

Students Algebraic Performance: Virtual and Non-Virtual Approach**Vincent A. Sasi**

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Abstract:

This study aimed to determine the Algebraic Performance of students who were exposed to virtual learning and those not exposed to virtual learning. Specifically, to determine if there is significant difference in Algebraic Performance of students who were exposed to virtual learning and those not exposed to virtual learning. The Causal Comparative Research Design was utilized in conducting this study. The respondents of this study were students from the College of Education Arts and Sciences who were enrolled in the Bachelor of Secondary Education Major in Mathematics school year 2019-2020 (first year) and school year 2020-2021 (first year) at the University of Southern Mindanao-Kidapawan City Campus. This study used the grades of respondents in College and Advanced Algebra subject to serve as data. The results revealed that virtual approach is more effective in student's algebraic performance than non-virtual approach. It is further revealed that there is significant difference in algebraic performance of students who were exposed to virtual learning approach and non-exposed to virtual learning approach.

Keywords: Quantitative, Virtual Approach, Non-Virtual Approach, Algebraic Performance

Introduction

Virtual Learning or E-learning is a situation where the pupils and the teacher communicates through online technology. Students are received instruction and instructed through online system (Ajadi, Salawu, & Adeoye, 2008).

Virtual education, also known as online education or remote education, has exploded in popularity in higher education over the last decade and has established itself as a permanent fixture in our culture. The number of degree-granting institutions and universities that offer virtual education courses grew from 44% in 1997 to 65% in 2010 (National Center for Education Statistics. 2010).

In the adventof developments in technology and the so called “new normal”, e-learning is now a common style of instruction which teachers utilize in order to address the particular requirements of students in the classroom. Distance learning, sometimes known as online learning, is a method of providing education to people who are unable to attend classes in person. The learner receives 100% of the content via the internet in this mode of training. E-learning is a broad phrase that encompasses both remote and online learning. Today, Artificial intelligence, for example, has transformed traditional schooling into a modern style of learning. (Di Vaio et al., 2020).

Technology-based learning environments that broaden learning opportunities and deliver high-quality education in a number of formats and modes. Online asynchronous education provides learners control over their learning experience and allows for flexibility of study schedules for nontraditional students; yet, this places a higher responsibility on the student.

The learning process is traditionally understood to take place only when a teacher meets a student or a group of students at a designated place and time. It is believed that the effectiveness of the learning process relies heavily on the teacher’s strategies and the students’ listening skills (Young, D. J. 2013).

However, students still find difficulties in comprehending the topics that a pure face-to-face learning where instructors discussed and explained the mathematical concepts— when it’s in math. It is said that mathematics is the most hated subject in the world that is why one of the biggest challenges in education is teaching mathematics (Panhuizen, 2009). Mathematics is really hard to understand even via traditional approach. Algebra is widely considered as one of the most difficult topics in mathematics curricula, resulting in learning challenges around the world (Jupri, 2013). This study aims to determine the Algebraic Performance of Students who are exposed to virtual learning and those not exposed to virtual learning.

Review of Literatures

The Virtual Learning

Virtual learning is often referred to as eLearning (Stauffer, 2020). The concept of using online learning tools is called "virtual learning." think of it as the key to learning online. Basically, lectures, assignments, tests are all enabled for visual platforms online lesson means distance between students and teachers. Rather than relying entirely on teacher-student interactions, "online learning" uses technology to aid the learning process. At its most basic level, it may include people who take part in a distance learning course, known as distance education. If you want all your students to hear the same message at the same time and to share with one another, this is a great option. People can benefit from practical learning by finding well-designed and effective learning opportunities. It can help students as individuals and their organizations achieve their learning and development goals.

According to Guerrero (2020), Virtual Learning has many features that include mobilization and discussion, enhances student interaction features, promotes interpersonal relationships, facilitates communication in both harmonious and harmonious environments, and provides available tools that enhance students' learning ability digital technology, gives students the opportunity to choose their learning pace, and provides additional useful information for learning.

The use of information and communication technology to access online learning / teaching resources is what we call E-learning. According to Almosa (2001), online-based reading is a step forward in computer-based learning by making content available online and includes links to related sources.

E-learning and social media are used as educational methods. Electronic reading or open learning is against traditional education as it has some distance between student and teacher and social media is known as the traditional way of learning where the student and teacher meet face to face. Students from faraway places or jobs can get an education in their department through e-learning and develop their qualifications at any age and age level (Anshari, et al., 2016). The new generation lacks creativity due to access to profuse technology. The interaction between technology and learning is inseparable in the 21st century. According to Alismail (2015) in technology e-learning provides direct access to information and knowledge. E-learning that leads to independent reading. Teachers have a responsibility to guide students as they research and acquire knowledge so that they can continue to develop that ability. Later, without realizing that students are "learning how to read" and develop their lifelong learning strategies. Technology has changed dramatically, and its invention has had a positive impact on our daily lives. It also brings about change in the field of education and research.

Websites, study sites, video conferencing, YouTube, mobile apps, and thousands of other free websites of integrated learning tools are all integrated under the great concept of technology-based learning. Through the internet, E-learning is currently developing student knowledge, as well as academic staff, professional and industrial skills (Adams, 2018; Chopra et al. 2019). Most tertiary institutions offer online courses to their students on and off campus to bring learning in these difficult times, the “epidemic”.

Familiarity with the virtual learning environment changes classroom control; students feel less restricted, and off-site computers allow students a different level of comfort (Thomas and Brown, 2011). The full benefits of virtual learning are: It allows students to complete their homework and work in their spare time and provides full online access to the entry course. In addition, online learning allows students to work at a time and place convenient for them (Thomson, 2010).

According to Bonk and Reynolds (1997), challenging tasks should be created that enable learners to integrate new knowledge with old knowledge in order to encourage critical thinking in e-learning; therefore, a teaching strategy, not technology, that influences the level of learning.

The identified factors for the success of the online class are communication and communication, leading to improved motivation and student satisfaction (Savenye, 2005). Also, some studies have shown that self-control and driving have been highlighted as two important ways to predict the effectiveness of online courses (Matuga, 2009). As such, non-self-reported students tend to show academic setbacks, major abnormalities, and use a few cognitive and memory strategies to achieve their learning goals, according to research (You & Kang, 2014).

Guerrero (2020) also pointed out that because e-learning can cause temporary and spatial divisions, it is important to make students' academic self-awareness to keep them busy and committed.

According to Stern (2004), in order to be successful in online learning, students need to become familiar with their learning style and the desire and motivation to take responsibility as a student.

Virtual Learning versus Traditional Learning

The results of studies comparing the impact of online education compared to regular classes are still conflicting. The test scores are bigger in traditional classes than online classes, according to some courses, but student performance is higher in parts of the internet, according to some. Some say there is no difference in student performance between online and traditional classes. Findings between students' performance in practical and traditional learning do not agree with other researchers who have reported significant differences between the two learning styles. Some researchers have found that online students are much more effective than students who

face face-to-face academic performance (Hannay and Newvine, 2006). In an online class the opportunity to cheat is not in control, a behavior that improves academic performance (Stack, 2015).

In virtual learning the most appealing thing is the flexibility of working with your own system and traditional learning freedom. In this study the students said that time constraints were more difficult than they had anticipated. But it also stated that the benefits of online learning with student freedom to choose a time and place of study are limited (Hassenburg, 2009).

According to Shachar and Neumann (2003), virtual learning has a much lower pass rate for students than traditional learning. In summary the traditional reading was more successful than the formal reading. These arguments in favor of traditional education are undoubtedly a passing fashion, and these subjects obviously have serious flaws (in some studies, using different criteria, showing conflicting data, etc.).

Caroline (2020) states that it is impossible to say whether online learning is more effective than traditional learning or vice versa; it all relies on the learning topic and how effectiveness is measured. In general, online learning appears to be a full-fledged replacement for classroom training. There's plenty of evidence that students learn just as much online as they do in regular classes.

While it should be considered easy to learn online, the biggest problem should be student success. According to Amin and Li (2010), online student performance is not significantly different from student face-to-face performance. According to some studies, there is no significant difference in student performance between students enrolling in traditional classes and those enrolled online. Online courses, as evidenced by Daymont and Blau (2011), can serve as traditional courses. In terms of academic qualifications, Ary and Brune (2011) found no difference between online and face-to-face students. One study, on the other hand, found that study design was important in assessing student achievement (Anthony, 2011). As a result, further research into online learning and its impact on student achievement is needed, especially in terms of determining the characteristics of successful students and curriculum design.

Algebraic Performance in a Virtual Learning

There are teaching practices in the field of mathematics where e-learning or online teaching has been established as a teaching method. One of the concepts is the MCIEC model (inspiration, context, interaction, assessment, and communication), which involves increased student participation. Due to growing interest, motivation, and familiarity with the situation, this approach allows the reader to develop his or her ability to make an effort to understand mathematical content (Guerrero, 2020).

In mathematical development, the use of e-learning or online learning encourages students' commitment, leading to improved performance. It also raises curiosity and, as a result, the number of results obtained. It is also helpful in learning mathematical concepts (Guerrero, 2020). Also, students' interest and good sense in maths is a major factor influencing the chance of passing maths (Archarya, 2016).

A mathematical study that incorporates algebra is sometimes confusing with mathematical symbols and concepts in visual learning. Also, peer pressure affects students' performance in visual learning maths (Kirtman, 2009). According to Tumarino (2004), Even in the traditional way, students are experimenting with mathematical problem-solving, algebraic-based instructions. The following are some obvious explanations for this malpractice: (1) students do not have the mathematical skills needed to solve written problems, or (2) students do not understand how to apply their mathematical skills to specific problem situations.

Algebra is widely regarded as one of the most difficult topics in the mathematical curriculum, leading to global learning challenges (Jupri, 2013). It is considered a major change in student mathematics education. Many students, however, have developed an important obstacle to solving algebraic problems and a systematic algebraic system. (Wang, 2015). As algebra is a challenging subject, it has been found that students' ability to solve algebraic problems varies greatly. Each student has different challenges, which may include working with cognitive and goal-related problems (Sugiarti and Retnawati, 2019).

Students can learn obscure algebraic topics using visual and practical elements. Many recent studies have found that using computers to learn math is beneficial. Waxman et al. (2003) found that using technology to teach and learn has a small but significant impact on student outcomes, including mathematical learning. As stated by Jamal, (2015), age and gender are one factor that has affected students' grades in Algebra dependence almost. Also, students in learning Algebra probably feel more difficult than students in traditional learning (Sorensen, 2017)

According to Heppen, J., (2016), In Algebra, students benefit more from face-to-face instruction than online learning. Algebra was no better than the traditional face-to-face instruction for students who could do well. Students in visual learning scored worse grades, lower pass rates, and lower scores on algebraic end-of-course tests than students in face-to-face learning. In addition, students in the online study have expressed a reduction in the confidence of their face-to-face colleagues.

Methodology

Research Design

This research used causal comparative research design to determine the algebraic performance of students who were exposed and not exposed to virtual learning.

Research Locale

This study was conducted at the University of Southern Mindanao-Kidapawan City Campus Sudapin, Kidapawan City since the chosen respondents were students of the said university.

Research Respondents

The ninety-two (92) respondents of this study were students from the College of Education Arts and Sciences specifically from the enrolled Bachelor of Secondary Education Major in Mathematics in school year 2019-2020 (first year) and school year 2020-2021 (first year).

Research Instruments

This study utilized the grades of the respondents in College and Advanced Algebra subject to determine Algebraic performance of students who were not exposed and exposed in virtual learning approach.

Sampling Procedure

This study utilized stratified random sampling in order to create comparison between two varied groups. The researcher created subgroup between those exposed and not exposed in virtual learning approach.

Data Gathering Procedure

The researchers created a letter address to the dean asking permission for the conduct of this study and to utilize the respondents' grades in college and advanced algebra that will be interpreted by different statistical tools. The researchers asked permission to the target respondents by presenting the Ethics Information Sheet (EIS) and Ethics Participants Consent Form (EPCF). With the permission of those willing respondents the researchers asked the grades in College and Advanced Algebra of the participants to their respective adviser. The data gathered were kept confidentially.

Statistical Tools

This study is a quantitative type of research. It described the algebraic performance of students who were exposed and not exposed in virtual learning approach. The statistical tools utilized were descriptive statistics such as frequency counts and weighted mean, also the researcher used independent sample t-test to identify the difference of the two approaches.

Findings

Table 1.1 shows the Algebraic Performance of students who are exposed to virtual learning.

In this table, it showed that nineteen (19) of the respondents got a 'Pass' description, the other twenty-one (21) of the respondents got 'Average' description, five (5) of the respondents got 'Above Average' description and one (1) of the respondents got an 'Excellent' description on their Algebraic Performance.

Moreover, the results for forty-six (46) respondents who were exposed to virtual learning had a mean of 2.6848 and a standard deviation of 0.35915.

It implies that most of the students who were exposed to virtual learning got a grade point of 2.50-2.75 which is equivalent to 78%-83% with the frequency of 21 and comprised to 45.65% which is described as 'Average' in their College and Advanced Algebra subject. The results run parallel with study of Pollanen, 2006 who said that mathematics subject including algebra are sometimes confusing with the mathematical symbols and concepts in virtual learning. Since algebra is a difficult subject, it has been discovered that students' levels of difficulty in solving algebraic problems vary greatly (Sugiarti and Retnawati, 2019).

Table: 1.1

Algebraic Performance of Students who are exposed to Virtual Learning

Grade Point	Grade Point Equivalent in %	Description	Frequency	Percentage
1.00-1.25	96-100	Excellent	1	2.17
1.50-1.75	90-95	Very Good		
2.00-2.25	84-89	Above Average	5	10.87
2.50-2.75	78-83	Average	21	45.65
3.00	75-77	Pass	19	41.30
Mean=2.6848			N=46	100
SD=0.35915				

Table 1.2 shows the Algebraic Performance of students who are not exposed to virtual learning.

In this table, it shows that thirty-eight (38) of the respondents got a 'Pass' description, the other four (4) of the respondents got a 'Below Average' description, one (1) of the respondents got 'Average' description and three (3) of the respondents got 'Above Average' description on their Algebraic Performance.

Moreover, the results for forty-six (46) respondents who were exposed to virtual learning had a mean of 2.8533 and a standard deviation of 0.38578.

It implies that most of the students who were not exposed to virtual learning got a grade point of 3.00 which is equivalent to 75%-77% with the frequency of 38 and comprised to 82.61% which is described as 'Pass' in their College and Advanced Algebra subject. This results are in consonance with the results of the study of Jupri, 2013 that said Algebra is widely considered as one of the most difficult topics in mathematics curricula, resulting in learning challenges around the world. Even under the traditional approach, according to Tumarino (2004), students in algebra-based subjects do poorly on mathematical problem-solving activities.

Table: 1.2

Algebraic Performance of students who are not exposed to Virtual Learning				
Grade Point	Grade Point Equivalent in %	Description	Frequency	Percentage
1.00-1.25	96-100	Excellent		
1.50-1.75	90-95	Very Good	3	6.52
2.00-2.25	84-89	Above Average	1	2.17
2.50-2.75	78-83	Average	4	8.7
3.00	75-77	Pass	38	82.61
Mean=2.8533			N=46	100
SD=0.38578				

The table 2 shows the test of significant difference on the Algebraic Performance of students who are exposed to virtual learning and those not exposed to virtual learning.

There is an increase in the mean difference between the students who are exposed and those not exposed to virtual learning mean in favor of the students who are exposed to virtual learning. Such difference is a highly significant at computed t-value of -2.168 with a p-value of $p=0.033 < 0.05$. Thus, the null hypothesis which states that there is no significant difference in algebraic performance of students who are exposed to virtual approach and those not exposed to virtual approach is rejected.

There's plenty of evidence that students learn just as much online as they do in regular classes. As a result, using e-learning or online learning in the development of mathematics boosts

student dedication, which improves performance (Guerrero, 2020). As stated by Caroline (2020), It is impossible to say whether online learning is more effective than traditional learning or vice versa; it is dependent on the learning topic and how effectiveness is measured. However, when it comes to students' algebraic performance, this study shows that online learning is more successful than traditional learning.

This indicates that the grades of the students who are exposed to virtual learning were higher than the grades of students who not exposed to virtual learning. This implies that virtual learning approach is effective in enhancing the algebraic performance of students.

Table: 2

Test of significant difference on the Algebraic Performance of students who are exposed to virtual learning and those not exposed to virtual learning.

Variables	t-value	p- value	Decision	Interpretation
Virtual and Non-Virtual Approach	-2.168	0.033	Reject Ho	There is significant difference

**Significant at 0.05

Conclusion

Based on the findings of the study, it was shown that students who were exposed and not exposed to virtual learning received poor grades in their College and Advanced Algebra subject. However, students who were exposed to virtual learning got better grades than students who were not exposed to virtual learning since it displayed a difference to students' algebraic performance.

Suggestions and Recommendations

Based on the findings and conclusions of the study, the researchers suggest the following:

1. Future researches on other learning approaches in learning College and Advanced Algebra and other mathematics subjects.
2. Future researches may consider taking the factors behind the student difficulties in learning algebra.
3. A similar study is recommended to validate research findings in this study and to assess consistency of findings.

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