



Mathematics Anxiety and Students' Learning Styles: Inputs for an Instructional Development Plan

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Abstract

This study described and examined the mathematics anxiety and students' learning styles from selected public secondary schools in the Philippines. The study used a descriptive-correlation research design which was participated by 300 randomly selected learners. A researcher-made survey-questionnaire was utilized. Results revealed that mathematics anxiety is part of learners learning acquisition experiences as they navigate the complexities of concepts, theories and principles in mathematics. With this, learners experienced multifaceted forms of anxiety which involved their personal, environmental and educational dimensions. As they learn, they immensely encounter fear of learning mathematical concepts. While learners experienced different forms of mathematics anxiety, they also utilized different learning styles to significantly address their anxiety. Significantly, they find interactions and games more useful in reducing their stresses and fear in learning math. In addition, learners who show higher level of mathematics anxiety tend to use visual learning styles as learning strategies. Hence, learners who tend to perform hands-on activities are more likely to experience higher level of anxiety in mathematics. Likewise, personal math anxiety is associated with visual and kinesthetic learning. This study recommends the consideration of the above inputs for the development of instructional development plan in mathematics emphasizing learners' mathematics anxiety and learning styles.

Keywords: Mathematics anxiety, learners, learning styles, personal, interactions, games



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INTRODUCTION

Mathematics is considered as the perfect the science where numbers, theorems, concepts, principles and the like are exactly measured and calculated. In the normal teaching and learning process, mathematics is likewise regarded as one of the most difficult subjects in the basic education program. In fact, learners hold preoccupied thinking when they hear the word mathematics. When learners see numbers and formulas, they feel that these are very difficult to understand. Also, they feel that they need to intensively employ higher order thinking skills. Anent to this, critical thinking and problem-solving are some of the common skills mathematics teachers intend to develop toward their learners, however, they struggle

on these areas. With the use of varied instructional strategies and creative teaching styles, teachers opt to attract the engagement and motivation of learners to apply these skills in solving mathematics problems. Despite of the efforts and diligence of mathematics teachers who design and develop effective teaching strategies, fear and poor performance of their learners in mathematics are still highly evident. This is where mathematics anxiety come. Khasawneh et al. (2021) defines mathematics anxiety as a feeling of tension and apprehension that interferes a performance ability, the manipulation of numbers and solving of mathematical problems. Learners are commonly experiencing mathematics anxiety as they thrive to learn and understand basic to complex mathematical concepts.

Learners commonly fear to answer mathematical problems because they think that solving problems and employing mathematical formulas and principles, based on the substance of the problems are difficult to understand. Mathematics skills of learners involving solving problems and calculation are significant indicators that cause learners' mathematics anxiety (Mutlu, 2019). Mathematics anxiety is one psychological factor that affects learners' achievement and practice. Teachers and facilitators are expected to extend efforts in teaching mathematics so as to enable learners understand mathematics, hence, address their anxiety. Implementation of engaging teaching and learning strategies and proper guidance with learners' proper study habits can help them overcome anxiety (Mutodi & Ngirande, 2014). Learners with high level of anxiety commonly failed to perform basic to complex mathematical problems (Chen, 2019).

On the other hand, while learners' mathematics anxiety becomes a pressing educational concern, teachers also observe that learners possess varying learning styles in learning mathematics. Learners show diverse form of learning acquisition techniques in which they do not rely only on one style in understanding mathematical concepts. Learners utilize different learning styles which they highly practiced in the teaching and learning process under mathematics class. Intrinsic motivation, self-efficacy and behavior are common affective aspects which learners show that potentially signify that they want to learn mathematics concepts and principles effectively (Sengodan & Iksan, 2019). Thus, learners have a combination and independent learning styles which are directly influenced by teaching strategies of mathematics teachers such as the use of deductive approach, inductive approach, cooperative learning and integrative approach (Cardino & Ortega-Dela Cruz, 2020).

In the Philippine Educational setting, learning mathematics becomes an immediate concern that immensely affect the overall success of the country's education system. In addition, learning mathematics can be most effective

when learners practically apply their acquired learning on their daily living. In other words, transfer of learning is also an acid test to measure the quality of learning learners gained. The significance of determining and examining learners' mathematics anxiety and their learning styles lies on the value of formulating effective and highly efficient instructional design. Also, with consistent use of varied and effective instructional design in teaching mathematics, learners learning experiences can be more effective and practical.

Previous studies only determined and examined the level of learners' mathematics anxiety using experimental designs. Also, a number of inquiries have focused on teachers' perceptions toward learners' level of anxiety in learning mathematics. For instance, moderate levels of mathematics anxiety, self-efficacy and mathematical creativity were identified based on teachers' perceptions with their learners (Nouhi et al., 2016). More so, dependent style is described by teachers as the most dominant style employed by learners in studying mathematics (Ivan & Maat, 2024). Based on these reviews, learners' perceptions relating to their anxiety in learning mathematics is found to be a prevailing gap by the researchers as this has been less emphasized. In view of this, the researchers aim to describe and examine the learners' mathematics anxiety drawn from their own perceptions as learners. The significance of this paper can provide comprehensive data for teachers, parents and school administrators as this will help them understand why learners find it difficult to learn mathematics based from their own perceptions.

Theoretical Framework. The study was theoretically anchored from the VAK (Visual-Auditory-Kinesthetic) model of learning. Developed by Walter Burke Barbe in the late 1970s, this learning theory laid the groundwork for various learning styles. This model identified three primary learning modalities: visual, auditory and kinesthetic.

The VAK Learning Styles consists of a combination of perception and memory. Human interpretation takes place through different

channels, with the modalities of vision, hearing, and feeling occupying an important position. By presenting subject matter or other information using all three learning styles, this allows listeners, students, or pupils to become more engaged with the information provided. They will then absorb the right information based on their preferred style (Mulder, 2023). As such, relating their learning styles with their math anxiety level can be a good basis in determining a way to address their math anxiety through identification of the most suitable learning style.

It is worth noting that learning styles were argued to be a mismatch to learners' academic capabilities as (Romanelli, 2009) scales of variety of learning styles are specific measures of personality rather than the style itself. It suggests that learning styles may have influenced the form and shape of learners' personality as different styles are reflective of learners' capabilities. In this paper, it tries to examine the relationship of learners' learning styles to their mathematics anxiety.

Statement of the Problem. This study described and examined the mathematics anxiety and students' learning styles from among selected public secondary schools in the Philippines. Specifically, it answered the following questions:

1. How may mathematics anxiety of the learners be described in terms of:
 - 1.1 Personal;
 - 1.2 Environmental; and,
 - 1.3 Educational?
2. How may students' learning styles in learning mathematics be described in terms of:
 - 2.1 Visual;
 - 2.2 Auditory; and,
 - 2.3 Tactile/kinesthetic?
3. Is there a significant relationship between learners' mathematics anxiety and their learning styles in mathematics?

4. Based on the findings, what proposed input can be suggested for instructional development plan?

METHODS

The study utilized descriptive-correlational research design in order to describe and examine learners' mathematics anxiety and learning styles in mathematics. A researcher-made survey-questionnaire was utilized. To measure the indicators, a 4-point Likert scale was used. Validation and reliability testing were administered to validate the instrument. Experts in the subject were tapped as experts-validators. On the other hand, reliability testing was also undertaken. Based on the results, part 1 of the questionnaire (Mathematics Anxiety) obtained a Cronbach alpha result of .856 signifying that this part of the instrument was reliable. Part 2 of the instrument obtained a Cronbach alpha result of .918 which also signify that the items on this part were reliable.

The researchers administered the study among selected public secondary schools in Central Luzon, CALABARZON and MIMAROPA regions. Selection of these locale is based on the researchers' exposure to teaching practice under the public school system. A total of 300 randomly selected Junior High School learners in the Philippines served as respondents. Sampling was based on the "rules of thumb" technique. According to Wilson, Voorhis and Morgan (2007), the general rule of thumb is no less than 50 participants for a correlation or regression with the number increasing with larger numbers of independent variables. With this basis, the employed 300 respondents could already provide enough data for meaningful insights without needing rigorous calculations. As such, the selection of the respondents was also drawn based on the characteristics of the learners' anxiety in learning mathematics as observed by the researchers. Respondents' age ranged from 14-16 years old at the time of the study. Majority of them were female and were in Junior High School level.

On the other hand, the researchers personally gathered the data through Google Forms – a digital facility to collect data. Respondents were provided a link in order to access the instrument from the Google Forms and fill in their responses. Prior to data gathering, the researchers distributed informed consents to the respondents. Parents and guardians were informed on the participation of their children in the study by sending them a formal letter. Upon receipt of the signed letters, a short orientation was implemented to discuss the nature and intent of the study using Zoom teleconferencing. Data gathering proper was then conducted. Thereafter, the researchers carefully collected the data and encoded the same in the established digital facility using MS Excel. Appropriate statistical tools were used. Specifically, mean and overall mean were used to describe and examine the respondents' mathematics anxiety and learning styles while Pearson r was used to examine if significant relationship exists between learners' mathematics anxiety and their learning styles used in learning mathematics.

RESULTS AND DISCUSSION

Learners' Mathematics Anxiety. Learners' mathematics anxiety as to personal dimension obtained an overall mean of 3.68 ("Strongly Agree"). This implies a strong consensus among the respondents who immensely feel anxious in learning mathematics. The result also show that the respondents are fearful and nervous in doing mathematics-related activities. Also, they strongly agreed that they experienced intense emotional tendencies as they try to understand mathematical concepts and principles as well as solving problems. Further, they hold the belief that on their capacities, mathematical knowledge and skills are unattainable. In addition, the tendency to avoid solving problems due to potential rejection by their peers also contributed to their anxiety in learning mathematics.

Meanwhile, learners' mathematics anxiety in terms of environmental dimension gained an overall mean of 3.65, which is verbally described as "Strongly Agree." This shows that

learners experienced less support from their family members. Further, it shows that the presence of peers who express similar anxious behavior in understanding mathematics suggests that social dynamics contributed to the critical state of learners' anxious behavior towards mathematics which they personally see. Even adults share similar contention in learning mathematics. On the other hand, availability of academic resources at home significantly provides importance to enrich learners' attitude towards mathematics which they find it in contrary.

Table 1
Learners' mathematics anxiety in terms of personal, environmental and educational dimensions

Items	WM	Verbal description
Personal		
1. Feel anxious when faced with numbers and mathematical problems	3.82	Strongly Agree
2. Believe that knowledge and skills are not for mathematics	3.63	Strongly Agree
3. Experience fear and nervousness when engaged in mathematics-related tasks and activities	3.76	Strongly Agree
4. Hold negative past experiences in mathematics classes	3.45	Strongly Agree
5. Avoid solving numbers and problems because of possible rejection of answers	3.76	Strongly Agree
Overall Mean	3.68	Strongly Agree
Environmental		
1. Less support from family members in learning mathematics	3.63	Strongly Agree
2. Presence of peers who expressed anxiety towards mathematics	3.56	Strongly Agree
3. Discomfort posed by peers when answering mathematical problems	3.52	Strongly Agree
4. Hold traditional belief that mathematics is the most difficult subject influenced by peers and adults	3.74	Strongly Agree
5. Insufficient academic resources available at home	3.81	Strongly Agree
Overall Mean	3.65	Strongly Agree
Educational		
1. Employment of complex teaching methods	3.83	Strongly Agree
2. Complex activities and tasks that make the subject even harder	3.83	Strongly Agree
3. Less access to relevant learning materials	3.33	Strongly Agree
4. Insufficient learning materials available at school	3.28	Strongly Agree
5. Books and other learning resources used are very hard to understand	3.76	Strongly Agree
Overall Mean	3.60	Strongly Agree

Lastly, learners' mathematics anxiety in terms of educational dimension obtained an overall mean of 3.60 ("Strongly Agree"). This suggests that teaching methods and other curriculum designs in learning mathematics contributed to their anxious behavior towards mathematics. In this regard, the employment of complex teaching methods and the use of complex activities that aggravate their challenges encountered in learning mathematics indicate that instructional approaches can inadvertently add to learners' learning burdens. Apparently, learners find it difficult to select and utilize relevant learning materials that can be effectively used in learning mathematics.

Therefore, the use of learning resources complicated their understanding on mathematical concepts and principles, thus this added to their burden, and which, potentially increased their fear in learning mathematics.

The findings reveal that learners encounter multifaceted forms of mathematics anxiety including their personal beliefs, environmental stimuli and educational practices employed by their teachers. But the most significant factor influencing students' mathematics anxiety is home and interactions with their teachers. Also, classroom experiences are considered as second most significant factor contributing to the anxiety experienced by learners in learning mathematics. This was also revealed in the study of Prahmana et al. (2021).

Students' Learning Styles in Learning Mathematics. As shown in Table 2, students' learning styles in terms of visual style obtained an overall mean of 3.49 which is verbally described as "Strongly Agree." This implies that learners strongly agreed that visual aids help them learn mathematical concepts and theories. As such, usefulness of illustrations in understanding math problems help learners to understand math concepts while color codes and written instructions are beneficial for learners because they can significantly organize and structure their understanding towards math concepts, principles and theories. On the other hand, visual presentation suggests that learners' find it important, but these are not commonly used because of its intricacies and contained difficult content when used and presented.

Meanwhile, in terms of auditory style, an overall mean of 3.41 was obtained and verbally described as "Strongly Agree." This implies that learners also learned and eased their anxious behavior as they utilize auditory learning style. They find the usefulness of listening to their teachers' explanations so they can follow the concepts and process in solving problems effectively. In addition, direct verbal instruction is beneficial. Teachers give clear and specific illustrations in discussing mathematics concepts and principles. Meanwhile, learners

find it strongly useful when they are engaged in solving problems verbally. Thus, discussions in lectures are useful for learners as they immensely concentrate to their teachers' discussion and techniques in solving problems.

Lastly, tactile/kinesthetic style obtained an overall mean of 3.56 ("Strongly Agree"). This suggests that learners find this learning style useful. This also shows that it ceases their anxious behavior in learning mathematics. With the use of interactions and games, learners practically employed them as means for learning mathematics concepts, principles and theories. In addition, paper and pen activities are also fundamental activities that help learners create meaningful learning experiences. Further, hands-on activities and use of math tools are also useful as well as the use of experimentation in varied procedures and structures.

Table 2
Students' learning styles in learning mathematics in terms of visual, auditory and tactile/kinesthetic

Items	WM	Verbal description
Visual		
1.Find visual aids such as graphs, tables, charts, diagrams and others helpful in learning math concept	3.56	Strongly Agree
2.Color codes are helpful in organizing mathematical information	3.45	Strongly Agree
3.Illustration of problems are typically useful to comprehend math problems	3.61	Strongly Agree
4.Written instructions are helpful to follow process of solving problems	3.52	Strongly Agree
5.Graphical representations ease burdens in understanding math theories and principles	3.33	Strongly Agree
Overall Mean	3.49	Strongly Agree
Auditory		
1.Listening to teachers' explanation are useful to understand math concept	3.52	Strongly Agree
2.Discussion are useful to simplify math concept where retention takes place	3.33	Strongly Agree
3.Rhymes and Mnemonic devices are useful in learning equations and formula	3.41	Strongly Agree
4.Lecture discussion creates simplified explanation	3.53	Strongly Agree
5.Solving problems verbally are more engaging and motivating	3.27	Strongly Agree
Overall Mean	3.41	Strongly Agree
Tactile/Kinesthetic		
1.Hands-on activities are helpful to practically apply math concept	3.72	Strongly Agree
2.Gestures and movement are useful to create ideas and strong understanding in math	3.45	Strongly Agree
3.Experimentation such as testing of math procedure is useful and more engaging	3.29	Strongly Agree
4.Math tools are helpful to learn simple to complex math concept	3.57	Strongly Agree
5.Interactions and games are helpful to learn math concept	3.81	Strongly Agree
Overall Mean	3.56	Strongly Agree

Learners utilize diverse forms of learning styles where they find it necessary to address their fear in learning mathematics. In this regard, gaining the highest overall mean score among the three learning styles,

tactile/kinesthetic learning style indicates that learners preferred this style in learning mathematics concepts and principles meaningfully. The use of games and interactive activities enable learners to enjoy learning mathematical concepts and principles because games provided them with excitement while completing their assigned activity. As postulated by Bosman and Schulze (2020), positive learning environment at school is established through providing effective teaching methods that are congruent to the prevalent learning styles of learners. Techniques for developing cognitive skills in mathematics learning greatly consider learners' learning styles and application of such ideas and learned concepts in practical and real-based scenario (Sheromova et al., 2020).

Relationship Between Learners' Mathematics Anxiety and their Learning Styles in Learning Mathematics. A significant correlation is found in the personal dimension where a statistically significant positive relationship exists between mathematics anxiety in terms of personal factor visual learning and tactile/kinesthetic styles (Table 3). Personal factor is positively correlated with visual learning style ($r=.180$). This implies that learners who show higher level of mathematics anxiety tend to use visual learning styles as learning strategies.

Table 3
Relationship between learners' mathematics anxiety and their learning styles in learning mathematics

Math Anxiety	Learning Styles		
	Visual	Auditory	Tactile/Kinesthetic
Personal	.180*	.09	.128*
	.002	.121	.027
	300	300	300
Environmental	.011	.173	.033
	.854	.298	.567
	300	300	300
Educational	.005	.023	.014
	.931	.687	.812
	300	300	300

Practically, personal factors relating to mathematics anxiety specially on visual learning styles play critical roles in shaping learners' mathematics anxiety. Meanwhile, mathematics anxiety in terms of personal factor is significantly correlated with

tactile/kinesthetic ($r=.128$). This implies that tactile/kinesthetic learners more likely to experience personal stress and anxiety in learning mathematics as they are doing hands-on activities. In other words, tactile/kinesthetic learners have the tendency to experience anxiety when they are confronted with hands-on activities like actual solving problems and calculations. The above finding are negated by the study of Ahmad et al. (2020) which reveals that there is no significance among students with different learning styles with respect to mathematics anxiety and achievement.

Recognizing learners' mathematics anxiety, along with their identified learning styles utilized in learning mathematics concepts and principles, it is more practical that teachers and school administrators provide separate instructional interventions which may help learners reduce their mathematics anxiety through consistent exposure to interesting and enjoyable classroom-based activities and direct exposure to real-based activities.

Inputs for Instructional Development Plan in Mathematics. The Instructional Development Plan (IDP) is a blueprint for teachers and learners aiming to direct positive and highly effective instruction in mathematics. Addressing the prevalence of mathematics anxiety experienced by learners while considering different learning styles of learners, the following should be emphasized as input for the instructional development plan:

1. *Learners Interests.* Create a Needs Analysis study on learner's instructional processes where teachers can objectively identify the needs and interests of learners in learning math. As such, learners are given privilege to express what common learning styles and methods they best utilize to effectively learn mathematics concepts, theories and principles.
2. *Development of Manipulative, Interactive and Highly Engaging Activities in Math.* Development of creative and innovative activities in math where learners can feel that they are included and engaged can

increase their morale in learning math. In doing so, teachers should create more relevant teaching approaches and the content in the teaching and learning process. This includes illustrative examples and presentations that should reflect the learners' interests.

3. *Simulations and Real-Life Based Illustrations.* Teachers can provide more realistic examples which learners can explore. Teachers can design practical problem-solving activities that learners find them as forms of classroom-based competitions.

Conclusion. Mathematics anxiety is part of learners learning acquisition experiences as they navigate the complexities of concepts, theories and principles in mathematics. With this, learners experienced multifaceted forms of anxiety which involved their personal, environmental and educational dimensions. As they learn, they immensely encounter fear of learning mathematical concepts. While learners experienced different forms of mathematics anxiety, they also utilized different learning styles to significantly address their anxiety. Significantly, they find interactions and games more useful in reducing their stresses and fear in learning math. Consequently, learners who show higher level of mathematics anxiety tend to use visual learning styles as learning strategies. Also, learners who tend to perform hands-on activities are more likely to experience higher level of anxiety in mathematics.

Recommendations. This study recommends the consideration of the proposed inputs for the development of instructional development plan in mathematics. The plan emphasizes the learners' mathematics anxiety and learning styles. In this line, teachers should provide comprehensive analysis on learners' needs and develop creative and highly engaging activities so that learners' anxiety towards learning math may be reduced. Further, teachers, parents and school administrators should collaborate to develop creative and highly engaging instructional activities for learners. The use of

practical examples or illustrations in line with the interests, readiness and needs of the learners in mathematics should also be considered in the formulation of school instructional plan in mathematics. In addition, future researches can administer a parallel study delving on learners' mathematics anxiety and its influence to their academic performance in mathematics class.

REFERENCES

- Ahmad, S., Safee, S., & Wan Afthanorhan, W. M. (2020). Learning styles towards mathematics achievements among higher education students. *Global Journal of Mathematical Analysis*, 2(2). <https://doi.org/10.14419/gjma.v2i2.2267>
- Bosman, A., & Schulze, S. (2018). Learning style preferences and mathematics achievement of Secondary School Learners. *South African Journal of Education*, 38(1), 1–8. <https://doi.org/10.15700/saje.v38n1a1440>
- Cardino, J. M., & Ortega-Dela Cruz, R. A. (2020). Understanding of learning styles and teaching strategies towards improving the teaching and learning of mathematics. *LUMAT: International Journal on Math, Science and Technology Education*, 8(1). <https://doi.org/10.31129/lumat.8.1.1348>
- Chen, Y. (2019). Effect of mobile augmented reality on learning performance, motivation, and math anxiety in a math course. *Journal of Educational Computing Research*, 57(7), 1695–1722. <https://doi.org/10.1177/0735633119854036>
- Ivan, V., & Maat, S. M. (2024). The relationship between learning styles and math anxiety among secondary school students. *International Journal of Academic Research in Progressive Education and Development*, 13(1). <https://doi.org/10.6007/ijarped/v13-i1/20858>

- Khasawneh, E., Gosling, C., & Williams, B. (2021). What impact does maths anxiety have on university students? *BMC Psychology*, 9(1). <https://doi.org/10.1186/s40359-021-00537-2>
- Mulder, P. (2023). VAK Learning Styles. *Tools Hero*. <https://www.toolshero.com/communication-methods/vak-learning-styles/>
- Mutlu, Y. (2019). Math anxiety in students with and without math learning difficulties. *International Electronic Journal of Elementary Education*, 11(5), 471–475. <https://doi.org/10.26822/iejee.2019553343>
- Mutodi, P., & Ngirande, H. (2014). Exploring mathematics anxiety: Mathematics students' experiences. *Mediterranean Journal of Social Sciences*. <https://doi.org/10.5901/mjss.2014.v5n1p283>
- Nouhi, N., Abadi, M. J., & Haddad, F. N. (2016). Investigation of the relationship of cognitive learning styles and self-efficacy beliefs in mathematics anxiety among high school students. *Asian Journal of Research in Social Sciences and Humanities*, 6(8), 2598. <https://doi.org/10.5958/2249-7315.2016.00767.x>
- Prahmana, R. C., Sutanti, T., & Diponegoro, A. M. (2021). Mathematics anxiety and the influencing factors among junior high school students in Yogyakarta, Indonesia / Matematička Tjeskoba I Faktori Utjecaja među učenicima Niže Srednje škole U Yogyakarta U Indoneziji. *Croatian Journal of Education - Hrvatski Časopis Za Odgoj i Obrazovanje*, 23(2). <https://doi.org/10.15516/cje.v23i2.3890>
- Romanelli, F., Bird, E., & Ryan, M. (2009). Learning styles: A review of theory, application, and best practices. *American Journal of Pharmaceutical Education*, 73(1), 9. <https://doi.org/10.5688/aj730109>
- Sengodan, V., & Iksan, Z. H. (2019). Students' learning styles and intrinsic motivation in learning mathematics. *Asian Social Science*, 8(16). <https://doi.org/10.5539/ass.v8n16p17>
- Sheromova, T. S., Khuziakhmetov, A. N., Kazinets, V. A., Sizova, Z. M., Buslaev, S. I., & Borodianskaia, E. A. (2020). Learning styles and development of cognitive skills in Mathematics learning. *Eurasia Journal of Mathematics, Science and Technology Education*, 16(11). <https://doi.org/10.29333/ejmste/8538>
- Wilson, C.R., Voorhis, V., & Morgan, B.L. (2007). Understanding Power and Rules of Thumb for Determining Sample Sizes. *Tutorials in Quantitative Methods for Psychology*, 3(2), 43-50. <https://www.tqmp.org/RegularArticles/vol03-2/p043/p043.pdf>