THE EFFECTS OF STATISTICAL TRAINING WITH MS EXCEL ON STUDENT ACHIEVEMENTS: BENEFITS AND CHALLENGES

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Abstract

The study investigated the effects of training on the use of MS Excel in statistics on students' successes, the utility of data analysis tools, and the benefits received from using MS Excel. It examined whether employing MS Excel's data analysis capabilities improved learners' levels of understanding and achievement after they received MSE Excel training. It investigated whether there was a significant difference in the perceived learning skills obtained before and after training on MS Excel analysis tools. With the result of this study, the level of achievement and knowledge of the students in statistics enhanced following the training on MS Excel. The t-test result was statistically significant. This means that the improvement in students' achievements as a result of training in MS Excel with data analysis tools is significant. As a result, data analysis training is successful. The respondents stated that they highly agree on the various uses of MS Excel in statistics learning. This implies that the respondents highly agree on the many potential consequences of utilizing MS Excel's data analysis tool in studying statistics since it reduces anxiety in statistics, is very useful, and can serve as a reference tool in the future. It was also found that there are some advantages they gained from using Excel data analysis to learn statistics. One hundred percent of them said that working with statistics in Microsoft Excel improved their abilities and talents when handling huge volumes of data and indicated that there are significant benefits that students can receive from using Microsoft Excel in learning statistics. On the table of challenges, one major factor that the students considered that affected their attitudes towards learning during the pandemic was a low communication network or limited internet. This indicates that there is a need to improve the internet network for a better learning atmosphere, especially during a pandemic.

Keywords: MS Excel Application, Statistical Analysis, Learning Skills, Education & Technology

INTRODUCTION

This study dealt with how the use of technology can make a difference to the learning progress of students in problem-solving courses like mathematics and statistics. It has been the dream of teachers and students to acquire skills in the use of software. As observed today, it is crucial to have knowledge about the uses of technology and some software to aid in dealing with everyday problem solving. In provinces where internet access is not fast, the use of technology is not so much appreciated, but since ICT tools are now improving, learners and teachers can now adopt their use.

The integration of technology in the teaching and learning during this pandemic era is vital to the students' access to education as well as the delivery of instruction, specifically in teaching statistics, which entails lots of time spent calculating numerical values and analyzing the results of computation. The shift from face-to-face classes to non-face-to-face classes brought sudden difficulties in the educational system, especially in teaching technical subjects. But with the utilization of software and Microsoft Excel, the conduct of classes online became possible.

The use of computer software in teaching statistics is not new, but it has not been adopted

regularly in the past. But some schools in remote areas don't strictly require the its use because the learning modality is offline in which students must learn first the theory before the application of any software learning materials are adopted. But due to the sudden release of COVID-19 has clearly transformed people's lifestyles all around the world. This outbreak had impacted the strategies in the delivery of teaching as well as in the students' ways of learning. Because of the COVID-19 impact, many students have been hard at work in their studies since the middle of March 2020. The closure of schools had far-reaching economic and sociological effects for students, instructors, and their families throughout this time. It has also raised awareness on a variety of social and economic issues, such as student debt, digital learning, healthcare, the Internet, and disability services. As a result, each education division at the regional and national levels must take preventive measures and steps to develop flexible and innovative programs that can be accessible at any time and from any location.

According to the study of Emmanuel Boachie (2016), there are strengths in using Microsoft Excel in the teaching and learning of mathematics, as follows: The benefit is time savings. Excel saves you time by offering an intuitive GUI (graphic user interface). A key feature of this interface is the Ribbon, which prominently displays icons for the tools you will likely use most often. 2. When you think of what Excel is, you likely think of data manipulation first: sorting, filtering, tabulating, and calculating data. Each of these tasks is immediately available on the home tab of the ribbon. 3. Excel's extensive data portability tools provide the benefit of a shortened work pipeline. In other words, Excel can import common and not-so-common data formats, which reduces your need for specialized format conversion software. 4. Another benefit and advantage you gain from Excel comes from its extensibility: using Visual Basic for Applications (VBA), you can tailor Excel to your exact needs.

The Philippines as a country would tremendously benefit from offering more high-tech learning tools to its students. According to a World Remit article, it is critical for "students to become familiar with technology at an early age, especially in growing countries like the Philippines," because technology "sparks many market opportunities—even a chance to compete against industrialized economies!" "Unfortunately, that is not the current reality in impoverished sections of the country. "Public education and technology are hard to offer, especially since [the] bulk of the population is living above their daily resources," according to an article published by Off Crowd. "The article goes on to say that there is a technology gap in the Philippines' local schools, which is caused by a "lack of distribution of resources to those below the poverty line." Without the proper resources, students in these lower-income areas will not receive the same educational support as students from higher-income areas. (https://www.unicef.org/coronavirus/reopen-schools).

The community only acknowledges the worth of a scientific study when it is backed up by data that verifies its authenticity. Statistics analysis is essential in this regard. The name "statistics" was coined in the seventeenth century to describe "state science," which encompassed the distribution of income, education, and health. (Duilio et al., 2017).

Teachers can't make their students buy their own educational technology equipment now that they are aware of the distribution disparities in the Philippine market for technological resources. As a result, teachers are figuring out how to introduce or incorporate the use of a technology or program that will help them and their pupils keep up with the latest trends.

Statistics is one of the introductory subjects covered in various courses, particularly the Social Science Statistics course. In comparison to other general disciplines, the majority of students regarded this subject as hard science. Many of us who teach statistics have to put in a lot of effort to improve our lessons. Mathematics educators are constantly looking for new and better ways to alter and improve their teaching methods in order to satisfy the demands of their students. Theory, research, and the experiences of both teachers and students of statistics all point to the importance of attitudes toward statistics in the teaching-learning process (Jatnika, 2015). Statistics teachers and students believe that a positive approach toward statistics is critical. Students that have a negative attitude and express it can make the classroom feel uneasy. Outside of the classroom, attitude can have an impact on achievement and the use of statistics.

Using statistics software in the classroom, such as MS Excel, SPSS, Mega STAT, XLSTAT, SAT, and others, will help students comprehend statistics better during this pandemic. Despite the fact that a large majority of pupils in mathematics classes use a calculator (Jatnika, 2015). Because of the limited characteristics of the technology, using calculators alone is insufficient, especially when teaching business statistics courses. As a result, in teaching statistics for autonomous learning, the usage of computers such as MS Excel and software should be encouraged. Students can work at their own pace and at their own ability level, giving them confidence, success, and a desire to learn more. When MS Excel is used in the classroom, it is possible to minimize lecture time by 30-40% since the teacher prefers to monitor and supervise the students' learning in order to allow them to work cooperatively rather than lecturing the entire session. The Microsoft excel and software application in mathematics is crucial in the 21th century education which requires education services to make use of it though the teachers are not yet well trained. As a result of the pandemic world, many innovations were adopted and applied in the delivery of classroom services. This study based its concept on the application of Microsoft excel in teaching statistics while classes are held online so that the students will be accustomed to it. According to Marie Jean N. Mendezabal, & et.al. (2018) in their study, they found out that the result of their experiment on the use MS excel in mathematics (calculus) teaching has a significant improvement on the academic performance of the students. They also found out that the use Microsoft excel mathematics is equally effective as that of the traditional approach. Currently, the use of technology, particularly Microsoft Excel, in the teaching of statistics data analysis to students in undergraduate and graduate programs, as well as in graduate programs during this pandemic due to non-face-to-face classes, has been successful. According to Glenn Geher's (2020) article on understanding statistical power, statistical power is essentially the capacity to identify a statistically significant effect given a specific methodological design. If you know how to estimate statistical power, you may help design this type of research from the ground up. For example, you can decide how to modify the primary independent variables, how many people to enroll in the study at the outset, and other

important issues. The power of statistics is just that—powerful. And comprehending it will offer you a significant advantage in creating effective research that can address crucial problems." Another study, by Ratna, Jatnika (2016), showed the results of the data processing show that here is a significant increase in the cognitive aspects of learning Statistics after using SPSS but there is a significant decrease in achievement.

Moses Makgato (2014) underlined in his study on the characteristics contributing to inadequate integration of instructional technology at various South African schools that the findings included poor usage of computers such as PowerPoint, word processing, emails, printing, and data storage by both teachers. Teachers received no professional computer literacy or training. His study indicated that both teachers made insufficient use of computers, including PowerPoint, word processing, emails, printing, and data storage. Teachers did not acquire any professional computer literacy training. Computers should be made available in classrooms, and other technologies, such as table delivery, can be beneficial. They complement each other. Students should be taught computer literacy on a regular basis, and teachers should be trained in computer literacy. Divisi (2017) stressed in his study that the scientific world is enhanced daily with fresh knowledge due to new technology and continual discoveries. He investigated the mathematical functions that explain statistical concepts, particularly mean, median, and mode, as well as frequency and frequency distribution associated with histograms and graphical representations, determining elaborative processes based on spreadsheet operations, with the goal of highlighting the mathematical basis of statistical models that regulate the operation of spreadsheets in Microsoft Excel.

The goal of the study was to evaluate how well the training improved students' abilities to use Microsoft Excel's data analysis tool for statistical computation. Technology would be more intelligent and precise than manual calculation in helping to increase students' enthusiasm for studying. Teachers and students in some colleges and outlying districts were accustomed to performing statistical calculations by hand. But now that we live in the age of technology, it is imperative that we are aware of its use. The use of software should be familiar to the students. Despite being used less frequently than other statistical techniques, data analysis tools nonetheless have importance since they are easy to use, affordable, and accessible. Finally, this study examined the advantages of using Microsoft Excel for learning statistics in the field of social work as well as in other social science topics, as well as the students' learning abilities. This is because, in the past, students were used to learning in a classroom setting where lectures were written on the board, making technology new and unfamiliar to them. The pandemic condition, however, makes it difficult for teachers to incorporate or make use of the software or technology that can improve learning for their kids. The hurdles to learning, particularly in the fields of mathematics, and statistics were also examined in this study.

Statement of the Problem

This study aims to assess the effectiveness of the utilization of Microsoft excel in understanding the basic concepts in Social Science Statistics course in the classroom through online classes.

Specifically, this study was conducted to answer the following objectives:

The study sought to provide answers to the following specific objectives:

1. What is the level of achievement of the students in the use of Microsoft Excel in statistics before and after the training?

Hypothesis:

There is a significant difference between the mean responses of the students before the short training on the use of Excel and after the training.

There is a significant difference in the students' achievements before and after the training in learning statistics with the use of Microsoft Excel.

2. Students' Responses on the Use of Microsoft Excel-Data Analysis as a Learning Aid after the Training.

3. What are the beneficial effects of using the Microsoft Excel-data analysis as a learning aid to study statistics?

4. What are the challenges faced by   students in learning statistics in online mode of instruction.

METHODOLOGY

In this study, the descriptive research technique was combined with a quantitative design. The empirical data formed the basis for responding to the study's requirements. The research looked at the students' learning abilities and the benefits they gained from learning how to use Microsoft Excel through the data analysis tools in order to effectively learn the various topics under the descriptive and inferential statistics. The study was conducted during the scheduled training in statistics with the use of MS Excel's data analysis tool. The teacher gave three days of training in the usage of Microsoft Excel, from which the students were exposed to using Microsoft Excel in applying the different statistical formulas. They were lectured by an expert in statistics, after which they were told to apply what they learned in the training. The students had a workshop on the following: data categorization, graphing, tabulating, computing, and analyzing using Microsoft Excel. The trainees were given workshops and practiced problem solving using the data analysis tools in MS Excel to explore the lessons and gain skills in statistical data analysis. After which an assessment was given to measure their achievements before and after the training. Their scores were then recorded, compared, and analyzed.

Respondents

The Bachelor of Science in Social Work students at Kalinga State University particularly at Dagupan Campus were used as respondents with a total of ninety-two (92) students and out of this number, there were seventy five (75) or 81.52% students were considered as the number of sample based on the sampling formula using the Slovin formula.

Research Instrument

A set of test questionnaire was utilized to assess the level of progress of the student-respondents. The researcher's questionnaire was posted in the Google classroom in a Google

form for the students to assess them on the utilization of the Microsoft excel after the orientation, demonstration on the utilization of the Microsoft excel on its application in statistical computation and analysis in the specific topics like in the descriptive and inferential statistics. The questionnaire gathered data from the students' grades and responses to the numerous criteria used to assess the success of Excel usage and the training provided to them. This questionnaire was given to the participants both before and after the session. The questionnaire included the students' assessments of their achievements from using Microsoft Excel, including their assessments of the use of MS Excel, the effects of using MS Excel, and the challenges faced by the students in using such statistical software in an online mode of instruction.

Data Treatment

The responses on the effectiveness of the excel training in statistics solution were summarized and described using a table showing the achievements of the respondents before and after, while the skills and benefits of using Microsoft Excel in statistics study were counted and transcribed into frequency and per cent. Similarly, a frequency table is used to summarize responses on the factors impacting students' perspectives on learning the subject using Microsoft Excel during this pandemic. The t-test for paired sample test was used to analyze if there is a significant difference on the use of excel before and after the training. The 5-point scale was used to describe and measure the agreement of the respondents on the various indicators on the use of MS Excel as a learning software in the study of statistics.

RESULTS AND DISCUSSION

This section presents the data and interpretation of the research's results. Discussions were also done to elaborate more about the meaning and implication of data gathered.

Effects of The Training on the Introduction of MS Excel in Statistics to the Achievements (Grades) of Students before and after the training

Areas of Activities	Grades Before	Grades After	Mean Difference	Rank of the Mean difference
1. Organization and presentation of data	81	96	15	1
2. Evaluate or interpretation of data	80	94	14	4
3. Computation of numerical values required in Statistics analysis	80	95	15	1
4. Designing a better picture of the information	85	95	10	6
5. Answering and solving problems in statistical analysis	81	95	14	4
6. Working faster with accurate result in shorter period.	82	96	14	4
7. Sorting of information	81	95	14	4
8. Handling big data	77	86	9	7
Average	81	94	13	

The table shows the students' grades or achievements in the many areas where they learned statistics. This result implies that the students' capabilities have improved, as indicated by higher ratings in all areas where their statistical abilities were assessed. It is demonstrated that the mean difference is 13. It is also demonstrated that after being exposed to the data analysis function in MS Excel, the majority of the students achieved an average accomplishment of 94%. The mean differences emphasized that their grades increased in the presentation of data when the application of MS Excel was introduced to them. Likewise, their grades also increased in the areas in computation of numerical values required in statistics analysis. The students had increase mean difference areas such as: Evaluate or interpretation of data, Answering and solving problems in statistical analysis, Working faster with accurate result in shorter period, Sorting of information, Designing a better picture of the information, and Handling big data. According to the study of Kumasi, Ashanti, Ghan, the research findings has revealed multiple problems such as time constraint and committing of errors. Also 80% ad skills on Microsoft Excel and preferred to use it, but the remaining twenty percent (20%) has no or less skill and did not prefer the use of the computerized system although is safer than the paper based due to the Complexity of the computerized system. Furthermore 48% agreed that the computerized system is very effective but shouldn't be put in use now, whiles 52% agreed that is effective and should be put in use and be made compulsory for the students.

Achievements of the students before and after the Training on the use of MS Excel

t-Test: Paired Two Sample for Means		
	Variable 1	**Variable 2**
Mean	80.875	94
Variance	4.982143	10.85714
Observations	8	8
Pearson Correlation	0.718684	
Hypothesized Mean Difference	0	
Df	7	
t Stat	-16.1744	
P(T<=t) one-tail	4.2E-07	
t Critical one-tail	1.894579	
P(T<=t) two-tail	8.4E-07	
t Critical two-tail	2.364624	

The results show that the difference in student achievement before and after the training is statistically significant, as indicated by the t-test results. This implies that the improvement in students' achievements following using the MS Excel with data analysis tools training is significant. As a result, the data analysis training is effective. This study is further corroborated by the conclusions of a similar study by Emmanuel Boachie on The Effectiveness of Microsoft Excel to Improve Students Continuous Assessment in Secondary Schools in Ghana, in which 48% of respondents felt that electronic assessment is "very effective." Another study, by Ratna, Jatnika (2016), showed the results of the data processing show that here is a significant increase in the cognitive aspects of learning Statistics after using SPSS but there is a significant decrease in achievement.

Description of the Various Advantages on the Use of Microsoft Excel

Variables	Mean	Description
Actual use	4.38	Strongly Agree
Future use	4.62	
Usefulness	4.69	
Ease of use	4.24	
Self-efficacy on Excel	4.45	
Positive Computer Attitude	4.18	
Reduced Statistics Anxiety	4.72	
Statistics Learning Value	4.49	
Average	4.47	

The table displays data on students' mean response to questions about using MS Excel for statistics, with an average mean of 4.47. This would imply that the respondents strongly agree on the various potential effects of using MS Excel's data analysis tool in learning statistics because of it reduces anxiety in statistics, it is very useful, and can serve for future use. According to the research by Wongphat Chudam* and Irisa Prommachan on the development of indicators for learning management competencies of students in physical education teaching careers in the 4.0 Era, students need to adapt themselves to ongoing changes and have skills and well-rounded abilities based on morality and patience in order to promote creativity and be able to create knowledge from self-learning. Additionally, they need to instill in their students the ability to develop positive relationships while cooperating with others, work within a changing social context, and possess life skills. The introduction of technology use like the MS excel data analysis tool is very important for the learners as seen in the level of agreement responses that was mostly indicated of its efficacy, ease of use and usefulness, positive computer attitude, and statistics learning value.

Benefits of Using MS Excel in Learning Statistics

Benefits of Using MS Excel in Learning Statistics	Frequency	Percent	Rank
1. There is quick presentation provided for the data	75	100	1
2. There is a clear visualization of the data.	65	87	4
3. Create an easy-to-read set of data that can be easily compute values required in Statistics analysis	68	91	4
4. Design and provide a better picture of the information	60	80	6
5. Provide immediate results and solutions to problems in inferential statistics	66	88	5
6. Microsoft Excel Statistical functions enable students learn to work faster and accurate.	72	96	3
7. Quick display of information so that it can be appropriately analyzed and transferred to graphs or charts for better interpretation.	72	96	3
8. Improved capabilities and skills in handling big data for analysis.	73	97	2

The table displays the advantages that students have gained from using Excel data analysis to learn statistics. One hundred percent, or 75 out of the students, said that the information is

presented quickly. 73 of them, or 97 percent, said that working with statistics in Microsoft Excel improved their abilities and talents when handling huge volumes of data. Finally, the students indicated that there are significant benefits that students can receive from using Microsoft Excel in learning statistics, as shown in the table, with 72 or 96 percent of the students describing "rapid display of information so that it may be adequately examined and transferred to graphs" and "allow pupils to learn and work faster and more accurately. Divisi (2017) stressed in his study that the scientific world is enhanced daily with fresh knowledge due to new technology and continual discoveries.

Challenges faced by   Students in Learning Statistics in online mode of instruction.

Indicators	Frequency (No. of Students)	Percentage	Rank
1.Low communication network/limited internet	71	95	1
2. Lack of contact hours	54	72	4
3. Inability to focus	25	33	6
4.Being not accustomed to the system	60	80	3
5. Lack of learning facilities like computer, laptop, smartphone, headphone, etc.	38	51	5
6. Learning environment (Learning from home is not conducive for a study place.)	63	84	2

The table indicates the result of the survey about the challenges affecting students' attitudes towards learning statistics through online class or Google class due to pandemic. In the table, one major factor that the students considered that affected their attitudes towards learning during pandemic is low communication network or limited internet which has the highest frequency of 71 out of 75 respondents or 95%. This is followed by the learning environment with a frequency of 63 or 84%. Being not accustomed to the system was mentioned by 60 or 80% of the respondents and the indicator on the lack of contact hours has a frequency of 54 or 72%. So, in summary, almost all the marked factors are considerable reasons affecting the attitudes of students in learning during the time of pandemic.

CONCLUSION

Based from the result of the study, it can be concluded that the male and female students had acquired learning skills and derived benefits from the application of MS Excel in teaching and learning statistics and it has statistical significance. Likewise in the correlation of the learning skills and the benefits derived by the students from the use of Micro Soft Excel in statistics, it is moderate positive correlation. Therefore, the use of Microsoft Excel in teaching statistics can develop or enhance the skills of students in solution of problems involving data analysis and thereby providing them sure benefits which they can use in their real life situation.

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