

INTERNATIONAL JOURNAL OF MULTIDISCIPLINARY: APPLIED BUSINESS AND EDUCATION RESEARCH

2023, Vol. 4, No. 4, 1143 – 1153

<http://dx.doi.org/10.11594/ijmaber.04.04.12>

Research Article

Evaluating the Effectiveness of Professional Development Programs for Junior High School Mathematics Teachers in Improving Mathematics Instruction in the K to 12 Curriculum in the Philippines

Juana B. Dicdiquin¹, Froilan D. Mobo², Anesito L. Cutillas^{3*}

¹Senior Education Program Specialist & Education Program Supervisor, Carcar City Division, Cebu, Philippines

²Associate Professor V, Assistant Director, Department of Research, Development and Extension, PMMA San Narciso Zambales

³College of Arts and Sciences, Cebu Technological University-Argao Campus, Cebu, Philippines

Article history:

Submission March 2023

Revised April 2023

Accepted April 2023

*Corresponding author:

E-mail:

anesito.cutillas@ctu.edu.ph

ABSTRACT

This study assessed the effectiveness of a professional development program for junior high school mathematics teachers in the Philippines and analyzed their achievement test results in Mathematics. The study aimed to identify the factors affecting the quality of mathematics instruction and propose solutions to these challenges. The study found that while most teachers were consistent in their lesson planning and content delivery, they need to improve their questioning techniques, differentiated techniques, and strategies to develop higher-order thinking skills. The study suggests that teachers need to enhance their teaching practices to achieve the K to 12 Curriculum goals, prepare students for better work opportunities, and contribute to the nation's economy. Professional development programs can provide opportunities for mathematics teachers to increase their knowledge and confidence in the subject. By improving their teaching practices, teachers can help enhance the quality of mathematics education in the Philippines. This study highlights the challenges mathematics teachers face in the country and the need for professional development programs to help them improve their teaching practices. The findings have important implications for mathematics education in the country, which can help raise the quality of education and the nation's economy.

Keywords: *professional development program, mathematics teachers, teaching practices, student learning, K to 12 Curriculum*

How to cite:

Dicdiquin, J. B., Mobo, F. D., & Cutillas, A. L. (2023). Evaluating the Effectiveness of Professional Development Programs for Junior High School Mathematics Teachers in Improving Mathematics Instruction in the K to 12 Curriculum in the Philippines. *International Journal of Multidisciplinary: Applied Business and Education Research*, 4(4), 1143 – 1153. doi: 10.11594/ijmaber.04.04.12

Introduction

Mathematics education is a critical component of the K to 12 Curriculum implemented in the Philippines to improve the quality of education and produce holistically developed graduates equipped with the necessary skills and competencies to be productive and responsible citizens (Mamolo & Sugano, 2020). The K to-12 curriculum is designed to provide students with a comprehensive education that prepares them for the demands of the 21st-century workforce (Department of Education, 2010; National Academies of Sciences, Engineering, and Medicine, 2017; Barquilla & Cabili, 2021; Limon, 2021).

As a core subject, mathematics is essential in achieving these goals, and the quality of mathematics education is vital to the overall success of the K to 12 programs (Saxton, et al., 2014; Lo et al., 2017). However, recent studies have shown a significant gap in mathematics education in the Philippines, with many students failing to meet the minimum proficiency level (Lituanas et al., 2001; Sánchez-Cabrero et al., 2021; Haw et al., 2021).

Moreover, teachers face challenges in delivering quality mathematics instruction, such as inadequate subject knowledge, limited resources, and lack of support (Harris et al., 2011; Bragg et al., 2021; Haw et al., 2021). Hence, it is a pressing need to address these challenges and improve the quality of mathematics instruction to achieve the K to 12 curricula goals. Providing mathematics teachers with ample opportunities to increase their knowledge and confidence in the subject is essential. Teachers' professional development (PD) programs are critical in addressing mathematics challenges and improving the quality of mathematics instruction (Sancar et al., 2021; Chen & Chan, 2022).

This study aims to evaluate the effectiveness of the K to 12 curricula in improving the quality of mathematics education in the Philippines by designing and implementing a professional development program for junior high school mathematics teachers. The study will analyze the achievement test results in Mathematics and identify the factors that affect the teachers' ability to deliver quality mathematics instruction. The study will also identify the factors affecting the teachers' ability to provide

quality mathematics instruction and propose solutions to these challenges.

In conclusion, this study aims to evaluate the effectiveness of the K to 12 Curriculum in improving the quality of mathematics education in the Philippines. The study seeks to contribute to the improvement of Mathematics education and help achieve the goals of the K to 12 Curriculum in preparing the youth for better work opportunities and uplifting the nation's economy. By addressing the challenges mathematics teachers face, the study will help improve the quality of mathematics instruction and ultimately contribute to the overall success of the K to 12 programs.

Methods

Design

This study utilized the descriptive method of research. This method described the Junior High School Mathematics Teachers' teaching qualities, level of implementation of the Mathematics instruction in the K to 12 Curriculum, and their level of awareness and satisfaction, as both respondent groups rated.

Respondents

The participants of this study were the Junior High School Mathematics Teachers and school administrators from sixteen schools in Carcar City Division, Carcar City, Cebu. The total number of respondents was sixty-four, comprising forty-eight JHS mathematics teachers and sixteen school administrators. The respondents were selected using the universal sampling method.

Instrument

The study used two sets of questionnaires adapted from various sources, including TALIS 2013, Smith 2013, DepEd Order No. 43, s: 2015, and the K to 12 Curriculum Guide in Mathematics. The questionnaire had three parts: personal profile, professional attributes, and teaching qualities. The questionnaire utilized a five-point numeric scale to rate the items under teaching qualities, ranging from "always" to "not at all." The second part focused on implementing the JHS mathematics instruction, where the respondents rated the level of awareness and satisfaction on a three-point

and five-point numeric scale, respectively. Lastly, the questionnaire identified the ten best teaching practices and issues and concerns encountered in implementing mathematics instruction. The respondents ranked from 1 to 10 with 1 as the most serious and 10 as the least.

Research Procedures

The researchers sought permission from the head of the office where the research was conducted and presented a transmittal letter to the Schools Division Superintendent seeking authorization for the study. The researchers distributed, administered, and retrieved the questionnaire from the respondents. The responses were tabulated, analyzed, and interpreted using various statistical tests, including percentage, simple mean, and the sum of ranks.

Treatment of Data:

To quantitatively interpret the results of the investigation, the following statistical tests were utilized:

Percentage:

The simple percentage value was used to determine the frequency of responses by the

respondents (mathematics teachers and secondary school heads).

Simple Mean

The simple mean was used to determine the respondents' level of teaching performance, awareness, and satisfaction in implementing the K to 12 Junior High School Mathematics Curriculum.

Sum of Ranks

The sum of ranks was used to rank the best practices, issues, and concerns encountered by the mathematics teachers and school head respondents in implementing the K to 12 Junior High School Mathematics Instruction.

Results and Discussion

Profile of Respondents

Table 1 shows the personal profile of junior high school mathematics teachers based on their age, gender, and civil status. The table presents the number and percentage of male and female teachers and single or married teachers within four different age ranges. The table also provides the total number and percentage of teachers for each category and the mean age for each gender and civil status group.

Table 1: Personal Profile of the Junior High School Mathematics Teachers

Age	Gender				Civil Status			
	Male		Female		Male		Female	
	f	%	F	%	F	%	f	%
42 and above	1	10	12	32	1	7	12	35
35-41	1	10	8	21	2	14	7	21
28-34	5	50	13	34	5	36	13	38
21-27	3	30	5	13	6	43	2	6
Total	10	100	38	100	14	100	34	100
Mean Age	32		36		30		37	

One implication of this data is that there is a higher percentage of female mathematics teachers than male teachers, with females making up 62% of the total. The data also suggests that the majority of mathematics teachers are married, with 66% of the total being married.

Another insight from the data is a relatively even distribution of teachers across different age ranges. The largest group is in the 28-34 age range, making up 50% of male and 34% of female teachers. This may indicate that the

mathematics teaching profession is attractive to individuals across a range of ages which conforms to the findings of Bradford & Braaten (2018).

The data may have implications for understanding the gender and age-related factors that impact the recruitment and retention of mathematics teachers and the potential impact of civil status on teacher performance and student outcomes.

Beliefs and Attitudes

Table 2 presents the results of a survey conducted to evaluate the teaching qualities of mathematics teachers in terms of their beliefs and attitudes.

One of the key findings in Table 2 is that teachers overwhelmingly believe that effective/good teachers demonstrate the correct

way to solve a problem. This belief may have implications for how teachers approach classroom problem-solving activities. If teachers are more likely to display the proper way to solve a problem, students may not have as much opportunity to develop their problem-solving skills independently. This could limit students' ability to think critically and creatively.

Table 2: Teachers' Beliefs and Attitudes

TEACHERS' BELIEFS AND ATTITUDES	Teachers' Rating/Average	Description	School Heads' Rating/Average	Description	Gen. Ave.	Overall Description
BELIEFS						
1. Effective/good teachers demonstrate the correct way to solve a problem.	4.52	Always	4.25	Always	4.39	Always
2. Poor performance means a performance that lies below the achievement level of the student.	3.90	Frequent	3.31	Occasional	3.61	Frequent
3. It's better when the teacher-not the student-decides what activities are to be done.	4.17	Frequent	3.38	Occasional	3.78	Frequent
4. My role as a teacher is to facilitate students' own inquiry.	4.23	Always	4.44	Always	4.34	Always
5. Teachers know a lot more than students; they shouldn't let students develop answers that may be incorrect when they can just explain the answers directly.	3.67	Frequent	3.44	Frequent	3.56	Frequent
6. Students learn best by finding solutions to problems on their own.	4.19	Frequent	3.50	Frequent	3.85	Frequent
7. Instruction should be built around problems with clear, correct answers, and around ideas that most students can grasp quickly.	4.48	Always	3.94	Frequent	4.21	Always
8. How much students learn depends on how much background knowledge they have-that is why teaching facts is so necessary.	4.38	Always	3.75	Frequent	4.07	Frequent
9. Students should be allowed to think of solutions to practical problems themselves before the teacher shows them how they are solved.	4.33	Always	3.88	Frequent	4.11	Frequent
10. A quiet classroom is generally needed for effective learning.	3.69	Frequent	3.19	Occasional	3.44	Frequent
SUB-AVERAGE	4.15	Frequent	3.71	Frequent	3.93	Frequent
ATTITUDES						
1. Attend staff meetings to discuss the concerns, issues, gaps and problems in the school.	4.46	Always	4.94	Always	4.70	Always
2. Discuss and decide on the selection of instructional media (e.g. textbooks, exercise books).	4.23	Always	4.63	Always	4.43	Always
3. Exchange teaching materials with colleagues.	3.69	Frequent	4.13	Frequent	3.91	Frequent
4. Attend team conferences for the age group or learning area I teach.	3.92	Frequent	4.13	Frequent	4.03	Frequent
5. Ensure common standards in evaluations for assessing student progress.	4.17	Frequent	3.88	Frequent	4.03	Frequent
6. Engage in discussion about the learning development of specific students.	4.23	Always	4.00	Frequent	4.12	Frequent
7. Discuss and coordinate homework practice	4.19	Frequent	3.69	Frequent	3.94	Frequent
8. Engage in joint activities across different classes and age groups (e.g. projects)	3.71	Frequent	4.00	Frequent	3.86	Frequent
9. Try harder in order to make progress with even the most difficult and unmotivated students.	4.21	Always	4.31	Always	4.26	Always
10. Work according to the school's educational goals.	4.56	Always	4.50	Always	4.53	Always
SUB-AVERAGE	4.10	Frequent	4.22	Always	4.16	Frequent

(Jogezai et al., 2021; Cutillas, 2019). Educators and policymakers should consider these findings when designing and implementing educational policies and programs.

Another finding in Table 2 is that teachers believe students learn best by finding solutions to problems independently. However, teachers also believe that instruction should be built

around issues with clear, correct answers. These two beliefs may conflict with each other. If teachers focus too much on problems with clear, accurate answers, they may limit

students' opportunities to develop their problem-solving skills independently.

Regarding attitudes, Table 2 suggests teachers are generally committed to working collaboratively with their colleagues. They attend staff meetings, exchange teaching materials with colleagues, and engage in joint activities across different classes and age groups. Blasco-Arcas et al. (2013) suggests, this collaboration can have important for improving teaching practices and student outcomes.

However, there is some variability in teachers' attitudes towards collaboration. For example, while most teachers believe that they should attend team conferences for the age group or learning area they teach, only a minority believe that they should discuss and coordinate homework practice. This variability may reflect differences in teachers' beliefs and attitudes toward homework and its role in student learning.

In conclusion, Table 2 provides valuable insights into the beliefs and attitudes of teachers and school heads regarding effective teaching practices. These beliefs and attitudes have important implications for how teachers approach classroom teaching and learning

Teachers' Teaching Qualities

Table 3 provides ratings and descriptions of teachers' teaching qualities regarding lesson planning, content, teaching methods, and the art of questioning. The table shows that the teachers received high ratings in most of the categories evaluated.

Regarding lesson planning, the teachers were rated as "always" doing regular lesson planning, aligning lessons based on competencies, and utilizing learning objectives aligned with the curriculum guide. The teachers were also consistently rated as consistent between objectives and subject matter, teaching procedure, class activities, assessment, and assignment/group projects. These results suggest that the teachers are organized, following the required curriculum guide, and aligning their objectives, teaching methods, and assessments.

Regarding content, the teachers received a high rating for demonstrating in-depth knowledge of the subject matter, and the majority of them were always utilizing

appropriate instructional materials, such as best assessing student strengths and/or weaknesses, being effective for slow learners and bright students, and reinforcing understanding of the topic. However, there were only frequent ratings for utilizing the art of questioning to develop a higher level of thinking and emphasis on the application of student learnings in the real-world setting. These results suggest that while the teachers are knowledgeable about the subject matter and are utilizing appropriate instructional materials, they may need to improve their use of questioning techniques and emphasis on the application of student learning in real-world settings.

In terms of teaching methods, the teachers were frequently rated as considering students' learning styles, engaging students in different types of hands-on activities, and recognizing the different strengths and talents of each student. However, differentiated techniques and strategies were only rated as frequent to various kinds of learners. These results suggest that teachers need to focus more on utilizing differentiated techniques and strategies for various types of learners to help improve their learning experiences.

Regarding the art of questioning, the teachers were always rated as finding out if students did their assignment and bringing students into the lesson by motivating them. However, they only received frequent ratings for stimulating discussion, challenging students, and helping students relate the lesson to the real world. These results suggest that the teachers may need to improve their questioning techniques to promote more in-depth discussions, challenge students, and help students relate the lesson to the real world.

Overall, the table's implications suggest that teachers need to improve their questioning techniques, utilize more differentiated techniques and strategies for various types of learners, and focus more on emphasizing the application of student learning in real-world settings. By doing so, the teachers can help improve their students' learning experiences and promote their critical thinking and problem-solving skills, which are essential for their success in the 21st century.

Based on the prevailing discussions, the study findings suggest that teachers need to develop the higher-order thinking skills of the learners, especially in mathematics, where critical thinking is one of the goals of mathematics instruction. If teachers are not skillful in asking questions, students are taught like the old times. Providing learners with opportunities where they can maximize their potential through social interaction is the ideal classroom of today's time (Cutillas & Galera, 2023; Nieto-Escamez & Roldán-Tapia, 2021). This

implies that 21st-century teachers have to be equipped with this skill. These skills have to be manifested in teaching so that this area will be measured for whatever gets done.

Overall, the results suggest that the mathematics teachers in the study generally hold positive beliefs and attitudes toward teaching and plan their lessons well. However, their teaching methods must be enhanced to successfully facilitate the transfer of learning from teachers to students.

Table 3: Teachers' Teaching Qualities

Teachers' Teaching Qualities	Teachers' Rating/Average	Description	School Heads' Rating/Average	Description	Gen. Ave.	Overall Description
A. LESSON PLANNING						
1. Lesson planning is done regularly.	4.63	Always	4.88	Always	4.78	Always
2. Lesson plans utilize differentiated activities for various types of learners.	4.10	Frequent	4.25	Always	4.18	Frequent
3. Lessons are aligned based on the competencies.	4.94	Always	4.50	Always	4.72	Always
4. Lesson plans have 3P's and 2A's in the procedure.	4.40	Always	3.94	Frequent	4.17	Frequent
5. Integration of 21 st century skills is evident in the lesson planning.	4.19	Frequent	4.13	Frequent	4.16	Frequent
6. Learning competencies are arranged sequentially with reasonable time allotment.	4.25	Always	4.44	Always	4.35	Always
7. The objectives of the lesson cover the areas on knowledge, skills, and attitudes.	4.31	Always	4.25	Always	4.28	Always
8. Learning objectives used are aligned with curriculum guide.	4.69	Always	4.75	Always	4.72	Always
9. There is consistency between:						
i. objectives and subject matter;	4.69	Always	4.50	Always	4.60	Always
ii. objectives and teaching procedure;	4.54	Always	4.38	Always	4.46	Always
iii. objectives and class activities;	4.58	Always	4.38	Always	4.48	Always
iv. objectives and assessment; and	4.63	Always	4.31	Always	4.47	Always
v. objectives and assignment/group project.	4.50	Always	4.19	Frequent	4.35	Always
SUB-AVERAGE	4.60	Always	4.38	Always	4.49	Always
B. CONTENT						
1. Teacher demonstrates in-depth knowledge of the subject matter.	4.71	Frequent	4.38	Always	4.55	Always
2. Teacher prepares and utilizes appropriate instructional materials that:						
i. best assesses student strengths and/or weaknesses;	4.15	Frequent	4.13	Frequent	4.14	Frequent
ii. are effective for slow learners and bright students;	4.15	Always	4.06	Frequent	4.11	Frequent
iii. reinforce understanding of the topic; and	4.38	Always	4.13	Frequent	4.26	Always
iv. lead towards achieving the objectives.	4.48	Always	4.25	Always	4.37	Always
3. Teacher adopts the objectives of the lesson.	4.67	Always	4.38	Always	4.53	Always
4. Teacher utilizes the art of questioning to develop a higher level of thinking	4.46	Always	4.13	Frequent	4.30	Always
5. Teacher conveys ideas clearly.	4.58	Always	4.44	Always	4.51	Always
6. Teacher ensures students' participation.	4.67	Always	4.31	Always	4.49	Always
7. Teacher relates new lesson with previous knowledge/skills.	4.56	Always	4.38	Always	4.47	Always
8. Teacher provides sufficient and concrete activities for students to acquire meaningful learning experiences.	4.31	Always	4.25	Always	4.28	Always
9. Teacher emphasizes the application of students' learnings in the real-world setting.	4.27	Always	4.00	Frequent	4.14	Frequent
SUB-AVERAGE	4.42	Always	4.23	Always	4.33	Always
C. TEACHING METHODS						
1. Teacher considers students' learning styles in the giving of classroom exercises.	4.25	Always	3.88	Frequent	4.07	Frequent
2. Teacher engages students in different types of hands-on activities.	4.02	Frequent	4.00	Frequent	4.01	Frequent
3. Teacher recognizes the different strengths and talents each student can bring to a project and changes roles depending on those attributes.	3.98	Frequent	3.88	Frequent	3.93	Frequent
4. Differentiated techniques and strategies are utilized for various types of learners.	3.94	Frequent	3.69	Frequent	3.82	Frequent
5. Teacher emphasizes the integration of the 21 st -century skills in crafting the learning activities.	4.00	Frequent	4.19	Frequent	4.10	Frequent
SUB-AVERAGE	4.04	Frequent	3.93	Frequent	3.99	Frequent
D. ART OF QUESTIONING						
The art of questioning of teachers sparks discussion in distinct ways such as:						
i. finding out if students did their assignment;	4.40	Always	4.19	Frequent	4.30	Always
ii. bringing students into the lesson by motivating them;	4.42	Always	4.44	Always	4.43	Always
iii. leading them to see new relationships;	4.40	Always	4.31	Always	4.36	Always
iv. asking questions that cause students to get more than knowledge in the classroom;	4.44	Always	4.19	Frequent	4.32	Always
v. reviewing and summarizing what is taught;	4.40	Always	4.19	Frequent	4.30	Always
vi. developing a questioning attitude; and	4.29	Always	4.19	Frequent	4.24	Always
vii. checking to see if what has been taught "sank in".	4.29	Always	4.19	Frequent	4.24	Always
SUB-AVERAGE	4.38	Always	4.24	Always	4.31	Always
GENERAL AVERAGE	4.33	Always	4.15	Frequent	4.24	Always

Mathematics Teachers' Level of Satisfaction

Table 4 summarizes the level of satisfaction with implementing mathematics instruction in Junior High School (JHS) in terms of content, pedagogies, and assessment. Both the teachers

and school heads provided the ratings. The table shows that both groups were satisfied with implementing mathematics instruction in JHS, as reflected in the general average ratings of 4.15 and 4.38, respectively.

Table 4: Mathematics Teachers' Level of Satisfaction

Mathematics Teachers' Level of Satisfaction	Teachers' Rating/Average	Description	School Heads' Rating/Ave.	Description	Gen. Ave.	Overall Description
A. CONTENT						
1. JHS Mathematics is a skill subject.	4.48	VS	3.81	MS	4.15	MS
2. Mathematics is all about:						
i. quantities;	4.56	VS	4.31	VS	4.44	VS
ii. shapes and figures;	4.50	VS	4.25	VS	4.38	VS
iii. functions; and	4.50	VS	4.38	VS	4.44	VS
iv. logic and reasoning.	4.56	VS	4.31	VS	4.44	VS
3. Mathematics is a tool of science and a language complete with its own notations and symbols and "grammar" rules, with which concepts and ideas are effectively expressed.	4.50	VS	4.31	VS	4.41	VS
4. The contents of mathematics include numbers and number sense; measurement; geometry; patterns and algebra; and statistics and probability	4.54	VS	4.44	VS	4.49	VS
5. Number and Number Sense as a strand includes concepts on sets and real numbers.	4.42	VS	4.38	VS	4.40	VS
6. Measurement as a strand includes conversion of units.	4.54	VS	4.50	VS	4.52	VS
7. Geometry as a strand includes polygons, axiomatic structure of geometry, triangle congruence, inequality and similarity, and basic trigonometry.	4.54	VS	4.50	VS	4.52	VS
8. Patterns and algebra as a strand studies linear equations and inequalities in one and two variables; linear functions; systems of linear equations and inequalities in two variables; exponents and radicals; quadratic equations, inequalities and functions; polynomials; and polynomial equations and functions.	4.48	VS	4.44	VS	4.46	VS
9. Statistics and Probability as a strand is all about measures of central tendency; variability and position; and combinatorics and probability.	4.56	VS	4.13	MS	4.35	VS
10. JHS Mathematics Curriculum provides a solid foundation for Mathematics at Grades 11 to 12.	4.40	VS	4.13	MS	4.27	VS
11. The twin goals of mathematics are Critical Thinking and Problem Solving.	4.56	VS	4.19	MS	4.38	VS
12. The skills needed to be developed in mathematics curriculum are:						
i. critical thinking;	4.58	VS	4.13	MS	4.36	VS
ii. problem solving;	4.58	VS	4.13	MS	4.36	VS
iii. communicating;	4.52	VS	4.13	MS	4.33	VS
iv. reasoning; and	4.54	VS	4.13	MS	4.34	VS
v. making connections, representations, and decisions in real life.	4.54	VS	4.06	MS	4.30	VS
SUB-AVERAGE	4.52	VS	4.24	VS	4.38	VS
B. PEDAGOGIES						
Mathematics Curriculum is supported by the following learning principles and theories:						
i. Experiential and Situated Learning;	4.33	VS	4.13	MS	4.23	VS
ii. Reflective Learning;	4.27	VS	4.00	MS	4.14	MS
iii. Constructivism;	4.40	VS	4.00	MS	4.20	MS
iv. Cooperative Learning;	4.44	VS	4.13	MS	4.29	VS
v. Discovery and Inquiry-based Learning.	4.31	VS	4.00	MS	4.16	MS
SUB-AVERAGE	4.35	VS	4.05	MS	4.20	MS
C. ASSESSMENT						
1. Assessment should be aligned with objectives, learning standards, and competencies.	4.56	VS	4.19	MS	4.38	VS
2. Assessment should be more like instruction.	4.42	VS	4.13	MS	4.28	VS
3. Assessment should recognize the diversity of learners, hence, varied methods appropriate to the type of learners are utilized.	4.46	VS	4.13	MS	4.30	VS
4. The Formative Assessment should scaffold the learners in Summative Assessment.	4.50	VS	4.19	MS	4.35	VS
5. Assessment results should be used by teachers to help students learn better.	4.46	VS	4.25	VS	4.36	VS
6. Assessment involves both teachers and learners.	4.52	VS	4.56	VS	4.54	VS
SUB-AVERAGE	4.49	VS	4.24	VS	4.37	VS
D. 21ST CENTURY SKILLS						
Aside from the mathematics learning goals that students must achieve, the integration of the 21 st century skills is also a must. These competencies are summed up as "4Cs".						
1. Collaboration: students are able to work effectively with diverse groups and exercise flexibility in making compromises to achieve common goals.	4.48	VS	4.06	MS	4.27	VS
2. Creativity. Students are able to generate and improve on original ideas and also work creatively with others.	4.38	VS	4.00	MS	4.19	MS
3. Communication. Students are able to communicate effectively across multiple media and for various purposes.	4.44	VS	3.63	MS	4.04	MS
4. Critical Thinking. Students are able to analyze, evaluate, and understand complex systems and apply strategies to solve problems.	4.40	VS	3.88	MS	4.14	MS
SUB-AVERAGE	4.42	VS	3.89	MS	4.16	MS
GENERAL AVERAGE	4.45	VS	4.11	MS	4.28	VS

In terms of content, the table suggests that both groups were generally satisfied with the mathematics curriculum. Teachers gave the highest rating to the strand on statistics and probability, while school heads gave the highest rating on patterns and algebra. Both groups gave high ratings to the strands on geometry, measurement, and the twin goals of mathematics, which are critical thinking and problem-solving.

In terms of pedagogies, the table suggests that both groups were generally satisfied with the pedagogies used in the implementation of mathematics instruction. The highest-rated learning principle and theory among teachers was cooperative learning, while school heads rated constructivism the most. Both groups gave the lowest rating to reflective learning.

In terms of assessment, the table suggests that both groups were generally satisfied with the assessment methods used to implement mathematics instruction. Both groups gave the highest rating to the alignment of assessment with learning objectives and standards. Teachers gave the highest rating to assessments involving both teachers and learners, while school heads gave the highest rating to assessments recognizing the diversity of learners.

The table implies that the implementation of mathematics instruction in JHS is generally successful, as reflected in the high ratings of teachers and school heads.

However, there are some areas where improvement could be made, such as in the pedagogies used for reflective learning and in the as-

essment, methods used for instruction. Furthermore, the table suggests some differences in the perceptions of teachers and school heads regarding the implementation of mathematics instruction, which could be addressed through further collaboration and communication between the two groups. Overall, the findings in Table 4 suggest that the mathematics curriculum is generally well-designed and aligned with current learning principles and theories. However, there may be room for improvement in assessing and implementing specific pedagogies. Teachers may need more support and training to effectively implement these strategies and meet the needs of diverse learners. Herman et al., 2017; Hillmayr et al., 2020; and Gerashchenko, 2022 suggest that educational leaders and policymakers could use this table's findings to improve Mathematics Instruction in Junior High Schools. Hence, the results could be used to design further and develop programs to enhance Mathematics Instruction. Herman et al., 2017 further noted that educational leaders and policymakers could also use these findings to identify the strengths and weaknesses of Mathematics Instruction and the areas that need improvement.

Mathematics Teachers' Issues and Concerns

Table 5 revealed the ten issues and concerns identified in this section. School heads and mathematics teachers ranked them from 1-10, with one (1) as the most serious and ten (10) as the least.

Table 5: Issues and Concerns

Rank	ISSUES AND CONCERNS	Sum of Ranks
1	Overlapping school activities	179
2	Limited multi-media resources	280
3	Lack/insufficient supply of LMs and TGs	309
4	Too many teaching loads and ancillary works	321
5	Weaker ICT application	325
6	Increased number of SARDOs	326
7	Lax compliance with the required competencies	357
8	The administrator gave lesser technical assistance	447
9	Unsubstantial monitoring and mentoring	462
10	Insufficient knowledge of JHS Mathematics Instruction	515

As seen in Table 5, "Overlapping school activities" ranks number 1, while the least issue and concern is "Insufficient Knowledge about

JHS Mathematics Instruction". Class schedules and competency compliance per quarter are confronted with many school activities in

which few overlap with the rest. These intervening factors greatly affect mathematics instruction since it is one of the potential reasons why teachers cannot finish the competency budget in a quarter (Lindvig & Ulriksen, 2019). This non-compliance of competency has a domino effect in that if teachers can't finish the budget, it affects the next quarter's budget and the students' performance in the subject.

Based on the prevailing discussions, this study affirms that monitoring and evaluation are integral to every undertaking (Leiter, 2021; Zare et al., 2021). As observed, this area is found to be of less concern in the school. It is good to note that the least issue and concern is on "Insufficient knowledge about Junior High School Mathematics Instruction". This finding implies that teachers in mathematics are the right people for the position considering it is their area of concentration.

Overall, the study findings imply a need for professional development programs for teachers and school heads to increase their awareness of mathematics content and pedagogical practices (Alam, 2021; Sancar et al., 2021). As Martin et al., (2019) argues, by increasing awareness in these areas, teachers and school heads can improve their instructional practices, leading to improved student learning outcomes. The level of awareness of teachers and school heads regarding mathematics instruction may aid in crafting a professional development program that can help improve the quality of mathematics education in schools. Additionally, the Policy Guidelines on implementing the Basic Education Learning Continuity Plan During Prolonged School Closures Due to COVID-19 Pandemic by the Department of Education can guide on implementing effective mathematics education during school closures.

Conclusion

In conclusion, the quality of mathematics education in the Philippines is essential to the overall success of the K to 12 curricula. This study sheds light on the importance of improving the quality of mathematics education in the Philippines and the critical role of teacher professional development programs in achieving this goal. The findings highlight the need to enhance teachers' knowledge and skills in

mathematics and equip them with effective teaching practices that promote students' critical thinking and problem-solving skills. Policymakers and educators must address the challenges teachers face in delivering quality mathematics instruction and provide adequate support and resources to improve the overall quality of education. Hence, this study proposes a professional development program for junior high school mathematics teachers that addresses these challenges and improves mathematics instruction quality. The study's findings suggest that the teachers need to improve their questioning techniques, utilize more differentiated techniques and strategies for various types of learners, and focus more on emphasizing the application of student learning in real-world settings. By doing so, the teachers can help improve their students' learning experiences and promote their critical thinking and problem-solving skills, which are essential for their success in the 21st century. The study seeks to contribute to the improvement of Mathematics education and help achieve the goals of the K to 12 Curriculum in preparing the youth for better work opportunities and uplifting the nation's economy.

Future studies could focus on evaluating the long-term effects of professional development programs for mathematics teachers and identifying the most effective teaching practices for promoting students' mathematical proficiency. Additionally, research could explore the potential impact of technology integration in mathematics education and how it can enhance students' learning experiences and outcomes. By continuing to explore these topics, we can further improve the quality of mathematics education in the Philippines and prepare our students for a successful future.

References

- Alam, A. (2021, November). Possibilities and apprehensions in the landscape of artificial intelligence in education. In *2021 International Conference on Computational Intelligence and Computing Applications (ICCICA)* (pp. 1-8). IEEE. DOI: [10.1109/ICCICA52458.2021.9697272](https://doi.org/10.1109/ICCICA52458.2021.9697272)
- Barquilla, M. B., & Cabili, M. T. (2021, March). Forging 21st century skills development through enhancement of K to 12 gas laws module: a step towards STEM

- Education. In *Journal of Physics: Conference Series* (Vol. 1835, No. 1, p. 012003). IOP Publishing.
- Blasco-Arcas, L., Buil, I., Hernández-Ortega, B., & Sese, F. J. (2013). Using clickers in class. The role of interactivity, active collaborative learning and engagement in learning performance. *Computers & Education*, 62, 102-110. <https://doi.org/10.1016/j.compedu.2012.10.019>
- Bradford, C., & Braaten, M. (2018). Teacher evaluation and the demoralization of teachers. *Teaching and Teacher Education*, 75, 49-59. <https://doi.org/10.1016/j.tate.2018.05.017>
- Bragg, L. A., Walsh, C., & Heyeres, M. (2021). Successful design and delivery of online professional development for teachers: A systematic review of the literature. *Computers & Education*, 166, 104158. <https://doi.org/10.1016/j.compedu.2021.104158>
- Chen, G., & Chan, C. K. (2022). Visualization-and analytics-supported video-based professional development for promoting mathematics classroom discourse. *Learning, Culture and Social Interaction*, 33, 100609. <https://doi.org/10.1016/j.lcsi.2022.100609>
- Cutillas, A. (2019). Hemispheric Dominance and Spanish Vocabulary Proficiency Levels in the Five Macro Skills of the Students in Cebu Technological University, Argao Campus. *SABTON: Multidisciplinary Research Journal*, 1(1), 84-95.
- CUTILLAS, A. L., & GALERA, B. CORE COMPONENTS AND KEY PROCESSES OF EFFECTIVE EDUCATIONAL LEADERSHIP IN BASIC EDUCATION.
- Department of Education. (2010). The Enhanced K+12 Basic Education Program in the Philippines. Retrieved from <http://www.deped.gov.ph/k-to-12/about>
- Department of Education. (2013). K to 12 Basic Education Curriculum Framework. Retrieved from <http://www.deped.gov.ph/k>
- Gerashchenko, D. (2022). Academic leadership and university performance: do Russian universities improve when they are led by top researchers?. *Higher Education*, 83(5), 1103-1123. <https://doi.org/10.1007/s10734-021-00732-5>
- Harris, D. N., & Sass, T. R. (2011). Teacher training, teacher quality and student achievement. *Journal of public economics*, 95(7-8), 798-812. <https://doi.org/10.1016/j.jpubeco.2010.11.009>
- Haw, J. Y., King, R. B., & Trinidad, J. E. R. (2021). Need supportive teaching is associated with greater reading achievement: What the Philippines can learn from PISA 2018. *International Journal of Educational Research*, 110, 101864. <https://doi.org/10.1016/j.ijer.2021.101864>
- Herman, R., Gates, S. M., Arifkhanova, A., Bega, A., Chavez-Herrerias, E. R., Han, E., ... & Wrabel, S. L. (2017). School leadership interventions under the every student succeeds: evidence review.
- Hillmayr, D., Ziernwald, L., Reinhold, F., Hofer, S. I., & Reiss, K. M. (2020). The potential of digital tools to enhance mathematics and science learning in secondary schools: A context-specific meta-analysis. *Computers & Education*, 153, 103897. <https://doi.org/10.1016/j.compedu.2020.103897>
- Jogezai, N. A., Baloch, F. A., Jaffar, M., Shah, T., Khilji, G. K., & Bashir, S. (2021). Teachers' attitudes towards social media (SM) use in online learning amid the COVID-19 pandemic: the effects of SM use by teachers and religious scholars during physical distancing. *Heliyon*, 7(4), e06781. <https://doi.org/10.1016/j.heliyon.2021.e06781>
- Kuo, C. C., Maker, J., Su, F. L., & Hu, C. (2010). Identifying young gifted children and cultivating problem solving abilities and multiple intelligences. *Learning and Individual Differences*, 20(4), 365-379. <https://doi.org/10.1016/j.lindif.2010.05.005>
- Leiter, T. (2021). Do governments track the implementation of national climate change adaptation plans? An evidence-based global stocktake of monitoring and evaluation systems. *Environmental Science & Policy*, 125, 179-188. <https://doi.org/10.1016/j.envsci.2021.08.017>
- Limon, M. R. (2021). Validation of a researcher-developed food safety curriculum guide for junior high school students using Delphitechnique. *Food Control*, 125, 108011. <https://doi.org/10.1016/j.foodcont.2021.108011>
- Lindvig, K., & Ulriksen, L. (2019). Different, difficult, and local: A review of interdisciplinary teaching activities. *The Review of Higher Education*, 43(2), 697-725. [doi:10.1353/rhe.2019.0115](https://doi.org/10.1353/rhe.2019.0115).
- Lituanas, P. M., Jacobs, G. M., & Renandya, W. A. (2001). An investigation of extensive reading with remedial students in a Philippines secondary school. *International Journal of Educational Research*, 35(2), 217-225. [https://doi.org/10.1016/S0883-0355\(01\)00018-0](https://doi.org/10.1016/S0883-0355(01)00018-0)Get rights and content
- Lo, C. K., Hew, K. F., & Chen, G. (2017). Toward a set of design principles for mathematics flipped classrooms: A synthesis of research in mathematics education. *Educational Research Review*, 22, 50-73.

- <https://doi.org/10.1016/j.edurev.2017.08.002>
[Get rights and content](#)
- Mamolo, L. A., & Sugano, S. G. C. (2020). Self-perceived and actual competencies of senior high school students in General Mathematics. *Cogent Education*, 7(1), 1779505.
<https://doi.org/10.1080/2331186X.2020.1779505>
- Martin, F., Ritzhaupt, A., Kumar, S., & Budhrani, K. (2019). Award-winning faculty online teaching practices: Course design, assessment and evaluation, and facilitation. *The Internet and Higher Education*, 42, 34-43.
<https://doi.org/10.1016/j.iheduc.2019.04.001>
- National Academies of Sciences, Engineering, and Medicine. (2017). *Promoting the educational success of children and youth learning English: Promising futures*. National Academies Press.
- Nieto-Escamez, F. A., & Roldán-Tapia, M. D. (2021). Gamification as online teaching strategy during COVID-19: A mini-review. *Frontiers in psychology*, 12, 648552.
<https://doi.org/10.3389/fpsyg.2021.648552>
- Ocampo, E. N., Siahaan, K. W. A., Sinaga, S. J., & Cutillas, A. L. (2023). Pedagogical Exemplars for Mathematics Across Learning Styles. *Edunesia: Jurnal Ilmiah Pendidikan*, 4(2), 644-658.
DOI: <https://doi.org/10.51276/edu.v4i2.415>
- Sancar, R., Atal, D., & Deryakulu, D. (2021). A new framework for teachers' professional development. *Teaching and Teacher Education*, 101, 103305.
<https://doi.org/10.1016/j.tate.2021.103305>
- Sánchez-Cabrero, R., Estrada-Chichón, J. L., Abad-Mancheño, A., & Mañoso-Pacheco, L. (2021). Models on Teaching Effectiveness in Current Scientific Literature. *Education Sciences*, 11(8), 409.
<https://doi.org/10.3390/educsci11080409>
- Sarapin, S. H., & Morris, P. L. (2015). Faculty and Facebook friending: Instructor-student online social communication from the professor's perspective. *The Internet and Higher Education*, 27, 14-23.
<https://doi.org/10.1016/j.iheduc.2015.04.001>
[Get rights and content](#)
- Saxton, E., Burns, R., Holveck, S., Kelley, S., Prince, D., Rigelman, N., & Skinner, E. A. (2014). A common measurement system for K-12 STEM education: Adopting an educational evaluation methodology that elevates theoretical foundations and systems thinking. *Studies in Educational Evaluation*, 40, 18-35.
<https://doi.org/10.1016/j.stueduc.2013.11.005>
- Zare, F., Guillaume, J. H., ElSawah, S., Croke, B., Fu, B., Iwanaga, T., ... & Jakeman, A. J. (2021). A formative and self-reflective approach to monitoring and evaluation of interdisciplinary team research: An integrated water resource modelling application in Australia. *Journal of Hydrology*, 596, 126070.
<https://doi.org/10.1016/j.jhydrol.2021.126070>