INSTRUCTIONAL QUALITY AS A PREDICTOR OF EDUCATIONAL OUTCOMES IN HIGH SCHOOL MATHEMATICS

Emy Lou M. Banoy[1], Clarissa M. Garay[2],
Honey Julie M. Macaraeg[3], and Prof. Ronnie F. Garcia[4]

UM Tagum College, Philippines
[1,2, 3]Students, Department of Engineering Education
[4]Faculty, Secondary Education Program
[1,2, 3, 4]rpctagum@umindanao.edu.ph

ABSTRACT

The multi-dimensionality of educational outcomes in high school mathematics addresses the various types of students' outcomes. The instructional quality takes the complexities of the educational systems that primarily determine students' academic performance and other educational outcomes. This study assessed the instructional quality and educational outcomes in high school mathematics, aiming to determine the influence between the variables. The study employs a quantitative approach under a non-experimental design. One hundred eighty-seven (187) senior high school students in UM Tagum College were surveyed using a two-part structured questionnaire. Randomly, sixty-four (64) grade eleven students and one hundred twenty-three (123) grade twelve students were selected. The collected data were treated appropriately using Mean, Pearson (r), and Linear Regression Analysis. The results revealed that instructional quality and educational outcomes possessed much evident and much observed mean description. Additionally, there was a significant relationship between instructional quality and educational outcomes in high school mathematics. Moreover, the domain, cognitive activation, significantly influences the educational outcomes in high school mathematics.

Keywords: *BSED-Mathematics, Instructional Quality, Educational Outcomes, High School Mathematics, Philippines.*

INTRODUCTION

It is well established that in primary and secondary schools, student learning differs considerably across classrooms. Every day, millions of learners undergo instruction in the classroom that positively affects a range of outcomes - from individual educational gains to broader cultural agendas such as the competitive economy and group fairness. High achievement is determined by the fact that academic performance is a prerequisite for productivity criteria such as welfare, higher education dropouts, and inclusion in the labor force. In addition, various types of student outcomes, such as cognitive and affective, are considered to address the multi-dimensionality of curriculum targets. In recent decades, however, studies have mainly emphasized cognitive outcomes. Few studies have concentrated on affective or motivating outcomes opposite to cognitive outcomes (Bellens *et al.,* 2019).

In addition, the dynamic paradigm of instructional effectiveness takes on accountability for the complexities of educational systems where learners are nested within an institution's classes. Instructional quality is presumed to be the quality of a teacher by the students' perception or the assessment of instructional performance. It is also a primary determinant of academic performance and other educational outcomes of students. In this concept and related to various educational outcomes, the international educational research group has a considerable interest. Furthermore, the quality of instruction is recognized as one of the main significant variables affecting students' learning and achievement in mathematics or any field of education.

Thus, educational reform in mathematics education and mathematics instruction has been addressed and debate on what counts in a mathematics classroom. It has been asserted that the nature and level of students' learning are significantly influenced by the qualities of classroom mathematics education (Nilsen & Gustafsson, 2016).

Moreover, in the study conducted by Nicolas and Emata (2018), in terms of content-related reasoning, evaluating, ordering or integrating, and critical thinking, high school students in Region XI, particularly in Tagum City, do not meet the passing threshold set by the Philippine Department of Education. These problems may involve students' comprehension of problem-solving due to limited vocabulary, failure to use concrete logical operations, and poor retention in recollecting understanding of mathematical concepts.

Recent studies, however, primarily concentrate on the mathematical performance of the students rather than its multi-dimensional outcomes in learning. The notion of instructional quality, or what constitutes good instruction, has a long history of educational research. Different research approaches yield varied viable responses depending on the study's context. Thus, the researchers need to study the relationship between instructional quality and students' educational outcomes in high school mathematics as it addresses the multi-dimensionality of learning outcomes. Furthermore, this educational study might catalyze practitioners aiming towards the high achievements of the students. In contrast, instructional quality explores more underlying domains in recognizing a wide variety of educational learning outcomes.

The main purpose of the study was to determine the influence of instructional quality and students' educational outcomes in high school mathematics. Specifically, it desired to answer the following objectives:

1. To assess the level of instructional quality in terms of:
   - 1.1 classroom management.
   - 1.2 supportive climate; and
   - 1.3 cognitive activation.
2. To assess the level of student's educational outcomes in high school mathematics in terms of:
   - 2.1 cognitive outcomes; and
   - 2.2 affective outcomes.

3. To determine the significant relationship between instructional quality and student's educational outcomes in high school mathematics.

4. To determine which of the domain in instructional quality significantly influence students' educational outcomes in high school mathematics.

The hypotheses of the study were tested at a 0.05 level of significance, stating that there is no significant relationship between instructional quality and students' educational outcomes in high school mathematics. Additionally, there is no domain in instructional quality that significantly influences the students' educational outcomes in high school mathematics.

The findings of this study may contribute to the widespread knowledge about instructional quality and serve as a basis in formulating effective instructional practices in a classroom setting. The results may provide insights to the school heads to determine the different domains of instructional quality that would improve the educational performance within the school. The information provided with this study would be beneficial to the teachers, whereas they can specify the teaching practices that affect the students' performance, especially in the mathematics lesson. It may develop an understanding of the students' factors on learning not only in academic achievement but also in an affective outcome. Additionally, this study may give motivation to the teachers that they may continue to improve their instructional processes in teaching mathematics.

Furthermore, the results of the study may be beneficial to the students where they can identify their strengths and weaknesses among the domains of the instructional processes that give them an idea to resolve their struggles in learning mathematics. It may encourage them to be more self-regulated and make progress in learning and achieving their educational goals. Finally, this study may benefit future researchers in which they use the finding as literature and stimulates further research in the field of instructional effectiveness in mathematics.

METHOD

Research Respondents

Stratified random sampling technique was used to select respondents who were senior high school students of UM Tagum for the school year 2020-2021. The respondents were classified into two distinct groups based on their grade level, which would provide greater precision. Random samples were selected from each stratum.

Research Instrument/Material

The instrument used in the independent variable was adopted and modified from TIMSS Questionnaire (Trends in Mathematics and Science Study). It is a modified questionnaire to suit the context of the study. The first part of the questionnaire deals with the instructional quality with three indicators: classroom management, supportive climate, and cognitive activation. The questionnaire structure is such that respondents can answer it quickly. Thus, the set of questionnaires structure using the Likert format with a five-point response scale. A Likert scale is a rating scale that allows the respondent to signify a statement with his or her level of approval or disapproval. The questionnaire contains the data of the respondents in order to use in the distribution of the respondents.

The instrument used in the dependent variable was adopted and modified from the Motivated Strategies for Learning Questionnaire (MSLQ). It is a modified questionnaire to suit the context of the study. The second part of the questionnaire deals with the educational outcomes of the students in high school mathematics with two indicators: cognitive outcome and affective outcome. The questionnaire structure is such that respondents can answer it quickly. Thus, the set of questionnaires structure using the Likert format with a five-point response scale. A Likert scale is a rating scale that allows the respondent to signify a statement with his or her level of approval or disapproval.

Research Design and Procedure

This study uses a quantitative non-experimental research design utilizing casual-effect technique where this study gathers data in numerical form and from which statistical inferences may be made. This type of data can be used to construct tables of raw data and graphs. Quantitative research is a formal, objective, systematic approach in which numerical data are used to obtain information for the study (Creswell, 2014).

The descriptive correlation method was used to investigate and describe the characteristics of the senior high school students, measuring the specified variables of instructional quality and educational outcomes in high school mathematics. The process of gathering data is through a survey questionnaire that gives an accurate account of the characteristics of a particular phenomenon, situation, community, or persons. The purpose of this study is to establish whether there is a relationship between two variables, a connection between them, not a distinction between their means. Thus, a correlational method is considered appropriate for this study to describe the level, relationship, and influence of instructional quality and educational outcomes in high school mathematics.

The researchers followed this procedure in gathering and getting the needed data for this research. The researchers sent a letter of permission to conduct the study from the school principal of the senior high school department of UM Tagum. Upon approval, the letter of endorsement was sought to accommodate the researcher to administer the survey questionnaire to the respondents of the study.

Moreover, the researchers sent another letter to inform senior high school students about the conduct of the study. Likewise, the researcher distributed the survey questionnaire through an online platform embedded with its purpose to conduct the study. After which, they retrieved the survey answers after the respondents submitted their answers via Google form.

Finally, the researchers extracted and tabulated all the data obtain from the Google system. The results were then analyzed and interpreted further. With the data, conclusions were drawn, and recommendations were being formulated based on the findings of the study.

The statistical tools that were being used for data analysis and interpretations are the following: *Mean*. This statistical tool was utilized to determine the level of instructional quality and educational outcomes in high school mathematics. *Pearson (r)*. This statistical tool was employed to determine the significance of the relationship between instructional quality and educational outcomes in high school mathematics. *Linear Regression Analysis*. This statistical tool was used to determine the influence of instructional quality and educational outcomes in high school mathematics.

RESULTS AND DISCUSSION

Level of Instructional Quality

Presented in Table 1 are the mean scores for the indicators of instructional quality in high school mathematics with an overall mean of 3.89, describe as high with a standard deviation of 0.63. The high rating can be attributed to the respondents' consistent ratings across all factors. It indicates that respondents' perceptions of instructional quality in high school mathematics are favorable, particularly in classroom management, supportive climate, and cognitive activation. The cited overall mean score was the result gathered from the following computed mean scores from highest to lowest: 4.01 or high for cognitive activation with a standard deviation of 0.72; 3.85 or high for supportive climate with a standard deviation of 0.72; and 3.82 or high for classroom management with a standard deviation of 0.70.

Table 1. *Level of Instructional Quality in High School Mathematics*

Indicator	Mean	SD	Descriptive Level
Classroom Management	3.82	0.70	High
Supportive Climate	3.85	0.72	High
Cognitive Activation	4.01	0.72	High
Overall	**3.89**	**0.63**	**High**

The leading instructional quality that was high in high school mathematics is Cognitive Activation, being the indicator with the highest mean, whose primary goal is to trigger the students' previous knowledge to engage the students in the class effectively. The respondents display favorable responses on activating the prior knowledge and giving a challenging task to the students; thus, this would result in cognitive involvement during class discussion. Consequently, helping the students in practicing their mathematical skills would result in mastery in mathematics.

On the other hand, Supportive Climate is high in instructional quality. It focused on supporting the student's emotional aspects to create a positive student-teacher relationship. The respondents find the teacher's support much evident during mathematics class. The teacher often provides praises, encouragement, and motivation whenever students try to participate in class. Hence, it would result in a child-friendly environment for the students. Moreover, providing

support and positive feedback to the students would boost encouragement and enthusiasm to finish the mathematics subject.
Finally, Classroom Management with the lowest means among the indicators of instructional quality displays high in high school mathematics. It means that being organized in the class discussion is frequently practiced, and planning classroom activities are prominent among the teachers. Moreover, a well-established classroom would result in the implementation of rules and regulations and cope with the distraction that may cause a delay in instruction. Consequently, providing learning goals would finally guide the students on what they expected to achieve as a result of completing a course.

The respondents' level on the instructional quality in high school mathematics is high. It means that the different instructional quality was much evident in high school mathematics. This further means that the senior high school teachers in UM Tagum often manifest all instructional quality where they practice classroom management, emphasizing classroom procedures, rules, and coping with interruptions. Students exposed to a supportive environment that includes positive and constructive teacher feedback, supportive teacher-student relationships, and cognitive activation are more likely to engage in higher-order thinking skills.
This result is in relation to the proposition of Decristan et al. (2015), who viewed that the success of teaching practices depends on how the students are assisted by the instructor and how they hold them cognitively engaged during lessons. Furthermore, it conforms to the theory of Brofenbrenner and Morris (1998) that the children's interaction with adults and peers drives social and learning development. Thus, instructional quality is significant to the effective learning environment for students.

A high level of instructional quality in terms of cognitive activation was positive for the respondents. It means that cognitive activation in high school mathematics was much evident. It connotes that activating the students' prior knowledge provides engaging classroom interaction wherein the teachers provide challenging tasks and ask questions. The result is in line with Baumert et al. (2010) viewpoint that cognitively stimulating activity in a mathematics classroom could draw on students' prior knowledge by questioning their preconceptions and encouraging them to assess the validity of their solutions and explore multiple ways of solving given problems. The integration of cognitive activation into instruction would be compatible with the teachers' chosen topic and resources and the course's curricular expectations.

With regard to the supportive climate in instructional quality, the level was high. It signifies that the practice of supportive climate in high school mathematics is much evident. It implies that the warm, supportive environment given by the teachers motivates the students rather than giving up when facing setbacks in learning mathematics. The teachers provide a positive attitude to mistakes and misconceptions of the students and maintain good interaction with them. This result is congruent with the findings of Berlin and Cohen (2018). They indicate that supporting the involvement of students in mathematics learning are the main quality indicators that may contribute to the student success in mathematics material, especially the aspects of educational quality in the mathematics classroom. By promoting warm classroom environments and effectively redirecting teachers' off-task behavior, students would be better able to learn mathematical content.

A high level of instructional quality in terms of classroom management was also manifest among the respondents. It signifies that classroom management in high school mathematics was much evident. It means that the teacher's classroom instruction techniques are firmly capable of handling situations like identifying learning priorities, implementing rules, and coping with distractions in teaching mathematics. This result is in line with the study of Jentch and Schlesinger (2017), who stated that effective classroom management is performed by a structured and well-organized lesson with clear rules and routines. To provide a quality-oriented learning time to the students, the teachers must focus on effectively dealing with disruptions or disciplinary conflicts. Furthermore, the aspects of classroom management are essential in all subjects since it is mainly regarded as a generic dimension.

Level of Educational Outcomes in High School Mathematics

Shown in Table 2 are the mean scores for the indicators of student's educational outcomes in high school mathematics, with an overall mean of 3.62 described as high with a standard deviation of 0.62. The high level could be attributed to the high rating given by the respondents in all indicators. It means that the respondents' responses to students' educational outcomes in high school mathematics were much observed in most cases in the items of cognitive outcomes and affective outcomes.

The cited overall mean score was the result gathered from the following computed mean scores from highest to lowest: 3.66 or high for cognitive outcomes with a standard deviation of 0.61; 3.58 or high for affective outcomes with a standard deviation of 0.72.

Table 2. *Level of Educational Outcomes in High School Mathematics*

Indicator	Mean	SD	Descriptive Level
Cognitive Outcome	3.66	0.61	High
Affective Outcome	3.58	0.72	High
Overall	**3.62**	**0.62**	**High**

The respondents identified the *Cognitive Outcomes* on educational outcomes in high school mathematics as much observed with the highest mean among the indicators. It implies that the acquisition of students' knowledge, application, and reasoning relies on the learners' critical thinking and problem-solving skills and is frequently observed and practiced; thus, learners accomplish a successful and beneficial academic activity throughout mathematics class. Additionally, in studying mathematics, students apply different cognitive strategies such as memorizing terms, elaborating information, questioning, and evaluating ideas, and sorting things out. Moreover, cognitive skills enhance analyzing, interpreting, and assessing the situation to create solutions and new ideas.

The student's educational outcomes that promote a positive attitude, motivation, confidence, and values in participating and learning mathematics, often described as an assessment of worth, are on *Affective Outcomes*. The respondents show that their motivation in learning mathematics was much observed. It implies that the students often perceived their confidence, enjoyment, and interest in high school mathematics. Moreover, applying a constructive criticism approach will help students confidently share their ideas and solutions to different complex problems and allow them to enjoy various mathematics activities. Thus, student's confidence in understanding mathematics will improve, exciting things can discover, and satisfaction and contentment were able to attain. Consequently, the student values mathematics as a part of their lives and believes that it would help learn other subjects.

The respondents' response on their level of educational outcomes in high school mathematics appears on a high level. It means that all measures described in educational outcomes in high school mathematics items were much observed. This result is supported by the study of Fung, Tan, and Chen (2018) stated that those students with high educational outcomes would have greater degrees of mathematics accomplishment, possessing optimistic emotions such as pleasure and pride in studying mathematics. Additionally, the active involvement of students leads to higher levels of math achievement. It develops academic success through a deep interest in mathematics learning that is open to more learning opportunities. Consequently, the result is also associated with the work of Nelsin and Gustafsson (2016). They emphasized that the success of the students in schooling is expressed in the affective and cognitive domains.

The high level of cognitive outcomes indicated that the respondents had an agreeable rating on educational outcomes. It means that cognitive skills appear to contribute to academic success that the students are able to grasp deep learning techniques and strategies for surface learning. It is congruent to the viewpoint of Taub, Benson, and Szente (2014), who stressed that numeracy, problem-solving, and quantitative thinking comprise the academic qualities associated with these cognitive abilities. The unique cognitive skills necessary for the performance of mathematics have the ability to influence the production of faculty instruction and curriculum. According to Deary, Penke, and Johnson (2010), the growth of cognitive skills is primarily affected by biological, genetic, and health influences. At the same time, academic achievement is also believed to be the basis for the development of academic success as a result of the expenditure of cognitive abilities and the contextual stimuli generated by the educational settings.

Similarly, the respondents also displayed a high level of affective outcomes. The high rating means that the affective outcome indicator in educational outcomes in high school mathematics is much observed. It implies that students' behavioral and emotional aspects contribute to their academic achievement where they possess self-concept, interest, and attainment value towards mathematics. It further means that students have the desire and motivation to closely pay attention to the instruction, appreciate the learning content, and use different learning techniques. This result is in line with the study of Froiland et al. (2012) stated that to reach a good level of mathematics education, high school students should have high encouragement in learning mathematics. They emphasized that students' motivation plays a crucial role in mathematics education and that mathematical success is connected to intrinsic and extrinsic motivational influences. Moreover, this result is also supported by Pantziara and Philippou's (2015) study, which indicates that the role of affected factors in learning mathematics is embodied in mathematics education, which regards motivation as a desirable result to enhance comprehension.

Relationship between Instructional Quality and Student's Educational Outcomes in High School Mathematics

A critical purpose of this study is to determine whether or not instructional quality has a significant relationship with student's educational outcomes in high school mathematics. Pearson r was used to determine the correlation of the two variables. The results of the computation are shown in Table 3.

The results revealed that instructional quality versus student's educational outcomes yields an r-value of 0.575, which is significant. The result is due to the p-value of 0.001, which is lower than the 0.05 level of significance. This led to the decision that the null hypothesis, which stated that there is no significant relationship between instructional quality and student's educational outcomes, is rejected.

Table 3. *Significance on the Relationship between Levels of Instructional Quality and Educational Outcomes*

Variables	Mean	SD	r-value	p-value
Instructional Quality	3.89	0.63		
Educational Outcomes	3.62	0.62		
			0.562*	0.001

*Significant at 0.05 significance level.

This further means that the relationship between instructional quality and student's educational outcomes is significantly correlated. It shows that the educational outcomes in high school mathematics significantly related to the instructional practices received by the students. Therefore, the correlation results exemplify that when the instructional quality as implemented by the high school mathematics teachers is high, the student’s educational outcome is also high.

The present study reveals a significant relationship between instructional quality and educational outcomes in high school mathematics. It implies that instructional quality has a positive relationship between the educational outcomes of the students in high school mathematics, which can be seen in the data. It confirms the proposition of Decristan et al. (2015), which stated that the process of instructional quality in the classroom is positively related to the students' educational outcomes. The efficiency of the classroom is not inherently increased by the provision of appraisal methods and resources but strengthened as unique instructional activities that are coupled with high-quality classroom processes. This result is also related to Klieme, Pauli, and Reusser's (2009) study, stating that a significant relationship exists between instructional quality and educational outcomes. With more cognitively stimulating instruction and a supportive classroom climate can stimulate and turn students' curiosity into advanced mathematical success.

The correlation between instructional quality and educational outcomes in high school mathematics is significant. It means that educational outcomes are dependent on the instructional quality in high school mathematics. These findings affirmed the study of Bellens et al. (2019) that the relationship between instructional quality and students' outcomes is established for different educational systems and found a positive correlation. Additionally, Kelcey, Hill, and Chin (2019) showed that instructional quality plays an essential role as it is emphasized as a mediator of the interaction between the expertise of the teachers and the outcomes of the students.

Regression Analysis of the Influence of Instructional Quality and Educational Outcomes

Data shown in Table 4 are the regression coefficients to test the significant influence of the overall instructional quality and educational outcomes in high school mathematics. Using the Linear Regression Analysis, the data revealed that the influence of instructional quality towards educational outcomes in high school mathematics has an F-value of 30.15 and a corresponding p-value of 0.001.

Table 4. *Regression Analysis of the Influence of Instructional Quality and Educational Outcomes*

INSTRUCTIONAL QUALITY (Indicators)	**B (Unstandardized Coefficient)**	**β (Standardized Coefficient)**	**t-value**	**p-value**
(constant)	1.425			
Classroom Management	0.147	0.166	1.859	0.065
Supportive Climate	0.086	0.100	1.115	0.266
Cognitive Activation	0.325	0.377*	4.437	0.001
Dependent Variable: ***Educational Outcomes***				
R=0.575	**R^2= 0.331**			
F-ratio= 30.15	**p-value= 0.001**			

*Significant at 0.05 significance level.

It means that the instructional quality influences educational outcomes since the probability value is less than 0.05. The R^2 value of 0.331 implies that 33.1% of the educational outcomes in high school mathematics are influenced by the instructional quality while other factors influenced the remaining 66.9%.

The indicator *Classroom Management* has a beta of 0.166 and a corresponding p-value of 0.065. It means that *Classroom Management* has no significant influence on the *educational outcomes* of students in high school mathematics since the probability level is 0.065, greater than the level of significance at 0.05. Also, *Supportive Climate* has a beta of 0.100 and a p-value of 0.266, which means that *Supportive Climate* has no significant influence on the *educational outcomes* of students in high school mathematics since the probability level is 0.266 is greater than the level of significance at 0.05. On the other hand, *Cognitive Activation* has a beta of 0.377* and a p-value of 0.001 which means that *Cognitive Activation* has a significant influence on the *educational outcomes* of students in high school mathematics since the probability level is 0.001, which is less than the level of significance at 0.05. It leads to the decision that the null hypothesis, which stated that there is no domain in instructional quality that significantly influences the student's educational outcomes, is rejected.

The regression coefficient tests the significant influence of the overall instructional quality and educational outcomes in high school mathematics. Using the Simple Linear Regression, the data reveal that the influence of instructional quality towards educational outcomes in high school mathematics has significant influence. It means that the educational outcomes of the students in mathematics are significantly influenced by instructional quality. Thus, the overall results of the instructional quality predict the educational outcomes of the students in mathematics. It confirms the study of Klieme, Pauli, and Reusser (2009), which revealed that any aspect of instructional quality positively influences the learning outcomes of the students, particularly in mathematics. In line with this finding, Siegler and Cohen (2016) emphasized that the educational practice of the classroom teacher predicts the creation of the motivational structure of children that contributes to the prediction of the student's academic achievements.

The study reveals that classroom management and supportive climate have no significant influence on the educational outcomes in high school mathematics. In comparison, cognitive activation has a significant influence on the educational outcomes in high school mathematics. It implies that cognitive activation of instructional quality influences the educational outcomes in high school mathematics. Thus, the null hypothesis is rejected, stating that no domain in instructional quality significantly influences the students' educational outcomes in high school mathematics. According to Fauth et al. (2014), the importance of a positive student-teacher connection and effective classroom management on student motivation has been confirmed empirically. It should have a favorable impact on student results, particularly on the intrinsic drive and topic interest. Cognitive activation, on the other hand, has been found to predict student achievement. Cognitively engaging classroom activities have traditionally resulted in increased student cognitive engagement, which should lead to a stronger knowledge of learning content. Cognitive activity, on the other hand, was demonstrated to predict student interest and motivation.

The overall result of the influence of instructional quality in educational outcomes is supported by the proposition of Phuntsho (2017) that the association between various aspects of the instructional activities of teachers and the encouragement of students in mathematics can be a driving tool for student behavior control and maximization of the learning outcome. It will not only make learning mathematics fascinating, but it will also be stimulating, investigative, innovative, and inspiring.

Similarly, Lin and Bransford (2010) emphasized that different instructional approach is structured to inspire learners to learn and can be used to enhance learning motivation. Whereas students' attitudes, expectations, and tactics are influenced within the classrooms as the studies explore inspiration coming from within and outside.

Conclusion

Based on the findings of the study, conclusions are drawn in this section. The level of instructional quality in high school mathematics is much evident for classroom management, much evident for supportive climate, much evident for cognitive activation, and the overall mean of a much evident level of instructional quality in high school mathematics. It means that the three dimensions of instructional quality were much evident. The level of educational outcomes in high school mathematics is much observed for the cognitive outcomes and much observed for the affective outcomes and the overall mean of a high level of educational outcomes in high school mathematics. It means that both cognitive and affective outcomes were much observed. There is a significant relationship between instructional quality and educational outcomes in high school mathematics. The instructional quality significantly influences the educational outcomes in high school mathematics. It is in line with the study of Decristan et al. (2015), which stated that the process of instructional quality in the classroom is one of the most powerful predictors of students' educational outcomes.

Recommendations

In the light of the initial findings and conclusion, the following recommendations are offered. The instructional quality and educational outcomes may rise to a higher level by supporting the school's program or even strengthening the implementation of the school's core competency. Moreover, the administration may continue to provide professional development to the teachers. It can be done by inviting professionals to conduct seminars in identifying strategies for improving instructional effectiveness and quality and conducting school-based research on instructional quality with different research approaches. Moreover, school heads may conduct teachers' evaluations on instructional quality to identify the areas of need and weakness to design a plan in improving instructional quality in the classroom. Teachers may introduce technology in the classroom, such as educational videos, digital games, and digital tools related to mathematics that can be easily implemented in the classroom.

Furthermore, an enormous population in the subsequent study is highly recommended to obtain different perspectives and understanding from the respondents to affirm and dispute the findings of the study. For the students, it is highly recommended to be actively involved in the instructional practices provided by the teachers to promote progress in learning and achieving their educational goals.

REFERENCES

Achola, P., & Bless, C. (1988). Fundamentals of social research methods; An african perspective. Lusaka: Government printer.

Bahri, A., & Corebima, A. D. (2015). The contribution of learning motivation and metacognitive skill on cognitive learning outcome of students within different learning strategies. *Journal of Baltic of Science Education*, *14*(4), 487.

Bellens, K., Van Damme, J., Van Den Noortgate, W., Wendt, H., & Nilsen, T. (2019). Instructional quality: Catalyst or pitfall in educational systems' aim for high achievement and equity? An answer based on multilevel SEM analyses of TIMSS 2015 data in Flanders (Belgium), Germany, and Norway. *Large-scale Assessments in Education*, *7*(1), 1.

Berlin, R., & Cohen, J. (2018). Understanding instructional quality through a relational lens. *ZDM*, *50*(3), 367-379.

Bronfenbrenner, U., & Morris, P. A. (1998). The ecology of developmental processes. *Handbook of child psychology*, *1*(5), 993-1028.

Creemers, B., & Kyriakides, L. (2010). School factors explaining achievement on cognitive and affective outcomes: Establishing a dynamic model of educational effectiveness. *Scandinavian Journal of Educational Research*, *54*(3), 263-294.

Creswell, J.W. (2007). Qualitative inquiry and research design: Choosing among five approaches (2nd ed.). Thousand Oaks, CA: Sage.

Creswell, J.W. (2014). Quantitative, qualitative and mixed method approaches. 5-200.

Deary, I. J., Penke, L., & Johnson, W. (2010). The neuroscience of human intelligence differences. *Nature reviews neuroscience, 11*(3), 201-211.

Decristan, J., Klieme, E., Kunter, M., Hochweber, J., Büttner, G., Fauth, B., ... & Hardy, I. (2015). Embedded formative assessment and classroom process quality: How do they interact in promoting science understanding? *American Educational Research Journal*, *52*(6), 1133-1159.

Evans, J. S. B., & Stanovich, K. E. (2013). Dual-process theories of higher cognition: Advancing the debate. *Perspectives on psychological science*, *8*(3), 223-241.

Froiland, J. M., & Oros, E. (2014). Intrinsic motivation, perceived competence and classroom engagement as longitudinal predictors of adolescent reading achievement. *Educational Psychology*, *34*(2), 119-132.

Fung, F., Tan, C. Y., & Chen, G. (2018). Student engagement and mathematics achievement: Unraveling main and interactive effects. *Psychology in the Schools*, *55*(7), 815-831.

Jentsch, A., & Schlesinger, L. (2017). Measuring instructional quality in mathematics education.

Keith, T. Z., & Reynolds, M. R. (2010). Cattell-Horn-Caroll abilities and cognitive test: What we've learned from 20 years of research. *Psychology in the Schools, 47*(7), 635-650.

Kelcey, B., Hill, H. C., & Chin, M. J. (2019). Teacher mathematical knowledge, instructional quality, and student outcomes: A multilevel quantile mediation analysis. *School Effectiveness and School Improvement*, *30*(4), 398-431.

Klieme, E., Pauli, C., & Reusser, K. (2009). The pythagoras study: Investigating effects of teaching and learning in Swiss and German mathematics classrooms. *The power of video studies in investigating teaching and learning in the classroom*, 137-160.

Kunter, M., Klusmann, U., Baumert, J., Richter, D., Voss, T., & Hachfeld, A. (2013). Professional competence of teachers: Effects on instructional quality and student development. *Journal of Educational Psychology*, *105*(3), 805.

Lin, X., & Bransford, J. (2010). Personal background knowledge influences cross-cultural understanding. *Teachers College Record, 112*(7), 1729-1757.

Murayama, K., Pekrun, R., Lichtenfeld, S., & Vom Hofe, R. (2013). Predicting long-term growth in students' mathematics achievement: The unique contributions of motivation and cognitive strategies. *Child development*, *84*(4), 1475-1490.

Nicolas, C. A. T., & Emata, C. Y. (2018). An integrative approach through reading comprehension to enhance problem solving skills of grade 7 mathematics students. *International Journal of Innovation in Science and Mathematics Education (formerly CAL-laborate International)*, *26*(3).

Nilsen, T., & Gustafsson, J. E. (2016). *Teacher quality, instructional quality and student outcomes: relationships across countries, cohorts and time* (p. 166). Springer Nature.

Pantziara, M., & Philippou, G. N. (2015). Students' motivation in the mathematics classroom: Revealing causes and consequences. *International ournal of Science and Mathematics Education 13*(2), 385-411.

Peng, P., & Kievit, R. A. (2020). The development of academic achievement and cognitive abilities: A bidirectional perspective. *Child Development Perspectives*, *14*(1), 15-20.

Permono, H., Sovitriana, R., & Santosa, A. D. (2019). Influence cognitive strategies, metacognitive strategies and experience success in mathematics achievement through self-efficacy in V grade elementary school in east jakarta. *International Review of Management and Marketing, 9*(5), 46-51. https://search.proquest.com/docview/2288758760?accountid=31259

Schlesinger, L., & Jentsch, A. (2016). Theoretical and methodological challenges in measuring instructional quality in mathematics education using classroom observations. *ZDM*, *48*(1-2), 29-40.

Simonson, M. (2019). Course quality or instructional quality. *Distance Learning*, 16(2), 100. https://search.proquest.com/docview/2331391661?accountid=31259

Sogunro, O. A. (2017). Quality Instruction as a motivating factor in higher education. *International Journal of Higher Education*, *6*(4), 173-184.

Tabatabaei, S., Ahadi, H., Bani-Jamali, S., Bahrami, H., & Khamesan, A. (2017). The effects of motivated strategies for learning questionnaire (MSLQ) on students' cognitive and meta-cognitive skills. *NeuroQuantology, 15*(2). doi:http://dx.doi.org/10.14704/nq.2017.15.2.1068

Taub, G. E. & Beson, N. (2013). Matters of consequences: An empirical investigation of the WAIS-III and WAIS-IV and implications for addressing the Atkins intelligence criterion. *Journal of Forensic Psychology Practice, 13*(1), 27-48.

Taub, G. E., Benson, N., & Szente, J. (2014). Improving mathematics: An examination of the effects of specific cognitive abilities on college-age students' mathematics achievement. *International Journal for the Scholarship of Teaching and Learning*, *8*(2), n2.

Urhahne, D., Chao, S. H., Florineth, M. L., Luttenberger, S., & Paechter, M. (2011). Academic self-concept, learning motivation, and test anxiety of the underestimated student. *British Journal of Educational Psychology*, *81*(1), 161-177.

Wigfield, A., & Eccles, J. S. (2000). Expectancy–value theory of achievement motivation. *Contemporary Educational Psychology*, *25*(1), 68–81. doi:10.1006/ceps.1999.1015

Zhu, Y. & Leung, F. K. (2011). Motivation and achievement: Is there an East Asian model?. *International Journal of Science and Mathematics Education, 9*(5), 1189-1212.