Integration of Physical Activity as a Supplement to the Mastery of Lesson in Plane and Solid Geometry

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ABSTRACT

The study aims to determine the effectiveness of the integration of physical activity as a supplement to the mastery of lessons in Plane and Solid Geometry of the First year BSEd Mathematics students of Batangas State University ARASOF-Nasugbu. Moreover, the study also aims to determine the effect of physical activity on students' class participation, motivation, and concept retention. This study was conducted using a mixed method research design which employs both quantitative research and qualitative research to achieve the main objective of the study. To gather data, the researchers employed survey questionnaires, pre-test/post-test, and focus group discussions. The gathered quantitative data was computed using T-testing, weighted mean, and ranking while the gathered quantitative data was analysed through transcribing and coding. The result of the research study showed that integration of physical activity has a positive effect on students' class participation, motivation, and concept retention. Moreover, the results revealed that the respondents viewed Zumba, drill/games, and body demonstration as a good supplement for their mastery of the lesson. Furthermore, the increase of the scores of the experimental group from pre-test to post-test and the greater mean they gained compared to the controlled group upon integrating physical activity has been a manifestation that the physical activity was an effective supplement to the mastery of the lesson in Plane and Solid Geometry. In accordance with the results and findings, the study also revealed that the development of a learning plan that highlights the integration of the physical activity on the course must be created. Moreover, this study suggests that physical activity should be considered by the faculty members on writing their course syllabi and for the future researcher to assess the integration of physical activity in more abstract mathematics courses.

Keywords: Integration, Physical Activity, Mastery of the Lesson, Plane and Solid Geometry

INTRODUCTION

Mathematics pertains to science focusing on creating conjectures through pattern observations, proving statements through critical deduction from terms definitions and axioms (Jones, 2022). In relation, Mathematics is one of the core subjects in the education system, and it cannot be denied that mathematical abilities are important in today's contemporary society. The status of mathematics as a fundamental and significant discipline cannot be replaced. It vigorously encourages later educational methods and other scientific and engineering areas.

However, despite its importance and benefits towards every day's life, it cannot be retracted that most of the

students encounter difficulties in comprehending and understanding mathematical concepts. Incapability of the students in understanding the importance of mathematics in real life, lack of concentration, the continuity of concepts which make math more difficult, lack of practice, and inability to understand mathematical concepts are the five main reasons why most of the students struggle in mathematics (Nel, 2020). Moreover, statistics also revealed that more than the average of the students or 617 students around the globe does not attain the ideal level of proficiency in basic Mathematics (UNESCO,2018).

In the Philippines, mathematics education has changed in the past years. The changes in Mathematical education were based on the changes in curriculum and the content of the Philippine education system. The K to 12 Curriculum is a learner centered curriculum that is focused on enhancing the cognitive abilities, performance and skill abilities and values. In the Mathematics Education Framework of Philippine Education, constructivism approach is used as a way to integrate different types of teaching styles to teach mathematics. The use of interactive teaching approaches is used to motivate the students and learn from movements. This learning approach can stimulate students' cognitive development and skills by integrating both strategies.

In connection, physical activity (PA) pertains to any movement of the body which is triggered by muscles that involve consumption of energy and plays a vital role in the growth and well-being of the individual; however, it has not received the attention it deserves. In addition, physical activity requires the use of different parts of the body to use in executing movements and exercises. The students should engage in daily activity for 60 minutes and schools should take and follow those suggestions, that there should be physical education, breaks in class and recess (Center for Disease Control and Prevention,2018).

Providing a specific task in a certain course in structured and systematic ways will be considered as a physical activity. In mathematics, physical activities are rarely used. As this subject is more on cognitive teaching discussion and problem. However, Physical activity has an impact on the way of teaching and learning mathematics as it is a somewhat unconventional strategy that includes the psychomotor domain in teaching mathematical concepts.

OBJECTIVES

The study determined the effectiveness of the integration of physical activity as a supplement to the mastery of the lessons in Plane and Solid Geometry of the 1st year BSEd Mathematics students of Batangas State University ARASOF-Nasugbu. Specifically, it sought to answer the following questions:

1. What is the perception of the students about the physical activity to be integrated in Mathematics teaching in terms of students':

1.1. class participation;

1.2. motivation; and

1.3. concepts retention?

2. How does physical activity supplement the mastery of the basic concepts in Plane and Solid Geometry?
3. Is there a significant difference between the scores of students' pre-test and post-test?
4. Is there a significant difference between the performance of the controlled group and experimental group?
5. What learning plan may be proposed integrating physical activity in Plane and Solid Geometry?

MATERIALS AND METHODS

Research Environment

The study was conducted at Batangas State University ARASOF-Nasugbu campus. This study delimited only to tertiary learners, the selection of respondents is only the 38 first-year students taking Bachelor of Secondary Education (BSEd) Major in Mathematics and 85 students from BSEd Mathematics Second Year, Third Year and Fourth Year of Batangas State University TNEU ARASOF Nasugbu A.Y. 2022-2023.

This study was limited to the physical activity to be involved in mathematics teaching and how it became a supplement to the mastery of Plane and Solid Geometry and does not cover any mathematical fields and courses. In addition, the physical activities were only used in the mathematics teaching instruction as a supplement and not the primary teaching strategy in teaching Plane and Solid Geometry.

This study delimited only to tertiary learners, the selection of respondents is only the first-year students taking Bachelor of Secondary Education (BSEd) Major in Mathematics and some selected students from BSEd Mathematics Second Year, Third Year and Fourth Year of Batangas State University TNEU ARASOF Nasugbu A.Y. 2022-2023. Due to the limited number of first-year BSEd Mathematics students in Batangas State University ARASOF-Nasugbu, the sample size for the experimental intervention is 38 students which is equal to the population of first year students. Students from other campuses of Batangas State University were not included as it is limited only to the BSEd Mathematics students of Batangas State University ARASOF-Nasugbu campus.

Respondents of the Study

The regular first year students under Bachelor of Secondary Education (BSEd) program of Batangas State University ARASOF – Nasugbu were the respondents of this research study. The researchers randomly choose the group of BSEd Mathematics students as they are the only group who will be taking the course Plane and Solid Geometry in the Second Semester of Academic Year 2022-2023. A total number of 38 BSEd Mathematics students, composed of 8 males and 30 females were randomly selected and divided into two groups namely the experimental group and the controlled group.

Furthermore, researchers also conducted a Focus Group Discussion (FGD) consisting of 8 randomly selected students from the experimental group. A survey was also conducted with 85 respondents from BSEd Mathematics first, second, third, and fourth-year students to gather data about the perception of the students to the physical activity integrated in terms of class participation, motivation and concept retention.

Data Gathering Instrument

Construction of the Questionnaire, FGD Guided Questions, Pre- Test, Post- Test and Table of Specification. Before the construction of the questionnaire, FGD guided questions and Pre- Test/ Post Test, the researchers read books, thesis, journals and other research to construct the existing survey questionnaire or to gain a background on constructing a survey questionnaire, FGD guide questions and pre- test/post-test. Survey questionnaire consists of close-ended statements which are answerable through Likert Scale. Guided questions for FGD are composed of an open-ended statement which allows the respondent to accept, reject, revise and give suggestions or comments. The researchers created their own survey questionnaire, FGD guided questions, pre-test and post-test including its table of specification.

Validation of Survey Questionnaire, FGD Guided Question, Pre- Test and Post- Test. Validation of Survey questionnaires, FGD questions and Pre- Test/ Post- Test is needed to ensure that the questions in the

instruments are reliable. It is composed of self- made questions, which aims to answer the primary questions of the research study that will undergo test reliability and validation from professionals and experts.

Administration of Survey Questionnaire, Pre- Test and Post- Test and the utilization of Guided Questions in FGD. After the construction and validation of the instruments, the researchers administered the pre- test before the start of physical activity integration. After the integration, a post test was administered to test the effectiveness of physical activity integration. The survey questionnaire was given after post-test to know the perception of the respondents about the teaching approach used in research study in gathering qualitative data. Afterwards, the researchers conducted a Focus Group Discussion (FGD) with the use of self-constructed guided questions to gather qualitative data.

Scoring. The data gathered by the researchers in the participants were analyzed, tabulated, and interpreted using statistical measures.

The following Level of expressed needs were classified and interpret the data gathered in the respondents according to the following scales:

Table 1. Likert Scale

Weight	Verbal Interpretation
3.51 – 4.00	Strongly Agree
2.51 – 3.50	Agree
1.51 – 2.50	Disagree
1.00 – 1.50	Strongly Agree

Data Gathering Procedure

In order for the study to achieve the rights and concerns between the researchers and the respondents, informed consent was obtained. The informed materials' entire substance is straightforward and truthful. In addition, the respondent was told that participation was entirely voluntary, all information provided by the respondents was treated with the strictest confidence, and nothing could be revealed to the general public.

The next part of the study was the utilization of the physical activity to be integrated into the topic. The researchers conducted a two-week teaching to test the effectiveness of the physical activity integration in Plane and Solid Geometry. After the weeks of the teaching, the researchers conducted a post -test to test the effectiveness of the physical activity integration in teaching Plane and Solid Geometry.

To gather data for the mixed method study, the researchers also conducted a Focus Group Discussion (FGD) to answer the statement of the problem. The Focus Group Discussion (FGD) was mediated by the researchers. The discussion was recorded through video and audio recording. The researchers took notes about the information that can be derived from the discussion.

Statistical Treatment of Data

Quantitative Treatment of Data

Frequency was used to indicate whether each survey respondent's level of reported needs is high or low.

Weighted Mean was used to indicate the average responses of the respondents. Ranking was used to rank the order of responses of the respondents.

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Ranking was required to organize the organization of the respondents' responses from rank 1 as the highest.

t- Test was utilized to compare the means of two groups. It will be used in hypothesis testing to ascertain whether a method or treatment truly has an impact or whether the two groups differ from one another.

Qualitative Treatment of Data

For the qualitative treatment of the data, the researchers used the following steps to analyze the qualitative data gathered from the conducted Focus Group Discussion. (1) The researchers transcribed all the recordings used in the discussions including the video, audio, and even the notes taken. (2) After transcribing, the researchers identified the major and the key points discussed in the conservation and organized all the gathered information. (3) After performing previous steps, the researchers contextually analyzed the major key points and ideas derived from the discussion as an input on drawing conclusions to answer the primary questions and objectives of the research study (Rev Marketing, 2022).

RESULTS AND DISCUSSION

Perception of the students about the physical activity to be integrated in Mathematics teaching in terms of:

Table 2. Class Participation

Statements	**Mean**	**Interpretation**	**Rank**
I participate voluntarily in my Plane and Solid Geometry class	3.33	Agree	2.5
I make sure to participate in all of the physical activities integrated in my course.	3.28	Agree	6.5
I become more active in my Plane and Solid Geometry discussion.	3.33	Agree	2.5
I engage myself more in the class discussion.	3.18	Agree	9.5
I have many opportunities to collaborate with my classmates.	3.35	Agree	1
I am able to perform physical activities integrated.	3.20	Agree	8
I make sure that I always participate in class.	3.18	Agree	9.5
I am preparing myself to join in the new physical activities to be introduced.	3.31	Agree	4.5
I enjoy interacting with my classmates because of the physical activities.	3.28	Agree	6.5
I ask questions and clarify the concepts that I did not understand.	3.31	Agree	4.5
General Weighted Mean	**3.278**	**Agree**	

As a result of the evaluation of the data towards students' participation in terms of class participation in the Plane and Solid Geometry class, the statement "I have many opportunities to collaborate with my classmates" obtained the highest rank with the weighted mean of 3.35 and with the verbal interpretation "agree". The statements "I participate voluntarily in my Plane and Solid Geometry class" and "I become more active in my Plane and Solid Geometry discussion" ranked 2.5th with the weighted mean of 3.33 and verbally interpreted as "agree".

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The statement "I am preparing myself to join in the new physical activities to be introduced" and "I ask questions and clarify the concepts that I did not understand" were ranked 4.5th with the weighted mean of 3.31 and with the verbal interpretation of "agree". The statement "I make sure to participate in all of the physical activities integrated in my course" and "I enjoy interacting with my classmates because of the physical activities" ranked 6.5th with the weighted mean of 3.28 and with the verbal interpretation "agree".

The statement "I am able to perform physical activities integrated" ranked 8th with the weighted mean of 3.20 and verbally interpreted as "agree". The statements "I engage myself more in the class discussion" and "I make sure that I always participate in class." ranked 9.5th with the weighted mean of 3.18 and verbally interpreted as "agree concepts of mathematics.

Table 3. Motivation

Statements	**Mean**	**Interpretation**	**Rank**
I feel more interested with the lesson.	3.37	Agree	2
I develop a positive attitude towards learning the lessons	3.38	Agree	1
I am excited every time I attend my class.	3.29	Agree	9
I develop my desire to learn the lesson.	3.30	Agree	8
I never felt sleepy during class discussion.	3.19	Agree	10
I am motivated to perform in class because the teachers were able to demonstrate physical activities well.	3.31	Agree	6.5
I develop my willingness to engage in my class.	3.35	Agree	5
I do not want to miss any Plane and Solid Geometry class.	3.36	Agree	3.5
I see the integration of physical activity as a motivation booster for my class	3.36	Agree	3.5
I believe that the inclusion of physical activity in lessons will help me stay motivated.	3.31	Agree	6.5
General Weighted Mean	**3.325**	**Agree**	

As a result of the evaluation of the data towards students' participation in terms of class participation in the Plane and Solid Geometry class, the statement "I develop a positive attitude towards learning the lessons" obtained the highest rank with the weighted mean of 3.38 and verbally interpreted as "agree". The second on the ranking was the statement "I feel more interested with the lesson" with the weighted mean of 3.37 and verbally interpreted as "agree".

The statements "I do not want to miss any Plane and Solid Geometry class" and "I see the integration of physical activity as a motivation booster for my class" shared on the 3.5th ranked with the weighted mean of 3.36 and verbally interpreted as "agree". The statement "I develop my willingness to engage in my class" was lone at the 5th rank with the weighted mean of 3.35 and verbally interpreted as "agree". Furthermore, the statement "I am motivated to perform in class because the teachers were able to demonstrate physical activities well" and "I believe that the inclusion of physical activity in lessons will help me stay motivated" were ranked as 6.5 with the weighted mean of 3.31 and verbally interpreted as "agree".

The statement "I develop my desire to learn the lesson" was ranked 8th with the weighted mean of 3.30 and verbally interpreted as "agree". The statement "I am excited every time I attend my class" was ranked 9th with the weighted mean of 3.29 and verbally interpreted as "agree". The statement which obtained the

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lowest rank was the "I never felt sleepy during class discussion" with the weighted mean of 3.19 and verbally interpreted as "agree".

Table 4. Concept Retention

Statements	**Mean**	**Interpretation**	**Rank**
I utilize body demonstration techniques in retaining the concepts and lessons.	3.33	Agree	1.5
Body demonstration serves as a mnemonic device in answering tests and quizzes.	3.27	Agree	7
Body demonstration helps me to easily remember the lesson and ideas.	3.27	Agree	7
Physical drill helps me to recall the previous lesson.	3.27	Agree	7
Physical drill allows me to memorize concepts on a daily basis.	3.28	Agree	4.5
The utilization of physical drills helps me to improve my body memory.	3.32	Agree	3
I connect physical activities and lessons to remember the concepts easily in Plane and Solid Geometry class	3.26	Agree	9
Zumba exercise reminds me of the past lesson we discussed in our class.	3.28	Agree	4.5
Zumba dance helps me to remember the lessons for my activities and assignments.	3.33	Agree	1.5
Zumba helps me to summarize all the concepts throughout the chapter.	3.12	Agree	10
General Weighted Mean	**3.325**	**Agree**	

As a result of the evaluation of the data in terms of concept retention in the Plane and Solid Geometry class, it clearly revealed that the statements "I utilize body demonstration techniques in retaining the concepts and lessons" and "Zumba dance helps me to remember the lessons for my activities and assignments" obtained the highest rank with the weighted mean of 3.33 and with the verbal interpretation of "agree".

The statement "The utilization of physical drills helps me to improve my body memory" placed on the 3rd rank with the weighted mean of 3.32 and with the verbal interpretation "agree". The statements "Physical drill allows me to memorize concepts on a daily basis." and "Zumba exercise reminds me of the past lesson we discussed in our class." shared the 4.5th rank with the weighted mean of 3.28 with the verbal interpretation "agree".

Meanwhile, statements "Body demonstration serves as a mnemonic device in answering tests and quizzes.", "Body demonstration helps me to easily remember the lesson and ideas." and "Physical drill helps me to recall the previous lesson." ranked 7th with the weighted mean of 3.27 and with the verbal interpretation "agree". The statement "I connect physical activities and lessons to remember the concepts easily in Plane and Solid Geometry class." ranked 9th with the weighted mean of 3.26 and with the verbal interpretation "agree".

Lastly, the lowest rank was obtained by the statement "Zumba helps me to summarize all the concepts throughout the chapter." with the weighted mean 3.12 with the verbal interpretation "agree"

How does physical activity supplement the mastery of the basic concepts in Plane and Solid Geometry?

Changes in academic performance, class participation, motivation, and concept retention upon integrating physical activity into Plane and Solid Geometry class.

The majority of the participants frequently revealed that they observed a change (Frequency=9) when it comes to their academic performance while once among the participants also revealed that his performance is neutral upon integrating physical activity into Plane and Solid Geometry class.

The responses of the students revealed that integrating physical activity on the class discussion manifested positive changes on the academic performance including their physical, verbal, and even mental performance. The results presented can be associated and supported with the findings of Montecalbo-Ignacio, Ignacio, and Buot (2017) which revealed that there are improvements on the students' academic performance upon joining in a physical activity.

Besides, the researchers also categorized their responses in volunteerism, self-esteem, and pressure related to the questions changes on their class participation upon integrating the physical activity.

The first category is volunteerism where the participants stated that they initiated raising hands (Frequency=2) and they extended their class participation (Frequency=2). The participant responses revealed that the integration of physical activity helps the students to develop their volunteerism on class participation to the point that they set aside their doubts and embarrassments when raising their hands to participate.

The second category is self-esteem where participants said that they become more confident on raising their hands (Frequency=3), comfortable on raising hands (Frequency=1), and receive praise (Frequency=1. It is clear based on the responses of the participants that they boosted their self-esteem as the physical integration took place where students developed their self-esteem by raising their hands confidently in a class discussion. Moreover, the integration of physical activity also helped the students in creating a comfortable learning space where they feel freedom in sharing and contributing in a class discussion.

The third category is the pressure where one of the participants admits that she participates because her peers participate. The response of one participant can also manifest a good impact of integrating physical activity on Plane and Solid Geometry as it allows students to be influenced by their peers to participate as well in the discussion. With this, this impact also helps to create a classroom environment where every student feels that they part and need to be part of the instruction.

All of the participants fall into the lone category which is motivated to answer the questions about the changes in their motivation upon integrating physical activity in the Plane and Solid Geometry class. The participants mentioned that they boost their confidence (Frequency=4), they change how they perceive Geometry (Frequency=1), they become pressured (Frequency=1), they exert more effort (Frequency=1), and they find the atmosphere becomes casual (Frequency=1). The responses of the students revealed that physical activity really helps in motivating students. Through that motivation, the students help to calibrate their mind about their perceived course subject and tap students 'enthusiasm to give more effort with the course.

Lastly, the participants' responses can be categorized as improved speed of concept retention (Frequency=8) and improved style of concept retention (Frequency=4) answering the question about the changes on their

concept retention upon integrating physical activity on the Plane and Solid Geometry course.

The first category would be the improvement on the speed of concept retention where students said that they improve their concept retention because the process was fun (Frequency=2) and because of the body visuals (Frequency=6).

The responses of the participants were the evidence that physical activity aids the concept retention of the students by allowing students to create a long-term learning and a more active way of recalling the concepts that they have learned through body demonstration. Moreover, physical integration also saved students' time as it allowed students not to review their lessons day by day as it still retained to their mind even in a long period of time because of the body mnemonic coming from the body demonstrations.

The changes on the students' concept retention revealed that physical activity serves as a mnemonic that allows them easily remember the concept is parallel with the findings of the research conducted by Ureta (2018) which said that through utilizing different hand mnemonics students' learning become more relevant and experiential which provides them long-term learnings.

How do physical drills/games help you recall/ give preview the lessons that have been/ to be discussed in the previous sessions?

The researchers categorized it as providing fast understanding (Frequency=5) and providing opportunity (Frequency=6) answering the question on how body demonstration helps to easily understand the lesson that day.

The first category said that body demonstration provides fast understanding where the participants mentioned that they easily catch up with the lesson discussed by the teacher (Frequency=5).

The second category was labelled body demonstration provides opportunity for the students as the participants revealed that it allows them to demonstrate concepts using body (Frequency=4) and allows them to have a deeper modelling of the concept.

How does a teacher's body demonstration help you easily understand the lesson that day?

The researchers categorized it as providing fast understanding (Frequency=5) and providing opportunity (Frequency=6) answering the question on how body demonstration helps to easily understand the lesson that day.

The first category said that body demonstration provides fast understanding where the participants mentioned that they easily catch up with the lesson discussed by the teacher (Frequency=5). The responses of the participants revealed that body demonstration is indeed a great help in providing a students' fast and better understanding of the lesson.

The second category was labelled body demonstration provides opportunity for the students as the participants revealed that it allows them to demonstrate concepts using body (Frequency=4) and allows them to have a deeper modelling of the concept. The responses of the participant revealed that body demonstration really helps the students to be creative. Using their own body parts as an instrument for learning Mathematics can be novel but with the use of body demonstration, it becomes possible.

How does Zumba help you summarize all the lessons that have been discussed in a whole chapter?

The researchers categorized the responses into mnemonic devices (Frequency=9) and fun (Frequency=1)

answering the questions about the help of Zumba in summarizing all the lessons that have been discussed in the whole chapter.

The first category is about Zumba that serves as a mnemonic device where participants agree that with the help of Zumba, they can easily recall all the concepts easily (Frequency=6). The participants' responses revealed that Zumba really serves as a tool for the students to easily recall all the topics discussed in the whole chapter and allows them to remember everything by just simply hearing the music they used in Zumba performance.

In addition, one participant also shared that Zumba also provides fun as Participant 2 revealed: "Learning becomes more fun and faster." The response of the students revealed that Zumba really helps the learning faster because they enjoy it and they have fun. As the students believed that learning is more authentic if the students feel enjoyment towards what they're doing.

In general, do you think integration of physical activity in your Plane and Solid Geometry really a good supplement to your mastery?

The researchers categorized the responses into improving students' performance (Frequency=9) and improving classroom atmosphere (Frequency=4) answering the questions do you think integration of physical activity in your Plane and Solid Geometry really a good supplement to your mastery?

The first category relies on improving students' performance where participants respond that physical integration supplements mental retention (Frequency=7) and improves physical performance (F=2). The responses of the participants revealed that Zumba is a great help to create an interactive, fun, and engaging classroom atmosphere. Improving classroom atmosphere is a crucial factor as social context is one of the pivotal factors on students' mastery of the lesson.

Significant difference between the scores of students' pre-test and post-test

The 19 students who underwent traditional teaching in their class have high mean scores in their post-test (Pre-test = 23.10) (Post-test =40.95) compared to their pre-test. However, this difference is significant because the null hypothesis is rejected, $t(40) = 7.32$, $p(0.00000049) < 0.05$. Moreover, the range of the score of the pre-test of the controlled group was ranging from 20-40 and the post-test from 35-45 score ranges. The difference in score range reflects the 17.84 mean difference and the gap between the pre-test and post-test's variances.

Significant difference between the scores of experimental and controlled groups

The 19 students who have physical activity intervention in their class have a higher mean (Experimental = 44.89) compared to the 19 students who undergo traditional methods of teaching (Controlled = 40.95). However, this difference is significant because the null hypothesis is rejected, $t(45) = 2.88$, $p(0.001) < 0.05$.

The range of the score is closer to its mean which is 44.89. The 3.94 mean score explains there was a large gap between the class with physical activity integration and class with traditional teaching strategy (α=0.05).

What learning plan may be proposed integrating physical activity in Plane and Solid Geometry?

The output of the study was a learning plan that was utilized before each class of the respondents. The researchers used the learning plan as a guide in the teaching process and the learning process in the subject. The learning plan consisted of the subject matter, preparatory activities and the lesson proper. There were parts of the lesson where the physical activity integration was implemented. The physical activity integration or the ZumDriBo was utilized as part of the learning plan's abstraction as a supplementation to

the discussion process and in the learning plan's abstraction part wherein it served as an authentic assessment in assessing the students' mastery of the lesson and their concept retention ability.

The learning plan created by the researchers served as the product of the study. The researchers created two different learning plans in the lessons of the triangles and parallel lines and planes and the physical activity integration was applied in each lesson proper.

CONCLUSION

Based on the result of the study, the researchers concluded that:

1. Students' perception about the integration of physical activity in teaching Plane and Solid Geometry has a positive impact on their mathematical academic achievement. In terms of class participation, it enhanced student self-efficacy and engagement, motivation. It developed students' willingness to be motivated to participate in class. In terms of concepts retention, it improved their memory skill and ability to retain concepts and lessons. Physical activities integrated helps students to remember past lessons that leads to a higher academic performance.
2. Physical activity such as Zumba, Drill/Games, and Body Demonstration are relatively providing a positive effect towards students' learning as it allows students to create body mnemonics to remember the concepts, provides students a definite demonstration of the basic concepts through the use of their body, and set the motivation and boost the self-confidence of the students which are beneficial for the students to attain the mastery of the lesson in Plane and Solid Geometry.
3. The increase in the students' scores from their pre-test to their post-test after integrating physical activity on the Plane and Solid Geometry instruction is a positive manifestation that the integrated teaching strategy is effective in supplementing the students' mastery of the lesson in Plane and Solid Geometry.
4. The physical activity integration in the class has a higher mean than the controlled group. It proved that the physical activity integration in class is more effective in terms of mastery of lesson than the controlled group. Looking at each group's variances, evidence found that the experimental group has a lower variance compared to the controlled group. Hence, physical integration has a more positive effect on making the range of scores of students more precise.
5. Development of a learning plan that highlights the integration of physical activity in teaching Plane and Solid Geometry must be created to support the students' mastery of the lesson.

RECOMMENDATIONS

After the analysis of the accumulated data, the following items are recommended to give solution to the existing problem of this study;

1. Physical activity such as Zumba, Drill/Games, and Body Demonstration should be integrated to supplement the learning and the mastery of the lesson of the students.
2. Faculty members should take on consideration on including physical activity in their teaching, learning, and assessment strategies on writing their course syllabus/syllabi.
3. Faculty members and administrators should support the integration of physical activity by exploring more sets of physical activities aside from those which were utilized in this study to supplement the mastery of the lesson of the students not only in Plane and Solid Geometry but regardless of the course subjects.
4. Future research must be conducted to assess the integration of the physical activity in more abstract mathematics subjects such as Elementary Calculus, Differential Equations, and etc.

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