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Exploring learning constructs and interest in Mathematics: A groundwork for developing effective learning and development plans

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Abstract

The study aimed to unveil the level of perception of the respondents on the learning constructs in terms of teacher-related, subject-related, school-related, self-related, and peer/social-related, and the level of interest of the respondents toward mathematics. It also aimed to disclose if significant relationship exists between the respondents' level of perception toward the learning constructs and interest toward mathematics to propose a learning and development plan. This quantitative study involved 260 respondents selected through stratified random sampling from the College of Teacher Education, Nueva Vizcaya State University-Bambang Campus. The findings revealed a high level of perception towards the learning constructs namely, subject-related, school-related, peer/social-related, self-related, and teacher-related being the highest. The respondents also have a high level of interest toward mathematics. The findings revealed a significant relationship between the level of perception toward the learning constructs and level of interest toward mathematics. Based from the findings, a learning and development plan was developed. The high level of perception towards the learning constructs suggests the need to maintain a learning environment conducive for mathematical instruction. The interest of the respondents toward mathematics may be enhanced by incorporating collaborative, constructivist, interactive, and differentiated activities that will cater every student need, fostering inclusivity and interaction. The proposed learning and development plan may be implemented in order to enhance students' interest toward mathematics. Future researchers may also consider other variables influencing interest toward mathematics.

Keywords: interest toward math, learning and development plan, learning constructs

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1. Introduction

Educational institutions globally are having struggle finding meaningful ways to engage students in the field of mathematics. The decreasing level of interest and performance in mathematics has been a problem that needs to be resolved. Mathematics is a fundamental subject, useful in the life of students. This gives not only general knowledge but develops students' analytical and critical thinking skills. Today, there has been the advent of technology and the world is becoming more complicated. The need for mathematics and problem-solving skills is necessary. Despite the decreasing interest and engagement towards mathematics, there are factors that need to be improved, problems to be solved, and other constructs that need to be considered to develop enthusiasm among students. These factors may guide administrators and policymakers in designing mathematics curriculum relevant, useful, and engaging to increase students' interest toward mathematics.

Aside from being a fundamental part to academic success, mathematics is also needed in this society that is becoming more and more advanced. This is emphasized by the United Nation's Sustainable Development Goals (SDGs), particularly SDG number 4, Quality Education. This is because it cultivates the analytical and problem-solving abilities of students (Boaler, 2016; Middleton & Jansen, 2019). There are many countries that continuously show poor performance in mathematics, resulting from low interest towards mathematics. This is evident in the results of standardized assessments like the Programme for International Student Assessment (PISA) (OECD, 2019). Devlin (2018) stressed that mathematics education is necessary since skills like critical thinking and reasoning are developed through it. These skills are necessary to achieve innovation and positive performance in many fields like science, engineering, medicine, and finance, among others. However, Ryan and Deci (2017) also pointed out that despite the importance of mathematics in real scenarios, many students still find the subject unengaging and uninteresting.

According to Schukajlow et al. (2018) and Gillet et al. (2014), there are many factors influencing students' interest toward mathematics. These include the conduciveness of the classroom, the activities employed by the teachers, the difficulty of the subject and its relevance to real life, and the perception of students on their ability. The interest may be increased among students by employing constructivist methods, emphasizing active learning and real-world applications of concepts learned (Dweck, 2017). Considering these factors, however, there are other problems that need to be resolved, specifically by the administrators and policymakers. These are large class sizes, outdated curricula, and a lack of resources (Wigfield et al., 2015). Though these were not covered entirely by the study, these are still contributory to the different learning constructs influencing students' interest toward mathematics. This is true, especially among developing countries like the Philippines.

The problem of poor performance in mathematics is true in the Philippines. This is based on standardized national assessment results (DepEd, 2018; SEI-DOST, 2020). According to David et al. (2019) and Perez et al. (2021), the student's performance and interest toward mathematics are influenced by many factors including lack of resources, teacher-centered teaching approaches, instructional materials used by the teacher, and lack of opportunities for students to practice their knowledge and skills in mathematics. These are among the factors contributing to the problems in the performance of mathematics in the country that need to be addressed. Moreover, in terms of the socioeconomic status of students, there are also differences in provinces and cities. There are locations who are under privilege, lack technology, resources, and experienced math teachers (UNSECO, 2019). In the country, the Department of Education (DepEd) is working to solve problems relative to mathematics, ultimately enhancing performance in standardized assessments. Considering these initiatives of the department, it is but the right time to study factors affecting an interest toward mathematics. There is little known about the direct interactions of these variables in the Philippine setup: like on teaching methods, school

environment, student self-perception, and other factors like peer-related and subject-related as contributing to interest toward mathematics among prospective teachers.

As to the findings of Monoranjan and Bharati (2013), students who do poorly tend to have a positive attitude towards mathematics. This suggests that there is still opportunity for development in terms of raising students' interest in math. Garin and Campit (2017) found that students' decisions to concentrate in mathematics are influenced by a variety of variables that are connected to their teachers, their subjects, and themselves. These include one's own impressions of the value of math professors, one's own experiences learning the subject, and one's own evaluation of one's own mathematical ability. Based on empirical pre-observations and interviews obtained from students at Nueva Vizcaya State University—Bambang Campus, various variables impact students' motivation toward mathematics. These included their self-perception, instructors, topic, school, and peer/social factors. Student A said, "Ma'am magaling po kasi yung teacher ko nung high school at sumasali ako sa mga contest before about Math." Student B also stated, "Math po kami ng kasama ko, and STEM din po kasi ang strand naming noon." Student C added, "…feeling ko po mas mag-excel ako sa Math."

These variables were considered in this analysis for the following reasons: a) Teachers have a significant impact on students' decision to study mathematics. Instructors would make their classes seem better so that learners would be inspired to learn the course's fundamentals. They would like to learn math and have a better attitude toward the course if they were motivated, which is what follows. In order to attain excellent teaching, educators must make a number of efforts (Natsir & Anisati, 2016). The key factors that determined how well students performed were the teachers and the students themselves. b) Students who have a better attitude toward mathematics are more likely to take the course. c) If the school has enough math facilities, equipment, and a welcoming environment, students may be more inclined to take math. d) Their opinion of themselves will be taken into consideration since if students feel good about math, they will not think twice about studying math.

In addition to having suggestions for how to change the mathematics teaching process to better support student learning, students are also able to recognize the influences on their thoughts and feelings regarding the subject. Finally, the social and peer component is added to address the concern that "students who perform well in algebra take/shift to another course." It was inferred from this circumstance that their friends, classmates, relatives, family, etc. may have an impact on them. Finding and analyzing these learning constructs that affect students' interest in mathematics within the Philippine educational system was the aim of this research. The goal of the research was to analyze these constructs in order to provide insights that may guide the creation of an all-encompassing learning and development plan that was customized to meet the requirements of the students. By focusing on these aspects, this approach would improve students' motivation, interest, and performance in mathematics by fostering a more encouraging, interesting, and pertinent learning environment.

There has long been debate and discord on the value of studying mathematics in school. Studies on students' performance in mathematics have been conducted, but there is a dearth of literature, especially when it comes to the variables influencing students' interest in specializing in mathematics, especially in the chosen research environment. Hence, this study could provide insights into mathematics instruction since these learning constructs affecting interest in mathematics are evident in the teaching-learning process. By investigating how various learning constructs affect students' interest in mathematics, especially in developing settings like the Philippines, this study sought to add to the body of knowledge already available on mathematics education. In addition to highlighting the particular difficulties encountered by Filipino students, the results offered suggestions for teachers looking to put into practice efficient methods for encouraging a lifelong interest in mathematics.

Lastly, this research complies with the Instruction and Curriculum/ Teaching Learning Development agenda area of the Department of Education (DepEd) and the College of Teacher Education (CTE) at Nueva Vizcaya State University (NVSU)-Bambang Campus. It also adheres to the main areas of curriculum design, instruction delivery, and facilitating learning toward relevant education as outlined in the National Research Agenda of Teacher Education (NRATE).

2. Related Literature

Constructivism Theory and Interest in Mathematics - The study's learning and development plan is based on the Constructivism Theory, which emphasizes student involvement, teacher interaction, and a conducive learning environment. Vygotsky (1978) advocates for participatory learning where students, teachers, and materials interact. This theory suggests that meaningful class discussions can increase prospective teachers' interest in mathematics. Piaget (1970) further highlights the importance of inquiry-based, problem-solving, and real-world applications to engage students. When students actively participate in learning, their interest in mathematics grows, fostering both confidence and motivation (Bandura, 1986). Constructivism also stresses intrinsic motivation, which emerges when students find personal significance in their studies (Deci & Ryan, 1985). Making mathematics relevant to real-life applications fosters curiosity and self-directed learning (Brooks & Brooks, 1993). Teachers can connect mathematics to students' lives to boost enthusiasm and dedication.

Interest-Driven Creator Model - The Interest-Driven Creator (IDC) model, used to enhance student motivation in mathematics (Wong et al., 2020), outlines three stages: Immersing, Extending, and Triggering. Immersing refers to sustaining student focus, while Triggering involves engaging students with activities or cues. Extending results from the first two stages and leads to habit formation and increased student engagement. Regular math practice can make the subject a habit, further increasing mastery and student interest (Chan et al., 2018).

Conceptual Framework for Learning and Development Plan - The conceptual framework integrates constructivist and motivational theories, identifying key factors that influence student interest in mathematics. These factors include teacher-related, subject-related, school-related, self-related, and peer-related constructs. Teacher-related factors, such as teaching methods and positive interactions, significantly impact student interest (Aldridge & Fraser, 2016). Subject-related factors, such as real-life relevance and challenge, enhance student engagement (Patrick et al., 2016). A resource-rich school environment fosters interest in mathematics, supporting a cooperative learning atmosphere (Wigfield & Eccles, 2015). Self-related factors, such as motivation and self-efficacy beliefs, play a crucial role in students' ability to tackle complex problems (Bandura, 2013). Lastly, peer-related factors highlight the importance of collaborative learning and healthy peer interactions to boost interest in mathematics (Patrick et al., 2016). This framework guides the development of a customized learning and development plan, aiming to improve teacher effectiveness, align the curriculum with practical applications, and create a supportive school environment. It also emphasizes building self-efficacy and promoting positive peer relationships to foster sustained interest in mathematics.

3. Methodology

Research Design. A quantitative research design was used in this study. This is necessary to gather and analyze the data necessary to describe the respondents in terms of their level of perception towards the different learning constructs and their interest toward mathematics. The quantitative design utilized decreases the bias in the results of the study (Creswell, 2014; Ranjit, 2016). The questionnaires used in the data gathering also help provide consistency and comparability in the data gathered from the selected respondents (Polit & Beck, 2016). Descriptive-correlational method was also employed. The relationship between respondents' level of perception towards the different learning constructs and their interest toward mathematics was also unveiled through the method used.

Research Environment. Nueva Vizcaya State University (NVSU), formed by the merger of the Nueva Vizcaya State Institute of Technology (NVSIT) and the Nueva Vizcaya State Polytechnic College (NVSPC), has a rich legacy in higher education. Established in 1916, NVSU's transformation reflects a history of legislative advocacy and strategic planning, culminating in its official establishment in 2004 under Republic Act 9272. The university, now a leader in innovation, ranks globally in the WURI 2024. The College of Teacher Education (CTE) offers undergraduate and graduate programs, focusing on mathematics and science, making it a fitting

research environment for the study.

Respondents of the Study. The respondents of this study consist of 260 from the 804 College of Teacher Education students of Nueva Vizcaya State University-Bambang Campus. Table 1 presented, illustrates the distribution of respondents, providing a clear overview of the demographic representation.

Table 1
Frequency and Percentage Distribution of the Respondents

Respondents	First Year	Second Year	Third Year	Fourth Year	Total	Percentage
Bachelor of Secondary Education	16	16	17	16	65	8.08
Bachelor of Elementary Education	16	16	17	16	65	8.08
Bachelor of Physical Education	16	16	17	16	65	8.08
Bachelor of Technology and Livelihood Education	16	16	17	16	65	8.08
Grand Total					260	32.33

Sampling Procedure. Stratified random sampling with equal allocation was used in this study. The programs namely, Bachelor of Elementary Education, Bachelor of Secondary Education, Bachelor of Technology and Livelihood Education, and Bachelor of Physical Education served as the strata. The respondents were randomly selected from these programs based on the number identified through Raosoft. The number of respondents identified was distributed equally to the four strata.

Research Instruments. The following instruments were used by the researcher in gathering the necessary data. These instruments underwent validation and pilot testing to ensure the trustworthiness of the data.

- **Learning Constructs Questionnaire.** This is composed of 40 statements. The instrument was adapted from Garin and Campit (2017). It aimed to elicit the perceptual level of the respondents on the learning constructs which may have an influence on their level of interest toward mathematics. A total of eight statements were used for each learning construct: teacher-related, subject-related, school-related, self-related, and peer/social-related. The instrument has a reliability coefficient of 0.97, qualitatively described as excellent. This instrument is a four-point Likert scale. The respondents were asked to choose from the four options, depending on their level of agreement on the statements.

- **Interest/Attitude toward Mathematics Inventory.** This is composed of 40 statements. The instrument was adapted from Tapia and Marsh (2004). The instrument aimed to determine the level of interest of the respondents toward mathematics. This instrument has a reliability coefficient of 0.98, qualitatively described as excellent.The instrument is also four-point Likert scale.

Data Gathering Procedure. The study followed a structured data-gathering process, beginning with the development of two questionnaires. The first, adapted from Garin and Campit (2017), had 40 items focused on five key factors: teacher-related, subject-related, school-related, self-related, and peer/social-related. The second, adapted from Tapia and Marsh (2004), assessed the students' level of interest in mathematics. Validation and reliability testing of these instruments involved expert feedback and pilot testing, ensuring the questionnaires' credibility and internal consistency. The respondents were identified using stratified sampling, focusing on 260 students from various education programs. Formal permission from the university, including the graduate school and college dean, was obtained to administer the instruments. The researcher communicated the study's purpose to the respondents, emphasizing the importance of honest responses for valid results. The researcher personally administered the questionnaires to ensure ethical considerations and reliability.

After data collection, the responses were tallied, tabulated, and statistically analyzed in relation to the research questions. Ethical guidelines were strictly followed, with respondents signing informed consent forms that assured confidentiality and voluntary participation. The study maintained high ethical standards by protecting the privacy of respondents and fostering trust and respect throughout the process, ensuring the validity and trustworthiness of the data collected. This meticulous approach strengthened the research findings and

upheld ethical integrity in the study.

Statistical Treatment of Data. The following statistical tools were used in analyzing the data gathered from the respondents.

- **Mean and Standard Deviation.** The mean was used to determine the level of perception of the respondents on the five learning constructs, and interest toward mathematics. The standard deviation was utilized to describe the level of perception based on the dispersion of data.
- **Spearman-rho.** Since the distribution of the gathered data was not normal based on the Kolmogorov-Smirnov and Shapiro-Wilk test of normality, this was used to determine the significant relationship between the five learning constructs and interest toward mathematics. The five percent or 0.05 level of significance was used.

4. Results and Discussion

Problem 1. What is the level of perception of the respondents on the teacher-related, subject-related, school-related, self-related, and peer/social-related learning constructs?

Table 2
Respondents' Level of Perception on the Learning Constructs

Learning Construct	Mean	SD	Level
Teacher-related	3.18	0.56	High
Subject-related	2.91	0.52	High
School-related	3.00	0.49	High
Self-related	2.91	0.53	High
Peer/Social-related	2.52	0.56	High

The data reveals that respondents have a high perception of various learning constructs. Teacher-related factors scored the highest (Mean = 3.18, SD = 0.56), indicating that respondents believe the teacher's approach, teaching methods, and attitude significantly contribute to their learning experience in mathematics. The relatively low standard deviation suggests a strong consensus among the respondents on this factor. Similarly, subject-related factors (Mean = 2.91, SD = 0.52) were also perceived positively, indicating that the respondents find the content of mathematics relevant, challenging, and engaging. School-related factors (Mean = 3.00, SD = 0.49) were viewed as highly influential as well, with respondents acknowledging the importance of a supportive learning environment and adequate resources. Self-related factors (Mean = 2.91, SD = 0.53) also scored high, reflecting respondents' strong confidence in their abilities and motivation toward learning mathematics. However, peer/social-related factors (Mean = 2.52, SD = 0.56) were perceived as having a slightly lesser impact, although still considered high. The higher standard deviation for peer/social-related factors suggests a wider variation in respondents' views on the influence of peer interactions. Overall, the data suggests that respondents view teacher-related, subject-related, school-related, and self-related factors as highly important in their learning experience, while peer/social-related factors, although still significant, appear to have a slightly lower impact.

Problem 2. What is the level of interest of the respondents toward mathematics?

To answer this, a questionnaire was administered to the respondents. Mean was used to compute the level of interest of the respondents toward mathematics. Data is presented in table 3. The respondents have a high interest toward mathematics as indicated by the mean 2.81. The respondents generally (f=181) perceive mathematics as an interesting subject indicated by the standard deviation of 0.56. There were 17 who rated their interest toward mathematics as very high, and 61 who rated it low. None of the respondents rated their interest as very low. In the statements under this learning construct, the sentence, "I want to develop my mathematical skills" got the highest rating. To add, these statements also got a high rating, "Mathematics is important in everyday life" and "Mathematics helps develop the mind and teaches a person to think". The high rating on these statements implies that the respondents value the importance of the subject in real life. They recognize its usefulness outside the

classroom setting and the practical benefits it may provide them. While these implications are seen by the respondents, their interest toward mathematics is sustained. Teachers shall then employ activities that are relevant to real-life scenario and activities that develop higher-order thinking skills.

Other statements that were rated high by the respondents are, "Math courses would be very helpful no matter what I decide to study" and "I can think of many ways that I use math outside of school". These statements imply that the respondents recognize mathematics as a subject that is important in their future careers. If mathematics is seen as an instrument to a better future or a successful career, the higher the tendency that the students will study mathematics and their interest will increase. Teachers shall enhance motivation toward mathematics by employing various strategies, and by presenting successes in the field of mathematics.

Table 3
Respondents' Level of Interest toward Mathematics

Level	Frequency	Percentage
Very High	17	7.00
High	181	70.00
Low	61	23.00
Very Low	0	0.00
Total	260	100.00
Mean	2.81(High)	0.56 (SD)

On the contrary, there are still statements that were rated low. There are indicators where the respondents feel less confident. These indicators affect their overall interest toward mathematics. For instance, the statement, "I am happier in a math class than in any other class" was rated low by the respondents. This implies that the respondents do not view math as more interesting and enjoyable compared to other subjects. Hence, teachers shall employ various activities that are engaging and interesting. In that way, students not only learn but are also enjoying what they are learning. Another statement that was rated low is "I am able to solve mathematics problems without too much difficulty". This statement suggests that mathematics should be presented in a way that students understand. This may be done by scaffolding or chunking. Complex topics may lower their confidence. Hence, these complex topics must be presented in a different way other than the traditional way of teaching. This is in consonance with other statements rated low by the respondents, "I learn mathematics easily". The respondents seem to struggle in learning mathematics, despite being perceived as interesting.

Overall, the respondents see the significance of the subject in real life, resulting in an increase of interest. However, because of complex topics, learning mathematics poses difficulty among the respondents. These topics lessen their confidence in learning mathematics. This poses a gap between viewing the importance of mathematics in real-life scenarios and the difficulty of learning the subject. The findings overall suggest that teachers should be creative in the teaching-learning process. Individual needs and talents must be considered to foster inclusivity, resulting to increase in interest toward mathematics. A positive mindset must also be developed by the teachers among the students. If their confidence is high, their self-perception towards their ability to solve complex problems becomes more positive.

Problem 3. Is there a significant relationship between the respondents' level of perception toward the learning constructs and interest toward mathematics?

Since the gathered data are not normal based on the Kolmogorov-Smirnov and Shapiro-Wilk test of normality, Spearman-rho was used to determine the significant relationship between the five learning constructs and interest toward mathematics. Data is presented in table 4. The data shows that there is a significant relationship between all the learning constructs and the respondents' interest in mathematics. The relationships between the variables are statistically significant, as indicated by the p-values being less than 0.001 for each construct. The strongest relationship was observed between self-related factors and interest toward mathematics ($\rho = 0.66$), suggesting that respondents' self-motivation, confidence, and perceived abilities have a considerable impact on their interest in the subject. This is followed by subject-related factors ($\rho = 0.55$), indicating that the relevance, challenge, and content of mathematics also significantly influence students' interest.

Table 4
Significant Relationship between the Respondents' Level of Perception toward the Learning Constructs and Interest toward Mathematics

Variables	ρ	p-value	Remarks
Teacher-related and Interest toward Mathematics	.46	<.001	Significant
Subject-related and Interest toward Mathematics	.55	<.001	Significant
School-related and Interest toward Mathematics	.48	<.001	Significant
Self-related and Interest toward Mathematics	.66	<.001	Significant
Peer/Social-related and Interest toward Mathematics	.45	<.001	Significant

Teacher-related factors ($\rho = 0.46$) and school-related factors ($\rho = 0.48$) also show a strong positive relationship, meaning that the teaching methods and the learning environment contribute meaningfully to students' enthusiasm and interest in mathematics. Lastly, peer/social-related factors, though having the weakest correlation ($\rho = 0.45$), still demonstrate a significant impact on interest, suggesting that peer interactions and social influences play a role in shaping students' motivation and interest in the subject. The findings indicate that all five learning constructs—teacher-related, subject-related, school-related, self-related, and peer/social-related—are significantly linked to the respondents' level of interest toward mathematics.

5. Conclusions

- The respondents' level of perception toward the teacher-related, subject-related, school-related, self-related, and peer/social-related constructs is high.
- The level of interest of the respondents toward mathematics is high.
- The is a significant relationship between the respondents' level of perception of the learning constructs influencing and interest toward mathematics.
- A learning and development plan aiming to improve the interest toward mathematics is proposed. This learning and development plan was based on the findings of the study.

Recommendations

- Activities that foster positive perceptions toward teacher-related, subject-related, school-related, self-related, and peer/social-related constructs should be integrated into the educational process. Given the high level of perception across these learning constructs, it is crucial to maintain and further develop a supportive and engaging learning environment that enhances mathematical instruction. This will help nurture the students' attitudes and sustain their interest in mathematics.
- To further elevate the respondents' high interest in mathematics, it is essential to incorporate a variety of instructional approaches such as collaborative, constructivist, interactive, and differentiated activities. These methods cater to the diverse learning needs of students, promoting inclusivity, interaction, and engagement. By emphasizing meaningful and active learning, students are more likely to develop a lasting interest in the subject.
- Given that the learning constructs are significantly related to students' interest in mathematics, it is essential to continue nurturing and positively enhancing perceptions of these constructs. Through targeted interventions, teachers can cultivate a deeper passion and greater enthusiasm for mathematics, ensuring long-term academic and personal growth.
- The proposed learning and development plan, designed to enhance students' interest in mathematics, should be considered for implementation. By addressing key factors that influence interest, this plan could provide a structured framework to engage and motivate students, fostering a more positive learning experience.

- Future research could expand the scope by exploring additional variables that may influence students' interest in mathematics, such as financial, technological, media-related, and cultural or societal factors. Moreover, adopting other research designs, such as qualitative studies, could provide deeper insights into factors not captured in this study, offering a more comprehensive understanding of student motivation.

6. References

Akinwumi, A., Njoku, N., & Okonkwo, B. (2020). Interactive and student-centered pedagogies in mathematics: Impacts on student engagement. International Journal of Educational Studies, 12(4), 45-58.

Akinwumi, A., Olufunmilayo, T., & Abosede, A. (2020). Interactive teaching strategies and students' interest in mathematics. International Journal of Education in Mathematics, Science and Technology, 8(1), 55-66.

Akinwumi, F., Odebode, D., & Adeyemo, S. (2020). Interactive and student-centered pedagogies in mathematics education. *Journal of Educational Research, 12*(2), 105-118.

Akçay, A., Koç, A., & Kaptan, F. (2019). The effects of peer relationships on students' attitudes toward mathematics. International Journal of Instruction, 12(1), 283-296.

Aldridge, J., & Fraser, B. (2016). Teachers' views of their school climate and its relationship with teacher self-efficacy and job satisfaction. *Learning Environments Research*, 19(2), 291-307.

Artino, A. (2018). Encouraging a growth mindset to improve student engagement in mathematics. Educational Psychology Review, 30(1), 99-115.

Artino, A. (2018). Motivation and self-regulation in learning mathematics. Educational Psychology Review, 30(4), 871–891.

Bandura, A. (1997). Self-efficacy: The exercise of control. W.H. Freeman and Company.

Boaler, J. (2016). Mathematical mindsets: Unleashing students' potential through creative math, inspiring messages and innovative teaching. Jossey-Bass.

Burnette, J., O'Boyle, E., & VanEpps, E. (2019). Mind-set change leads to greater academic performance in mathematics. Journal of Educational Psychology, 111(2), 245-263.

Cai, J., Liu, S., & Wang, J. (2019). Socio-cultural influences on students' interest in mathematics. Educational Studies in Mathematics, 100(3), 239-258.

Cai, J., & Hwang, S. (2019). Teachers' influence on students' attitudes towards mathematics: The role of social support, autonomy, and relatedness. *Educational Studies in Mathematics, 100*(1), 97–114. https://doi.org/10.1007/s10649-019-09917-7

Cai, J., & Wang, L. (2019). Teacher-student relationships and student motivation in mathematics. *Mathematics Education Research Journal, 31*(4), 533-551.

Carbonneau, N., Vallerand, R. J., & Massé, L. (2013). The role of passion for teaching in intrapersonal and interpersonal outcomes. Journal of Educational Psychology, 105(1), 129-143.

Cheung, C., Ho, A., & Lam, J. (2018). Fostering positive attitudes in mathematics through peer group discussions. Asia-Pacific Education Researcher, 27(5), 431-441.

Cheung, C., Liu, K., & Ma, J. (2019). The relationship between school resources and student interest in mathematics: Evidence from a multilevel analysis. Educational Studies in Mathematics, 100(3), 221-237.

Cheng, Y., & Mix, K. (2019). The role of play in fostering children's interest in mathematics. Child Development Perspectives, 13(2), 78-83.

Chiu, M. (2018). Effects of difficulty and interest on mathematics achievement: Differences in motivation and anxiety. Learning and Individual Differences, 65, 81-90.

Creswell, J. (2014). *Research design: Qualitative, quantitative, and mixed methods approaches* (4th ed.). Sage Publications.

Darragh, L. (2016). Identity research in mathematics education. Educational Studies in Mathematics, 93(1), 19-33.

David, C., Albert, J., & Vizmanos, J. (2019). *Out-of-school children: Changing landscape of school attendance*

and barriers to completion. Philippine Institute for Development Studies.

Deci, E., & Ryan, R. (2017). Self-determination theory: Basic psychological needs in motivation, development, and wellness. Guilford Press.

Dempsey, I., Ryan, K., & Boerman, M. (2020). The impact of school leadership on the mathematics education landscape. International Journal of Leadership in Education, 23(3), 286-305.

Department of Education (DepEd). (2018). *Philippine informal reading inventory manual.* DepEd.

Devlin, K. (2018). *Mathematics education for a new era: Video games as a medium for learning.* A K Peters/CRC Press.

Dweck, C. (2017). *Mindset: Changing the way you think to fulfill your potential.* Little, Brown Book Group.

Dweck, C. (2016). Mindset: The new psychology of success. Random House.

Empson, S. B., Leatham, K. R., & Brown, C. A. (2021). The role of formative assessment in mathematics education: Implications for student interest and engagement. Mathematics Education Research Journal, 33(3), 369-384.

Engelbrecht, J., & Putt, I. (2018). The impact of real-world applications on student interest in mathematics. International Journal of Mathematical Education in Science and Technology, 49(1), 14-27.

Engelbrecht, J., & Putt, I. (2018). The role of technology and real-world applications in mathematics education. *International Journal of Mathematical Education in Science and Technology, 49*(1), 1-14.

Engelbrecht, J., Llinares, S., & Borba, M. (2019). Transformation of the mathematics classroom with the internet. ZDM Mathematics Education, 51(5), 825-841.

Ernest, P., Greer, B., & Sriraman, B. (2016). Critical mathematics education: Theory, practice, and reality. Springer International Publishing.

Fan, X., & Chen, M. (2019). The influence of parental involvement on students' attitudes toward mathematics. Educational Studies in Mathematics, 102(3), 317-337.

Fives, H., & Buehl, M. (2016). Teachers' beliefs in the context of teaching and learning. Review of Educational Research, 86(4), 1059-1090.

García-Moya, I., Brooks, F., & Moreno, C. (2019). Peer support, teacher connectedness, and social support: Their roles in adolescents' positive relationships with school. Journal of School Health, 89(8), 621-629.

Garin, R. and Campit J. (2017). Factors affecting level of interest of bachelor of secondary students towards mathematics as field of specialization. *Pangasinan State University Journal of Education, Management and Social Sciences*, *1*(1), 5-11.

Gay, L., Mills, G., & Airasian, P. (2009). Educational Research: Competencies for Analysis and Applications. Pearson.

Gillet, N., Vallerand, R. J., & Lafrenière, M. A. K. (2014). Intrinsic and extrinsic school motivation as a function of age: The mediating role of autonomy support. *Social Psychology of Education*, 17(4), 641-654.

Gillies, R., & Haynes, M. (2015). Dialogue and shared cognition: The role of social interactions in fostering positive mathematics attitudes. International Journal of Educational Psychology, 4(2), 145-167.

Greif, S., Latz, A., & Barlow, A. (2018). Peer relationships, social support, and academic outcomes: The importance of context in mathematics education. Journal of Educational Psychology, 110(7), 964-979.

Gutiérrez, R., & Bowers, A. (2018). Relevance and real-world application in mathematics. *Mathematics Teacher Education, 22*(3), 189-202.

Gutiérrez, R., Cavanagh, M., & de Abreu, G. (2018). The importance of teacher-student relationships and teaching strategies for fostering student motivation in mathematics. *Journal of Research in Mathematics Education, 49*(4), 429-454.

Gutiérrez, J., Meyer, S., & Gaitan, J. (2018). Relevance and real-world application in mathematical engagement. Journal of Mathematics Education, 23(2), 201-216.

Gutiérrez, R., Foong, P. Y., & Rojas, S. (2018). The relevance of mathematics: A key to student interest. Journal of Mathematical Behavior, 52, 137-150.

Guay, F., Ratelle, C. F., & Foucreault, A. (2019). Intrinsic and extrinsic motivation in mathematics: What do we know? Mathematics Education Research Journal, 31(2), 123-141.

Hall, J., Smith, R., & Johnson, A. (2015). Creating a collaborative school culture to promote interest in

mathematics. International Journal of Mathematical Education in Science and Technology, 46(5), 678-694.

Hattie, J. (2019). Visible learning for mathematics. Routledge.

Hattie, J. (2019). Visible learning for teachers: Maximizing impact on learning. Routledge.

Huang, X., Zhou, Y., & Wang, L. (2020). Teacher feedback and student motivation in mathematics classrooms. Contemporary Educational Research Quarterly, 14(2), 89-102.

Huang, Y., Wang, L., & Zhang, L. (2020). Interactive learning environments and student motivation in mathematics. Educational Technology & Society, 23(4), 35-48.

Jansen, A., Cooper, B., Vascellaro, S., & Wandless, P. (2016). Developing productive dispositions toward mathematics in a collaborative environment. Journal of Mathematical Behavior, 43, 29-43.

Jansen, A., Keestra, M., & van der Schoot, M. (2017). The impact of varied instructional strategies on student engagement in mathematics classrooms. Mathematics Education Research Journal, 29(1), 63-81.

Jiang, H., & McClain, K. (2020). The role of gradual release in fostering mathematics interest: Impacts on student independence and confidence. Mathematics Education Research Journal, 32(1), 97-111.

Kim, S., Wang, Y., & Otten, R. (2020). Peer support and student engagement in mathematics: Reducing anxiety through social and emotional support. Journal of Educational Psychology, 112(4), 725-737.

Kiemer, K., Gröschner, A., Pehmer, A.-K., & Seidel, T. (2015). Effects of a classroom discourse intervention on teachers' practice and students' motivation to learn mathematics and science. Learning and Instruction, 35, 94-103.

Kyndt, E., Raes, E., Lismont, B., Timmers, F., Cascallar, E., & Dochy, F. (2015). A meta-analysis of the effects of peer tutoring on mathematics achievement. Journal of Educational Psychology, 107(4), 932-944.

Lavy, V. (2019). The effect of classroom conditions on student learning: Evidence from the evaluation of the Israel classroom conditions project. Educational Evaluation and Policy Analysis, 41(3), 456-482.

Lee, J., Liu, C., & Ko, Y. (2023). Enhancing interest in mathematics through storytelling: A qualitative study. Journal of Mathematics Education, 16(1), 14-29.

Liu, Z., Ma, W., & Zhang, H. (2021). Peer influences and family support in the development of students' mathematical attitudes and interests. *Learning and Instruction, 70,* 101378.

Li, Y., Wang, X., & Liu, S. (2020). Gender differences in mathematics interest: A meta-analysis. Educational Psychology Review, 32(4), 973-1001.

Liu, M., Wang, Z., & Wang, Y. (2021). Self-regulated learning and student interest in mathematics: The role of motivation and self-efficacy. Educational Psychology, 41(3), 377-390.

Liu, X., Wang, Z., & Chen, R. (2021). The impact of gamification on students' interest in mathematics learning: A meta-analysis. Journal of Computer Assisted Learning, 37(5), 1389-1402.

Ma, X., & Wilkins, J. (2020). The effects of teacher characteristics on students' attitudes toward mathematics. Educational Studies in Mathematics, 103(1), 27-45.

Marsh, H., & Craven, R. (2019). Academic self-concept: A key construct in educational psychology. Educational Psychologist, 54(3), 174-189.

Middleton, J., & Jansen, A. (2019). Motivation matters and interest counts: Fostering engagement in mathematics. *Educational Researcher*, 48(3), 189-197.

Miller, S., & Mercer, C. (2019). The role of the learning environment in promoting students' interest in mathematics. Journal of Special Education, 53(4), 229-238.

Miller, S., & Mercer, C. (2021). Strategies for fostering students' interest in mathematics: A special education perspective. Learning Disabilities Research & Practice, 36(1), 3-12.

Mills, K., & Sutherland, R. (2018). Mathematics anxiety: The impact on students' interest and engagement. Mathematics Education Research Journal, 30(1), 25-42.

Monoranjan B., Bharati B. (2013). Fuzzy measure of secondary students' attitudes towards mathematics. *International Journal of Research Studies in Education, 2*(2), 21-30.

Muis, K., & Duffy, M. (2018). Enhancing student motivation through growth mindset. *Learning and Instruction, 55*, 61-72.

Muis, K., & Duffy, M. (2021). Motivational and self-regulatory processes in learning mathematics: Examining

the role of the teacher and students' individual differences. *Learning and Instruction, 71*, 101370.

Muis, K., Winne, P., & Jamieson-Noel, D. (2018). Understanding the role of self-regulation and motivation in mathematics learning. Educational Psychologist, 53(3), 205–219.

Natsir Y., Anisati (2016). The matters in teaching reading comprehension to EFL students. *SIELE Journal, 3*(1).

Noble, T., & Smith, D. (2018). The importance of motivation and engagement in mathematics education. International Journal of Educational Psychology, 7(2), 163-181.

Organisation for Economic Co-operation and Development (OECD). (2019). *PISA 2018 results: Where all students can succeed.*

Parker, D., & Leatham, K. (2017). The role of teacher feedback in the development of students' mathematical thinking. Mathematics Education Research Journal, 29(3), 1-18.

Patrick, H., Ryan, A. M., & Kaplan, A. (2016). Early adolescents' perceptions of the classroom social environment, motivational beliefs, and engagement. *Journal of Educational Psychology*, 99(1), 83-98.

Petersen, A., & Moller, J. (2018). Student agency in mathematics education: Impacts on motivation and achievement. Educational Studies in Mathematics, 97(2), 125-144.

Perez, M., Buenaventura, R., & Garcia, A. (2021). Enhancing mathematics performance and motivation through differentiated instruction. *Journal of Educational Psychology*, 113(2), 310-328.

Polit, D., & Beck, C. (2016). *Nursing research: Generating and assessing evidence for nursing practice* (10th ed.). Lippincott Williams & Wilkins.

Radcliffe, K., & Sutherland, R. (2016). Building a community of practice: A focus on mathematics teachers' professional learning. Professional Development in Education, 42(4), 604-619.

Ranjit, K. (2016). *Research methodology: A step-by-step guide for beginners* (3rd ed.). SAGE Publications.

Reeves, T., & Hedberg, J. (2019). Interactive learning environments: The importance of feedback in mathematics education. International Journal of Mathematical Education in Science and Technology, 50(3), 335-350.

Reinhardt, M., & Mendez, M. (2016). An exploration of students' attitudes toward mathematics: The impact of context and curriculum. Mathematics Education Research Journal, 28(2), 239-257.

Reinhardt, M., Mendez, M., & Purdie, N. (2017). Teachers' beliefs about mathematics: Influences on student attitudes and achievement. Journal of Educational Psychology, 109(2), 172-188.

Rogers, K. (2016). The role of teacher beliefs in developing students' interest in mathematics. International Journal of Educational Research, 75, 44-53.

Ryan, R., & Deci, E. (2017). *Self-determination theory: Basic psychological needs in motivation, development, and wellness.* Guilford Press.

Schoenfeld, A. (2016). Mathematics teaching and learning: A research perspective. The Mathematics Teacher, 109(5), 340-347.

Schoenfeld, A. (2019). The importance of metacognition in learning mathematics. Educational Psychologist, 54(4), 231-240.

Schukajlow, S., Leiss, D., Pekrun, R., Blum, W., Müller, M., & Messner, R. (2018). Teaching methods for fostering enjoyment and reducing boredom in mathematics classrooms: An experimental study. *Journal for Research in Mathematics Education*, 49(3), 293-330.

Schunk, D., & Zimmerman, B. (2017). Motivation and self-regulated learning: Theory, research, and applications. Routledge.

Seah, W., & Bishop, A. (2019). The role of the teacher in fostering students' interest in mathematics: A cultural perspective. Mathematics Education Research Journal, 31(4), 431-452.

SEI-DOST. (2020). *Science Education Institute's research on educational performance.* Science Education Institute.

Sun, X., & Liu, X. (2019). The role of parents in shaping students' interest in mathematics: Evidence from a longitudinal study. Educational Studies in Mathematics, 100(2), 157-173.

Tapia, M. & Marsh, G. (2004). An instrument to measure mathematics attitudes. *Academic Exchange Quarterly, 8*(2), 16-21.

Uğur, A., & Uğur, B. (2019). The effects of project-based learning on students' interest in mathematics. International Journal of Education in Mathematics, Science and Technology, 7(4), 365-378.

UNESCO. (2019). *Meeting commitments: Are countries on track to achieve SDG 4?*

Van de Walle, J. A., Karp, K. S., & Bay-Williams, J. M. (2016). Elementary and middle school mathematics: Teaching developmentally (9th ed.). Pearson.

Vollstedt, M., & Möller, J. (2019). Peer learning in mathematics: A systematic review of the literature. Educational Psychology Review, 31(3), 439-474.

Wang, M., & Eccles, J. (2019). Adolescent behavioral, emotional, and cognitive engagement trajectories in school: Patterns, antecedents, and consequences. Developmental Psychology, 55(5), 947-959.

Wang, Z., & Chen, S. (2020). Teacher-student relationships and student engagement in mathematics: The role of cultural factors. Mathematics Education Research Journal, 32(1), 59-75.

Wigfield, A., & Eccles, J. (2015). Expectancy–value theory in achievement motivation. In *Handbook of Competence and Motivation* (pp. 74-100). Guilford Press.

Wong, S. and Wong, S. (2019). Relationship between interest and mathematics performance in a technology-enhanced learning context in Malaysia. *Research and Practice in Technology Enhanced Learning*, *14*(21), 1-13.

Zhang, Y., & Zhang, J. (2020). The relationship between classroom environment and students' interest in mathematics: A multilevel analysis. Educational Studies in Mathematics, 105(3), 237-254.