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Research Article

Students' Attitude Towards Learning Mathematics Online

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ABSTRACT

This study examines the attitude of the non-math major education students on learning mathematics online as a new way of delivering learning during the ongoing pandemic. It determines their attitude in the selected events of instruction. The study make used of descriptive design. Furthermore, the data used in this study were obtained from 50 respondents of Holy Name University who are taking General Education Course - Mathematics online. Data were collected through self-administered survey questionnaire sent through google form to comply with the existing policies in the midst of pandemic. The responses made by the respondents were collected, tallied, recorded, tabulated, and interpreted with the help of the statistical tools.

The result shows that students develop a positive perception in the event of presenting the content. Students got neutral level of perception to the rest of the events of instruction. The result also indicates that there is no significant difference between students' attitude towards learning mathematics online when grouped according to area of specialization and events of instruction. Moreover, it was concluded that employing various strategies, techniques, and teaching aids in the event of presenting the content develop a positive perception on the students' attitude towards learning Mathematics. The result proves that the events in instructional method employed in the mathematics classroom show a significant impact on developing students' attitude towards mathematics learning.

Keywords*: Attitude, Online learning; Mathematics*

Background

Attitude towards mathematics is described as a degree of liking or disliking of Mathematics as well as a desire to participate or avoid Mathematical activities (Kibrislioglu 2015). Mathematical attitudes have social, cognitive, and behavior components. However, some authorities regard attitude towards Mathematics just as simply a like or detest for Mathematics, whereas others amplify the meaning to embrace beliefs, ability, and quality of Mathematics.

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There are two simplified attitudes towards mathematics, the negative and positive attitude (Tahar, et al. 2010). When students have these negative attitudes, it affects the way they expect in themselves which will also affect their actions. It is to say, a negative attitude limits a student's performance, saps motivation and inhibits learning. Having a positive attitude creates a breakthrough for learning and can motivate a student regardless of its past performance. By changing this negative attitude into a positive one, the door is open to the possibility that a student can be exceptional in math or even becoming superior at it. Positive attitudes resist frustration from self-imposed that limits individual's potential to change through learning.

Teachers also play an important role in changing the attitudes of a student. Teachers of today are trying different strategies and plans that can attract the student's attention (Bain, 2004; Schiefele & Schaffner, 2015). With the help of the teacher's patience and persistence in teaching math, a student can cope up with the subject. Also, in today's era, technology is rapidly increasing and finding a better way to let students learn more and by doing such by just staying at home, it is really helpful due to recent event that is happening. Having this kind of technology, it may be a hindrance or an advantage to people.

Due to the pandemic that immensely extant, the educational sectors implemented that learner should go through distance ways of learning in order to prevent the education to be held. Most students are going through online learning and are being put to a more difficult situation (Basar et al., 2021). Learning mathematics online is often misjudged as hard that individuals can hardly cope up with despite doing their best. Individuals have different learning capabilities that makes them despise or hate mathematics in that manner. Having difficulties in answering or understanding mathematics often leads to misinterpretation of attitude with regard in learning mathematics. It is observed by the researchers that most students taking Mathematics done through online lack the motivation to learn mathematics and have the stigma that the subject become more difficult as credited to an inborn mathematical inclination. It was simply done by having casual conversation with the researchers' schoolmates.

However, there is a need for teachers to develop a teaching-learning strategy that is understandable to the students in learning Mathematics online. In this regard, the researchers are motivated to conduct research to know the students' attitudes towards learning mathematics online. The purpose of this study is to identify the student's attitude towards mathematics online. The future teachers may use this research for reference on how to enhance the student's way on learning based on their attitudes. Furthermore, this study is regarded as a way of providing students necessary skills to understand Mathematics through online approach.

This study is anchored on Behaviorist Learning Theory by Watson and Skinner (1913). According to Watson, behaviorism is a theory of learning which states all behaviors are learned through interaction with the environment through a process called conditioning. A behaviorist approach focuses on providing students with appropriate stimuli to help them demonstrate their desired behaviors that could also stimulate their attitude, be it happy or sad, etc. Thus, this theory is all about provoking reactions from learners and detecting any changes in behavior. In relation to this study, how the teacher teaches and instruct learners serves as the stimuli in the process whereas the student's attitudes as an observable change in the behavior of the learner represents the response.

Ostrom's ABC Model of Attitudes (1969) also known as Tripartite Model conceptualizes attitude as a synthesis of the three measurable components namely: Affective (A), Behavioral (B), and Cognitive (C). The affective component refers to the emotional reaction one has toward an attitude object. The behavior component as an action component consists of the predispositions to act in a particular way towards the attitude object. It refers to the way a person behaves when exposed to an attitude object. Cognition, on the other hand, as a mental component, consists of belief and perceptions hold about the attitude object. It involves a person's knowledge about an attitude object. These

three elements are needed to say that attitude really exists. Thus, the adoption of the ABC Model of attitude allows the researchers to investigate how learners feel, think and interact with the attitude object, which in this case is learning Mathematics online.

This study is further explained and supported by Gagne's Events of Instruction (1965) is a theoretical framework guiding this study. Robert Gagne developed a systematic way to come up a design of instruction for an effective learning process. His model is based on the knowledge on how human beings process information. He suggested 9 events of instructions that are associated with mental conditions that may enhance student learning and is divided into three segments namely, preparation, instruction and practice, and assessment and transfer. His principles refer to actions of both teachers and learners during the teaching and learning process.

In connection with these theories, legal basis is provided to strengthen the relevance of the study. In section 7 in Article I of the CHED Memorandum Order No. 62 series of 2016, CHED promotes Open Distance Learning (ODL) through tertiary education as appropriate, efficient and effective system of delivering quality higher and technical educational services in the country, it was also stated in section 8 of the same article that CHED encourages the utilization of quality Open Educational Resources (OER) to promote universal access and the transmission of information and knowledge.

Zan and Martino (2007) stressed that attitude towards Mathematics is only a positive or negative emotional disposition towards Mathematics. Additionally, from multifaceted perspectives, individual's attitude towards Mathematics is described as a more complex phenomenon characterized through the feelings that associates with Mathematics, his ideals about Mathematics and the way he behaves towards Mathematics.

Researchers (Attard, 2012; Grootenboer et al., 2008; Mata et al., 2012) have identified important factors that contribute to students' attitudes towards learning mathematics. These include the students themselves, the school, the teachers' beliefs and attitudes (Beswick, 2006) and their teaching methods. The teachers' teaching methods have a major influence on students' attitudes (Akinsola & Olowojaiye, 2008). Teachers can do many things to facilitate the classroom learning to alleviate students' engagement level and confidence in learning mathematics (Attard, 2012; Kele & Sharma, 2014). According to Sullivan and McDonough (2007), teachers can find ways to encourage student engagement and confidence in learning mathematics. This can be achieved by implementing meaningful activities embedded in real-life contexts (Kacerja, 2012).

Meanwhile, the related literature and studies revealed that student's attitude is relevant to different factors affecting it. The study of Manzana, et al (2018) concluded that teacher's strategy greatly influences student's learning towards Mathematics in online approach. Cortez (2020), stated that instructional strategy should intend to improve student's perceptions in distance learning and thus promote learning.

Methods

This study used descriptive design where it describes, analyses, correlates, and interpret data regarding the students' attitude towards learning mathematics online. The researchers make used of non-probability convenience sampling in selecting the respondents. A total of 50 first-year non-mathematics major students out of 96 enrolled in a general education mathematics course during the second semester of Academic Year 2020–2021 at the College of Education, Holy Name University, participated by answering an online survey questionnaire. The questionnaire will go through pilot-testing wherein it will be answered by the students out of the population of the study and the results will be given to a statistician which is then subject for evaluation. It was discovered that it has a reliability index of 0.990 using Cronbach's alpha. This indicates that an acceptable internal consistency in the statements. The researchers sent a letter for the approval to conduct the study to the Dean of the College of Education. Subsequently, the researchers asked the permission of the Academic Chairman in the conduct of the study. In determining whether there is a significant difference between students' attitude towards learning Mathematics online demographic profile and

events of instruction, the One-Way Analysis of Variance was used.

Result and Discussion

The analysis and interpretation of data are presented in this chapter in terms of the student's attitude towards learning Mathematics online. The findings are presented in tabular and textual forms after being analyzed to facilitate reading and understanding, interpreted, and statistically treated in sequence with the specific research problems regarding the student's attitude towards learning mathematics online.

Table 2. Students' Attitude Towards Presenting the Content of Mathematics

Question	Weighted Mean	Standard Deviation	Interpretation
I learn Mathematics better by listening to a clear explanation from the video lecture of my teacher.	3.7	0.11	Positive
I learn Mathematics better when the teacher provides a lot of resources to explain the topic.	4.16	0.11	Positive
I learn Mathematics when I read through the learning materials given by our teachers.	3.46	0.11	Positive
I like how my teacher uses various strategies, teaching aids/devices and techniques in presenting the lesson in synchronous and asynchronous classes.	3.52	0.17	Positive
I can easily understand my teacher's discussion in her pre-recorded video.	3.22	0.09	Neutral
Over-all mean	**3.61**	**0.28**	**Positive**

Legend:
4.21-5.00 Highly Positive
3.41-4.20 Positive
2.31-3.40 Neutral
1.81-2.30 Negative
1.00-1.80 Highly Negative

It can be gleaned in the Table 2, the results on determining the attitude as perceived by students on how the teacher present the content. It shows that students got positive attitude for the four indicators. The indicator that states that they learn Mathematics best with having a lot of resources and strategies has the highest mean of 4.16. This means that the students manifested positive perception to learn mathematics when provided by supplementary materials that gives further explanation of the topic. While the student has a neutral perception that they can easily understand their teacher's discussion in her pre-recorded video which has the lowest mean of 3.22. In general, the students got a positive interpretation for obtaining an over-all mean of 3.61. Based on the result, the students mostly had positive perception in this event, it could be the teacher has presented the content well as what the students prefer. The positive perception of the students showed an encouraging result on the part of the teacher in presenting the content of Mathematics in online class.

Table 3. Students' Attitude Towards Eliciting Performance in Learning Mathematics

Question	Weighted Mean	Standard Deviation	Interpretation
I like learning Mathematics online because I can work through some questions given by the teacher in my own pace.	2.96	0.04	Neutral
I don't like how the teacher give us the opportunity to demonstrate our ideas.	2.86	0.08	Neutral
I like how my teacher asks us students to create our own examples.	3.06	0.1	Neutral
I like how my teacher designs effective knowledge checks, online quizzes and tests that include comprehension questions and application opportunities such as individual or group projects, presentations and written assignments.	3.7	0.07	Positive
I like how my teacher encourages the student to have group discussions and sharing on some problems in Mathematics.	2.94	0.34	Neutral
Over-all mean	**3.10**	**0.13**	**Neutral**

Table 3 manifests the result that students showed favorable responses to the statements relating to the teacher's way of eliciting performance which received a general qualitative interpretation of "neutral". In this event, four indicators got neutral perceptions from the students. Only the statement states that they like how the teacher designs effective knowledge checks, online quizzes, and tests that include comprehension questions and application opportunities such as individual or group projects, presentations, and written assignments which has the highest mean of 3.7, received a positive interpretation. The indicator that students don't like how their teacher allows them to demonstrate their ideas obtain the lowest mean of 2.86. This means that they have unfavorable agreements about their dislike by which their teacher gives them the opportunity to demonstrate their ideas. Generally, this implies that they manifested such neutral preferences in the event of eliciting performance, it could be the teacher has elicited students' performance as what they mostly prefer.

Table 4. Students' Attitude Towards Providing Feedback in Learning Mathematics

Question	Weighted Mean	Standard Deviation	Interpretation
I like how my teacher provides detailed feedback on individual tasks on what must be done correctly, what must be improved, and include explanations.	3.14	0.12	Neutral
I like how my teacher does not provide guidance on how to progress.	2.6	1	Neutral
I like how my teacher informs us that we did what we supposed to do.	3.34	0.08	Neutral
I like how my teacher provides us with suggestions, directives and information to help us improve their performance.	3.58	0.02	Positive

Question	Weighted Mean	Standard Deviation	Interpretation
I like how my teacher encourages us to have self-evaluation to help us identify learning gaps and performance shortcomings in own work.	3.34	0.25	Neutral
Over-all mean	**3.20**	**0.29**	**Neutral**

It is shown in Table 4 that students have neutral interpretation in most statements relating to the event of providing feedback. This implies that students are in a neutral notion towards how their Mathematics teacher gives her learners feedback. The student's perception of how their teacher does not provide guidance on how to progress has the lowest weighted mean. This means that the students are having a hard time coping with the lecture and couldn't find ways to progress without the guidance of a teacher. The students have positive interpretation of how the teacher provides the students with suggestions, directives, and information to help the students improve in their performance. This gives that the students are delighted to be given assistance by their teachers that would greatly affect their performances. Given that the students are in neutral notion in the four questions show that their attitude towards how the teachers provide the learners his/her feedback. With the teacher's supervision and consistent monitoring where learners can directly ask for feedback and guidance on the process.

Table 5. Students' Attitude Towards Assessing Performance in Learning Mathematics

Question	Weighted Mean	Standard Deviation	Interpretation
I don't like the teacher's assessment that is not aligned with the content of his/her provided learning material.	2.64	0.01	Neutral
I like how my teacher does not give us the opportunity to explain our ideas.	2.78	0.16	Neutral
I like how my teacher implements a variety of assessment methods to provide students with multiple opportunities to demonstrate proficiency such as projects.	3.40	0.12	Neutral
I like how my teacher utilizes a variety of assessment methods including online exams/quizzes, written assignments and etc.	3.94	0.26	Positive
I like how my teacher utilizes rubrics when grading activities.	3.70	0.03	Positive
Over-all mean	**3.28**	**0.12**	**Neutral**

As shown in Table 5, the student's attitude towards learning mathematics online in the event of instruction in assessing performance has an overall interpretation of neutral attitudes and has an overall weighted mean of 3.28. The student has a neutral perception of the statement on the teacher's assessment is not aligned with the content of his/her provided learning material with the lowest weighted mean of 2.64. This means that students preferred to be assessed based on what the teacher provided learning material or aligned on what the lecture is all about. While in the statement where the student has a positive attitude towards how the teacher utilizes a variety of assessment methods including online exams/quizzes, written assignments and etc. has the highest weighted mean of 3.58. This means that the students are favorable to the way how the teacher carried out the evaluation.

Table 6. Results on Students' Attitude in terms of Events of Instruction

Events of Instruction	Weighted Mean	Interpretation	Rank
Presenting the Content	3.61	Positive	1st
Eliciting Performance	3.10	Neutral	4th
Providing Feedback	3.20	Neutral	3rd
Assessing Performance	3.28	Neutral	2nd

As shown in Table 6 the event of presenting the content has the highest composite mean of 3.61. The rest of the events of instruction got a comparable neutral interpretation. This means that students develop a positive attitude in the event of presenting the content whereas they have a neutral attitude in the events of eliciting performance, providing feedback, and assessing performance. This implies that respondents were favorable to the statements relating to how the teacher presents the content to the learners. They emerge with a positive frame of mind as to their Mathematics teacher's strategy of presenting the content for effective and efficient learning of Math.

Table 7. The Significant Difference Between the Students' Attitude Towards Learning Mathematics Online

Groups	F-value	P-value	Decision on Ho	Interpretation
Students' attitude towards learning mathematics online when grouped according to area of specialization	2.003	0.99	Accept Ho	Not Significant
Students' attitude towards learning mathematics online when grouped according to events of Instructions	3.234	0.281	Accept Ho	Not Significant

Table 7 indicates that there is no significant difference in students' attitudes when grouped according to area of specialization and events of instruction. For the area of specialization, the p-value of 0.99 exceeds the 0.05 level of significance, leading to the acceptance of the null hypothesis. This confirms that students' attitudes do not differ across their respective areas of specialization. Similarly, for events of instruction, the obtained p-value of 0.281 is also greater than 0.05, resulting in the acceptance of the null hypothesis. Therefore, the analysis clearly shows that no significant difference exists in students' attitudes based on the events of instruction.

The findings of this study are substantiated by Akinsola and Olowojaiye (2008) study that indicates that the instructional approach utilized in the mathematics classroom setting has a great influence on students' attitude toward mathematics learning. Learners' perceptions of the subject will be substantially influenced if they are not instructional aided or encouraged to positively perceive most of the things, they need for them to learn in their mathematics classes. Hence, for the learners to develop either a positive attitude or a negative attitude toward learning mathematics depends entirely on the teacher itself. The result of this study is consistent with Mazana et al. (2018) study that the quality of instruction is demonstrated by the degree to which the topic is clear to the learners, and the way the information is to be presented must be incorporated with the organization of information utilizes of clear and justifiable dialect. This suggests that teachers should attempt to create lessons that are pleasant for learners to generate a positive attitude. Moreover, they ought to utilize the leading instructional strategies/techniques that will boost their learner's understanding. This result is comparable to that of Simmers (2011) and Yılmazet et al. (2010). When it came to teachers, students wanted them to convey information properly and to make lectures more interesting.

The research of Attard (2012); Grootenboer, et al (2008); Mata, et al (2012)

that teachers and the students are the important factors that can contribute to learning mathematics. As the result of this study shows in the events of instruction particularly revolving around the teaching approaches of teachers have an utmost influence on the student's perception of mathematics.

Concerning the event of eliciting performance, the results are also in consonance with the findings of Mazana et al. (2018). Their study reveals that teachers should take into account the different variations of learners and that they need an additional period towards understanding the learning content. Their findings also indicate that assessment strategies greatly affect the students' perspectives. The results are also comparable to Sullivan and McDonough (2007) that teachers can come up with numerous ways to influence students' preferences in learning mathematics. By giving assessment and feedback to the students, students can gain confidence in the way he/she learns mathematics.

Conclusion

The researchers concluded, as indicated in the findings, that employing various strategies, techniques, and teaching aids in the event of presenting the content influence a positive perception of the student's attitude toward learning Mathematics. Therefore, the attitudes of the students towards online learning are determined based on what the teacher has presented. Students' perception was easily influenced by the instructional elements investigated in this study. The findings reveal that the events in the instructional method employed in the mathematics classroom have an influence on the students' attitude toward mathematics learning.

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