With units in Not Mathematics related graduate studies	1	3.33
With CAR in Mathematics related graduate studies	9	30.00
Full-fledged master's degree holder	1	3.33
Total	30	100.00

In Table 4, about 67% of the teachers took up graduate education. It means that the respondents put a value on pursuing graduate studies. Langguyuan-Kadtong (2013) corroborated the present finding when they revealed that teachers from the Schools Division of Cotabato were pursuing further studies to help improve one's competence.

Table 5. Teachers' level of competence in patterns and algebra for the first quarter

Pedagogy			Learning competencies	Content		
Mean	± SD	Verbal description	Quarter I	Mean	± SD	Verbal description
4.50	0.68	HC	1. Illustrate quadratic equations.	4.60	0.62	HC
4.47	0.68	HC	2. Solves quadratic equations by: (a) extracting the square roots; (b) factoring; (c) completing the square; (d) using the quadratic formula.	4.53	0.68	HC
4.43	0.68	HC	3. Characterises the roots of quadratic equation using the discriminant.	4.60	0.62	HC
4.37	0.77	HC	4. Describes the relationship between coefficients and the roots of a quadratic equation.	4.47	0.73	HC

4.43	0.77	HC	5. Solves equations transformable to quadratic equations (including rational algebraic equations).	4.47	0.78	HC
4.33	0.77	HC	6. Solves problems involving quadratic equations and rational algebraic equations.	4.23	0.86	HC
4.17	0.79	AAC	7. Illustrate quadratic inequalities.	4.27	0.78	HC
4.10	0.80	AAC	8. Solves quadratic inequalities	4.30	0.84	HC
4.03	0.77	AAC	9. Solves problem involving quadratic inequalities.	4.07	0.74	AAC
4.07	0.79	AAC	10. Model real-life situations using quadratic functions.	4.13	0.86	AAC
4.47	0.63	HC	11. Represents a quadratic function using: (a) table of values; b) graph and (c) equation.	4.53	0.68	HC
4.43	0.68	HC	12. Transforms the quadratic function defined by $y = ax^2 + bx + c$ into the form of $y = a\ (x - h)^2 + k$.	4.60	0.62	HC
4.40	0.77	HC	13. Graphs a quadratic function: (a) domain; (b) range; (c) intercepts; (d) axis of symmetry; (e) vertex and (f) direction of the opening of the parabola.	4.53	0.73	HC
4.23	0.82	HC	14. Analyses the effects of changing the values of a, h and k in the equation $y = a\ (x - h)^2 + k$ of a quadratic function on its graph.	4.37	0.76	HC
4.30	0.75	HC	15. Determines the equation of a quadratic function.	4.43	0.73	HC
4.03	0.81	AAC	16. Solves problems involving quadratic functions.	4.17	0.75	AAC
4.30	0.74	HC	Grand mean and standard deviation	4.39	0.74	HC

Table 5 shows that the teachers were highly and above average competent to some learning competencies both in Pedagogy and Content. It means that the teachers exceeded fundamental knowledge and core understanding in the learning competencies, and can transfer them automatically and flexibly through the delivery of their lesson (SEI-DOST & MATHED, 2011). Moreover, the standard deviations for all the learning competencies were less than 3.00, which indicated that there was a close clustering of the responses about the mean. It implies that there was a higher degree of homogeneity of the competencies in Patterns and Algebra.

Table 6. Teachers' level of competence in Patterns and algebra for second quarter

Pedagogy			Learning competencies for quarter II	Content		
Mean	**± SD**	**Verbal description**		**Mean**	**± SD**	**Verbal description**
4.47	0.68	HC	17. Illustrates situations that involve the following variations: (a) direct; (b) inverse; (c) joint and (d) combined.	4.53	0.73	HC
4.40	0.67	HC	18. Translates into variation statement a relationship between two quantities given by: (a) a table of values; (b) a mathematical equation and (c) a graph, and vice versa.	4.57	0.63	HC
4.37	0.72	HC	19. Solves problems involving variation.	4.50	0.68	HC

4.47	0.73	HC	20. Applies the laws involving positive integral exponents to zero and negative integral exponents.	4.53	0.73	HC
4.47	0.68	HC	21. Illustrates expressions with rational exponents.	4.57	0.73	HC
4.37	0.72	HC	22. Simplifies expressions with rational exponents.	4.40	0.77	HC
4.43	0.68	HC	23. Writes expressions with rational exponents as radicals and vice versa.	4.53	0.68	HC
4.13	0.78	AAC	24. Derives the laws of radicals.	4.23	0.82	HC
4.40	0.72	HC	25. Simplifies radical expressions using the laws of radicals.	4.43	0.73	HC
4.33	0.71	HC	26. Performs operations on radicals.	4.43	0.68	HC
4.27	0.74	HC	27. Solves equations involving radical expressions.	4.47	0.68	HC
4.20	0.81	HC	28. Solves problems involving radicals.	4.37	0.85	HC
4.36	0.72	HC	Grand mean and standard deviation	4.46	0.73	HC

Table 6 reveals that respondents were highly competent both in pedagogy and content in all learning competencies in pattern and algebra for quarter II with an overall mean value of 4.36 and 4.46, respectively. It means that the teachers exceeded the fundamental knowledge and core understanding in the learning competencies, and can transfer them automatically and flexibly through the delivery of their lesson (SEI-DOST & MATHED, 2011). In addition, the standard deviations for all the learning competencies in patterns and algebra for quarter II and the average standard deviation in this area were all less than 3.00 which indicated that there was a close clustering of the responses about the mean. It divulges that there was a higher degree of homogeneity of the competencies in patterns and algebra during the second quarter.

Table 7. Teachers' level of competence in Geometry for the third quarter

Pedagogy			Learning competencies for quarter III	Content		
Mean	**± SD**	**Verbal description**		**Mean**	**± SD**	**Verbal description**
4.50	0.68	HC	29. Identifies quadrilaterals that are parallelograms.	4.57	0.68	HC
4.43	0.73	HC	30. Determines the conditions that make a quadrilateral a parallelogram.	4.57	0.63	HC
4.43	0.68	HC	31. Uses properties to find measures of angles, sides and other quantities involving parallelograms.	4.47	0.78	HC
3.83	0.75	AAC	32. Proves theorems on the different kinds of parallelogram (rectangle, rhombus, square).	4.13	0.78	AAC
4.03	0.67	AAC	33. Proves the Midline Theorem.	4.17	0.70	HC
3.93	0.64	AAC	34. Proves theorem on trapezoids and kites.	4.10	0.76	AAC
4.17	0.79	AAC	35. Solves problems involving parallelograms, trapezoids and kites.	4.27	0.83	HC
4.30	0.79	HC	36. Describes proportion.	4.50	0.78	HC
4.17	0.75	AAC	37. Applies the fundamental theorems of proportionality to solve problems involving proportions.	4.33	0.76	HC
4.30	0.79	HC	38. Illustrates similarity of figures.	4.47	0.73	HC

3.93	0.74	AAC	39. Proves the conditions for similarity of triangles.	4.17	0.75	HC
3.97	0.72	AAC	39.1 SAS Similarity Theorem	4.20	0.66	HC
3.97	0.72	AAC	39.2 SSS Similarity Theorem	4.17	0.70	HC
3.97	0.72	AAC	39.3 AA Similarity Theorem	4.20	0.66	HC
3.97	0.76	AAC	39.4 Right triangle similarity theorem	4.13	0.73	AAC
3.93	0.74	AAC	39.5 Special right triangle theorem	4.23	0.68	HC
4.07	0.69	AAC	40. Applies the theorems to show the given triangles are similar.	4.30	0.65	HC
4.13	0.82	AAC	41. Proves the Pythagorean Theorem	4.27	0.83	HC
4.13	0.73	AAC	42. Solves problems that involve triangle similarity and right triangles.	4.17	0.83	HC
4.11	0.73	AAC	Grand mean and standard deviation	4.28	0.73	HC

Table 7 shows that the teachers were either above average and highly competent both in pedagogy and content in the learning competencies in geometry for quarter III. On average, the teachers were above average competent in pedagogy, while highly competent in content. It means that teachers at this level exceeded the fundamental knowledge and core understanding of the learning competencies. However, the delivery of the content was not as high as their mastery of it (SEI-DOST & MATHED, 2011). Moreover, the standard deviations for the learning competencies in geometry for quarter III and the average standard deviations in this area were all less than 3.00 which indicated that there was a close clustering of the responses about the mean. It implies that there was a higher degree of homogeneity of the competencies in geometry for quarter III.

Table 8. Teachers' level of competence in Geometry for the fourth quarter

Pedagogy			Learning competencies for quarter IV	Content		
Mean	**± SD**	**Verbal description**		**Mean**	**± SD**	**Verbal description**
4.33	0.80	HC	43. Illustrates the six trigonometric ratios: sine, cosine, tangent, secant, cosecant and cotangent.	4.47	0.82	HC
4.27	0.74	HC	44. Finds the trigonometric ratios of special angles.	4.40	0.72	HC
4.20	0.76	HC	45. Illustrate angles of elevation and angles of depression.	4.27	0.69	HC
4.13	0.73	AAC	46. Uses trigonometric ratios to solve real-life problems involving right triangles.	4.27	0.74	HC
4.13	0.68	AAC	47. Illustrates laws of sines and cosines.	4.30	0.70	HC
3.97	0.67	AAC	48. Solves problems involving oblique triangles.	4.23	0.68	HC
4.17	0.73	AAC	Grand mean and standard deviation	4.32	0.73	HC

Table 8 unveils that the teachers were above average competent in Pedagogy and highly competent in some learning competencies in geometry for quarter IV. In totality, the teachers were above average competent while highly competent in the learning competencies in geometry. It means that the teachers exceeded the fundamental knowledge and core understanding of the content and also can transfer the learning competency automatically through the delivery of the lesson. Moreover, on the average, the standard deviations for the learning competencies in geometry for quarter IV in this area were all less than 3.00 which indicated that there was a close clustering of the responses about the mean. The result provides that there was a higher degree of homogeneity of the competencies in geometry during the fourth quarter.

Table 9. Summary of the teachers' competence in content and pedagogy

Pedagogy			Quarter/Content	Content		
Mean	± SD	Verbal description		Mean	± SD	Verbal description
4.30	0.74	HC	Quarter I—Patterns and Algebra	4.39	0.74	HC
4.36	0.72	HC	Quarter II—Patterns and Algebra	4.46	0.73	HC
4.11	0.73	AAC	Quarter III—Geometry	4.28	0.73	HC
4.17	0.73	AAC	Quarter IV—Geometry	4.32	0.73	HC
4.24	0.73	Highly competent	Grand mean and standard deviation	4.36	0.73	Highly competent

The results show that respondents are highly competent in both pedagogy and content in patterns and algebra (Table 9). The results also show that respondents obtained above average competence in Pedagogy and highly competent in content in geometry. Overall, the respondents are highly competent in both patterns and algebra and geometry. It means that teachers in these areas exceeded the fundamental knowledge and core understandings and can transfer them automatically and flexibly through the delivery of the lesson. It implies that teachers possess high mastery level in teaching the learning competencies in the Grade 9 Mathematics Curriculum.

Table 10. Relationship between the teachers' competence in content and pedagogy in patterns and algebra and the number of years in teaching mathematics

Variables	*ρ*	*p*-value	Degree of relationship	Decision rule	Remarks
Patterns and Algebra Content Competence and the number of years teaching Mathematics	0.559	0.002	High positive correlation	Reject H_o	Significant
Patterns and Algebra Pedagogy Competence and the number of years teaching Mathematics	0.468	0.001	Moderate positive correlation	Reject H_o	Significant

Table 10 discloses that the teachers' teaching experience was highly and positively correlated to their content competence while moderately and positively correlated to their pedagogical competence in patterns and algebra. Table 9 shows further that the relationship was significant. It means that there is enough evidence in the relationship between content and pedagogy in patterns and algebra and the number of years teaching mathematics. It implies that the higher the number of years teaching mathematics corresponds to higher content and pedagogical competence in patterns and algebra, while those with a lower number of years teaching mathematics corresponds to lower content and pedagogy competence in patterns and algebra. Results suggest that the relationship can be generalised from the sample of this study to its population.

Berger, Girardet, Vaudroz and Crahay (2018) conclusion supported the findings. They averred that the years of teaching experience seem to be an essential variable to take into account, as it linked to teaching practices, self-efficacy, and general conceptions about teaching and learning. It pointed out further that teachers upgrade their mastery of the knowledge both in content and pedagogical as the number of years teaching increases.

Table 11. Relationship between the teachers' competence in content and pedagogy in geometry and the number of years of teaching mathematics

Variables	*ρ*	*p*-value	Degree of relationship	Decision rule	Remarks
Geometry Content Competence and the number of years of teaching Mathematics	0.531	0.03	High positive correlation	Reject H_o	Significant
Geometry Pedagogy Competence and number of years of teaching Mathematics	0.194	0.01	Low positive correlation	Reject H_o	Significant

Table 11 unveils that the teachers' teaching experience was highly and positively correlated to their content competence while positively low in pedagogical competence in geometry. However, the table reflects that the relationship was significant. It means that there is enough evidence in the relationship between content and pedagogy in geometry and the number of years teaching mathematics. It implies that the higher the number of years teaching mathematics corresponds to higher content and pedagogical competence in patterns and algebra, while those with a lower number of years teaching mathematics corresponds to lower content and pedagogical competence in patterns and algebra. Results provide that the relationship can be generalised from the sample of this study to its population.

Table 12. Relationship between the teachers' competence in content and pedagogy in patterns and algebra and the number of training and seminars attended

Variables	*ρ*	*p*-value	Degree of relationship	Decision rule	Remarks
Patterns and algebra Content Competence and the number of training and seminars attended	−0.349	0.003	Moderate negative correlation	Reject iH_o	Significant
Patterns and algebra Pedagogy Competence and the number of training and seminars attended	−0.274	0.02	Low negative correlation	Reject H_o	Significant

Table 12 reveals that the teachers' number of training and seminars attended was moderately and negatively correlated to their content competence while obtained low and negative correlation with their pedagogical competence in patterns and algebra. However, the relationship was significant. It means that there is enough evidence in the relationship between content and pedagogy in patterns and algebra and the number of training and seminars attended. This finding suggests that the higher the number of training and seminars attended corresponds to lower content and pedagogy competence in patterns and algebra while those with a lower number of training and seminars attended corresponds to higher content and pedagogical competence in patterns and algebra.

On the contrary, Ningtiyas (2018) refuted the results whose study found out that the training had a positive effect on the pedagogical skills of mathematics teachers. They further found that mathematics teachers need training related to learning tools, method/technique/learning strategies, use of information technology and instructional media. Biasong (2009) agreed that training and seminars are much needed in the teaching profession.

Table 13. Relationship between the teachers' competence in content and pedagogy in geometry and the number of training and seminars attended

Variables	*ρ*	*p* – value	Degree of relationship	Decision rule	Remarks
Geometry Content Competence and number of training and seminars attended	−0.257	0.02	Low negative correlation	Reject H_o	Significant
Geometry Pedagogy Competence and number of training and seminars attended	−0.153	0.03	Low negative correlation	Reject H_o	Significant

Table 13 unmasks that the relationship between the teachers' number of training and seminars attended and their content and pedagogical competence in geometry was low and negatively correlated. However, the link was found significant. It means that there is enough evidence in the relationship between content and pedagogy in geometry and the number of training and seminars attended. This finding implies that the higher the number of training and seminars attended corresponds to a lower content and pedagogy competence in geometry, while those with a smaller number of training and seminars attended corresponds to higher content and pedagogical competence in patterns and algebra. However, Ningtiyas (2018) and Biasong (2009) contradicted the current findings.

Table 14. Relationship between the teachers' competence in content and pedagogy in patterns and algebra and educational qualification

Variables	*ρ*	*p*-value	Degree of relationship	Decision rule	Remarks
Patterns and algebra Content Competence and educational attainment	0.303	0.000	Moderate positive correlation	Reject H_o	Significant
Patterns and algebra Pedagogy Competence and educational attainment	0.257	0.02	Low positive correlation	Reject H_o	Significant

Table 14 discloses that the relationship between the teachers' educational qualification and their content competence in patterns and algebra was moderate and positive, while the link between teachers' educational qualification and their pedagogical competence was low and positively correlated. Table 13 indicates further that the relationship was significant. It means that there is enough evidence in the relationship between the teachers' content and pedagogical competence in patterns and algebra and their educational qualification. It implies that the higher the educational qualification among the teachers corresponds to higher content and pedagogical competence in patterns and algebra. Hence, results are subsumed that the relationship can be generalised from the sample of this study to its population.

To validate the finding, the researchers reviewed and evaluated the educational attainment of the teacher-respondents. It was found out that the majority of them are pursuing graduate studies which are vertically aligned to the field of mathematics. Moreover, based on the interview with the teacher-respondents, they have a positive and strong drive to finish their graduate studies. It implies that the teachers are optimistic enough in pursuing graduate education to enhance and excellently establish higher competence level both in content and pedagogy.

However, on the contrary of the findings, RachiroOchieng, Kiplagat and Nyongesa (2016) on the impact of teacher qualification in public and independent schools in Sweden revealed that master's degree was not found to be linked with improved teacher competence in delivering mathematical content in secondary schools.

Table 15. Relationship between the teachers' competence in content and pedagogy in geometry and educational qualification

Variables	*ρ*	*p*-value	Degree of relationship	Decision rule	Remarks
Geometry Content Competence and educational attainment	0.288	0.001	Low positive correlation	Reject H_o	Significant
Geometry Pedagogy Competence and educational attainment	0.152	0.04	Low positive correlation	Reject H_o	Significant

Table 15 reveals that the relationship between the teachers' educational qualification and their content and pedagogical competence in geometry was low and positively correlated. However, Table 14 presents that the relationship was significant. It means that there is enough evidence in the relationship between the teachers' content and pedagogical competence in geometry and their educational qualification. It implies that the higher the educational qualification among the teachers corresponds to a higher content and pedagogy competence in geometry. It can be inferred that the relationship can be generalised from the sample of this study to its population.

However, the present finding is refuted by RachiroOchieng et al. (2016) on the impact of teacher qualification in public and independent schools in Sweden disclosing that master's degree was not found to be linked with improved teacher competence in delivering mathematical content in secondary schools.

4. Conclusions

In the Division of Dumaguete City in the Philippines, mathematics teachers in grade 9 are mature enough in their profession, attend only in a localised training and seminars to ensure a higher percentage of participation, and value on pursuing graduate studies to enhance one's competence. On the other hand, the teachers exceed the fundamental knowledge and core understandings and can transfer them automatically and flexibly through the delivery of the lesson. Moreover, it is concluded that the higher the number of years the teachers teaching mathematics and educational qualification corresponds to a higher content and pedagogical competence in patterns, algebra and geometry, while the higher the number of training and seminars attended by the teachers corresponds to a lower content and pedagogical competence in patterns, algebra, and geometry. In general, the relationship can be generalised from the sample of this study to its population.

5. Recommendations

Based on the findings and conclusions, the following recommendations are offered:

1. Since the bulk of the teacher-respondents possess above average competence in geometry, teachers should attend pedagogical enhancement training in geometry, specifically on proving and reasoning. Moreover, teacher-respondents who were highly competent both in content and pedagogy should also participate in practice to sustain their level of competence.

2. Mathematics teachers should be assigned to Grade 9 for a more extended time to attain mastery and upgrade one's level of competence.
3. The school administrators and the division training directors should provide avenues for teachers to attend training and seminars on content and pedagogy in patterns, algebra and geometry.
4. Teachers should pursue masters and doctoral degrees that are vertically aligned in the field of mathematics.
5. It is highly recommended to use the enhancement program design.
6. A similar study may be conducted to the grade levels in junior high school.
7. A different study may be conducted to determine the competence level of the students and correlate it with the teachers' competence.
8. A replication of this study may be conducted in a different sample and other learning areas to determine if there exists a relationship between demographic profile and competence level of teachers.

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