

The results from applying statistical technology software into classroom in comparison against the lecturer's traditional calculation by hand

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ABSTRACT

The purpose of this research was to find out whether or not technology which has impact on the student's motivation, interested way of learning, understanding, ability to apply after graduation, effectiveness and should be applied again in the statistic subject. Our procedure involved the completion of one real classroom over the course of 15 weeks study. The entire class was designed to learn by the traditional way along with the computer-based statistical software to calculate the complicated numbers in statistics subject in order to compare the differences. Likert scale questionnaire and before-after-statistical test were used as tools to collect and analyze the data respectively. In addition, in-depth interview was also included to ensure the quality of quantitative findings. Results of this research indicated the idea that when applying technology into classroom at university level, students evidently and strongly prefer the technology rather than the traditional method where calculations take long time and are done by hand on the board.

Keywords: Applying statistical technology software, Traditional calculation by hand, Benefit of using technology

1. INTRODUCTION

Technology is now the forefront of the modern world to create new jobs, innovations, and networking sites to allow individuals to connect globally. Computer software and Internet are among the fastest growing and most important in education nowadays [1]. Evidently, companies accept and hire employees from online graduates to work for them not only from the traditional curriculum universities. This is a strong indication that students can benefit from technology learning process [2]. Undoubtedly, the educational leaders and policy makers are having difficulty managing the young students and preparing them for the 21st century. Innovative use of modern technology is one way to improve

the vision of schooling [3]. Hence, an attempt to introduce the technology into classroom and to measure the effectiveness might be worthwhile and could alleviate the difficulties for educational policy makers in Higher Education.

There is strong evidence indicating for using technology leading to higher score of standardized tests [4], nonetheless the noticeable emphasis should not be limited on the test score of that specific course. Instead, how to increase their motivation, enable those who cannot perform in traditional classes, make them more positive toward education with new technology should be carefully discussed by educational researchers [4]. There has been research finding that classroom is the place where students spend their learning

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times. Generally, students feel bored and have less contributions in traditional classroom without technology support. Teachers are not able to motivate the students. Therefore, it is a huge barrier to increase the quality of education [5].

Therefore, this research has been formed to reveal and answer questions to those challenges by testing in statistics class in International College of Rajamangala University of Technology Krungthep (ICRMUTK), a public university located in the central of Bangkok, Thailand. Traditional calculation by hand from mathematicians and university teachers on the board is the traditional way in class making students feel highly complicated and extremely bored. It also makes students who are not smart in mathematic often feel discouraged, lose focus and try to pass with minimum effort. In addition, the expected beneficiaries of this research are teachers who recognize themselves as furthering the improvement of the classroom and eliminating complications and boredom in statistic and related classes.

1.1 Literature Review

Educational results were identified in Pittsburgh, Iowa where an algebra curriculum that combined the traditional approach with the use of technological computer tools. Koedinger et al. [6] found that there was a 15% increased score on the Iowa Algebra Aptitude Test, which was significantly higher than the comparison group without such tools. Angrist and Lavy [7] presented a similar research finding that not only technology improve students' accomplishment on test scores, it also increases their GPA eventually. The empirical research finding show that technology integration in teaching field is encouraged for many reasons which include academic ability improvement, more engagement and better collaborative learning enhancement [8].

Furthermore, Morgan and Ritter [9] conducted an educational research on technology with Mathematics subjects in Oklahoma, United States. By choosing many ethnicities and both sexes to represent the data, they discovered the students in computer-based curriculum outscored the students registered for the traditional math curriculum in 5 of the junior high school within the testing area. Moreover, Harandi [10] strengthens the use of new technology, for instance, websites, computers, internet and electronic media in classroom and shows the results lead to successful learning process for students in university level. Technology does not limit itself into helping educational industry. In medical industry, it is also used in various fields to help people disabilities. One medical study found that reading disorder called Dyslexia prevents students to read quickly, spell and pronouncing words correctly can be improved significantly by using the computer remediation program. The score is much higher and rises above the normal range [11]. Even for country that is considered behind in Information technology, it is a powerful tool for the development of quality and must be ensured for maximized use in teaching and learning system [12].

Despite those successful in applying technology to students, many research findings said otherwise. Funkhouser [13] argues that some studies did not find significant differences in motivation, student attitude and improvement towards using technology even though most of the researches usually back up the correlation of improved attitude with applying technology in class. As one research concluded, Norton et al. [14] disagree with the claim that simply using technology or putting computers in the classroom is likely to lead the students to such positive changes in learning outcome. In fact, it would depend on many uncontrollable internal and external factors. Although

the students gain many benefits of using technologies, downloadable class materials, instant messaging, lack of engagements, technological cheating opportunities and the social network are considered the disruptions in classroom [15]. Lack of access, lack of effective training, students' attitude, and teachers' attitude were identified as barriers to hinder the use of technology [16]. Meanwhile, Younes and Al-Zoubi [17] conducted a research on exploration of pros and cons of the internet network which include several part of exchanging information, entertainment and communication. Apparently, over 90% of the respondents have strong desire to use the internet. However, their finding revealed the negative impacts on using internet such as ethical, social and health problems when overconsuming. Moreover, Younes and Al-Zoubi [17] point out that the value of oriented family interaction was eroded by negative impact of media and technology. Therefore, applying statistical technology software must be implemented in class with prudent consideration.

2.METHODOLOGY

2.1 Research Population and Data Collection

The 4th year undergraduate students in ICRMUTK with the total of 37 are the research populations. There are 17 male and 20 female students with the age range of 22 to 25 years old who already have some knowledge about statistic from hand-calculated General Mathematics and Quantitative Analysis subjects throughout the first three years of the university. They were approached by the researcher inside the classroom since week 1 given the 15 weeks long in one semester. International Business Research is a required class as a core subject for the students in the last year prior to graduation which includes

many types of complex hand calculations. Therefore, this research selected and tested in International Business Research subject.

To actively approach the students who were used as samples, clear explanation and instructions by the researcher were informed repeatedly about the goal and benefit of this research since week 2 and later on. After week 15, the researcher asked them to complete the questionnaires by comparing the hand calculation against the applying the technology of statistical software. To assure the most accurate data, the questionnaires have been screened by the researcher and 2 assistants to avoid simple mistakes. In addition, qualitative data were obtained from in-depth interview from some students.

Prior to commencing the testing, the researchers determined the significant level at 0.05. The 5-point Likert-type scale has been put in the questionnaires to make it applicable for respondents when filling the information. The range of score from the respondents is 1 to 5 with indication of strongly disagree to strongly agree respectively with 3 as neutral in order to ensure the accuracy and standard when data collecting.

2.2 Actual classroom procedures

Multiple functions in statistical software namely SPSS, Excel and Minitab. are calculated and shown on the board to the 37 students as shown in Table 1. Due to the fact that each software does not have all calculation functions to cover different types of statistical knowledge, the researcher applies 2 software to make the class as effective as possible

Meanwhile, the class usually starts with hand calculation before applying statistical technology software. For that reason, the students perceive the sense of comparison throughout the semester.

Table 1. Completed details of function buttons demonstrated in real classroom

Statistical software program	Direction: Click the buttons below in order			Student's learning objective
SPSS	Analyze=>	Descriptive Statistics =>	Explore	Normality of the data
	Analyze=>	Compare Means=>	One Sample T-test	Significant level of data
Excel	Data=>	Data Analysis =>	Anova: Single Factor or Anova: Two Factor	Analysis of variance of data with single and two factors
	Stat=>	Basic Statistics =>	Normality Test	Normality of the data
Minitab	Stat=>	Nonparametric=>	1-Sample Sign	Significant level of data
	Stat=>	Regression=>	Fit Regression Model	Significant level data with regression model

2.3 Research Hypothesis

To measure the internal consistency for Likert-type data collected, Cronbach's Alpha will be tested to check the reliability before further analyzing data.

The hypothesis of the normality of the collected data

Two separate hypotheses are presented below for this research. Secondly, the normality test of the collected data will be tested to find out whether or not they are normally distributed in order to select the most accurate statistical running software. The Kolmogorov-Smirnov test by Minitab is applied for this hypothesis.

H_0 : the collected data from this class has normal distribution

H_1 : the collected data from this class does not have normal distribution

The hypothesis of positive implication

Last, the attempt to test positive implication by using **Before** (traditional hand calculation method) against **After** (using statistical software/ technology application in the subject). The hypothesis is seeking the result for testing in six different categories including motivation, interesting way of learning, understanding, ability to apply after graduation, effectiveness and technology continuation in the statistic subject.

H_0 : **After** applying Technology in class, it does not have positive impacts to the students than **before**.

H_1 : **After** applying Technology in class, it has positive impacts to the students than **Before**.

3. RESULTS AND DISCUSSION

Table 2. Reliability Statistics by SPSS

Cronbach's Alpha 0.857	Number of Items 6	
Item-Total Statistics		
Category of Testing	Scale mean if item deleted	Cronbach's Alpha if item deleted
Motivation (Q1)	5.6757	0.854
Interesting way of learning (Q2)	5.5135	0.818
Understanding (Q3)	6.2162	0.842
Ability to apply after graduation (Q4)	5.4865	0.849
Effectiveness (Q5)	5.5135	0.814
Technology continuation (Q6)	5.7838	0.821

The Cronbach's Alpha scores from question 1 to 6 from Table 2 above are all high with the lowest score of 0.814. It can be anticipated that the data has acceptable reliability since the reliability coefficient of 0.70 or higher is considered to be qualified in most researches.

Table 3. Tests of Normality of Collected Data by SPSS

Category of Testing	Kolmogorov-Smirnov		
	Statistic	N	Significant Level
Q1	0.184	37	0.003
Q2	0.199	37	0.001
Q3	0.183	37	0.003
Q4	0.178	37	0.004
Q5	0.216	37	0.000
Q6	0.199	37	0.001

Before running the data by using statistical software of Minitab, the raw data is required to test their normality in order to have the most accurate research finding. As presented in Table 3, the numbers of P-value or significant level are all less than 0.05 and stay near 0.00 which reject the hypothesis. These indicate the data collected from the questionnaires is not normally distributed. Therefore, statistic function such as One Sample T-test from SPSS is ignored, and the nonparametric 1-sample Sign Test from Minitab software is chosen.

Table 4: Descriptive statistics by Minitab software version 18

Sample	N	Mean	Standard Deviation	Std. Error Mean
Q1	37	1.1622	1.40463	.23092
Q2	37	1.3243	1.39551	.22942
Q3	37	0.6216	1.60470	.26381
Q4	37	1.3514	1.29564	.21300
Q5	37	1.3243	1.27048	.20887
Q6	37	1.0541	1.15340	.18962

Table 5. The nonparametric Sign Test by Minitab software version 18

Sign Test for Median: Q1, Q2, Q3, Q4, Q5, Q6
 η : median of Q1, Q2, Q3, Q4, Q5, Q6

Null hypothesis		$H_0 : \eta = 0$		
Alternative hypothesis		$H_1 : \eta > 0$		
Sample	Number < 0	Number = 0	Number > 0	P-Value
Q1	7	9	21	0.006
Q2	7	6	24	0.002
Q3	10	7	20	0.049
Q4	5	10	22	0.001
Q5	7	6	24	0.002
Q6	3	11	23	0.000

After running the data by using nonparametric test of Minitab on Table 4, the descriptive all 6 questions are presented with number of respondents, mean, standard deviation and standard error. On Table 5, the results tend to be in the same direction representing all numbers of P-value or significant level at less than 0.05. These rejected the hypothesis. Therefore, After applying Technology in class, it has positive impacts to the students than Before. However, question 3 presented to P-value of 0.049, which is the nearest to not being rejected at >0.05 . For this question, the respondents are doubting whether they have better understanding when applying technological statistical software in class against the calculation by hand. In fact, calculation by hand remains the fundamental of mathematical and statistic subject by most teachers.

Overall, the findings in this research indicate that applying technology in statistic related subject is moving toward benefits rather than negative which is related to work done by [12]. Technology provides the amazing potential to deepen skills, accelerate, engage and enrich students. Furthermore, better school experience, strengthening teaching and helping positive changes are the result of applying technology [12]. The respondents apparently demand more technology which is associated with the finding of McIntyre et al. [8] where they point out the trend of the students are quite hungry for greater autonomy, independence and technology in classroom learning more than they commonly receive from teachers.

From study's in-depth interviews, it was found that statistical technology software such as SPSS, Excel and Minitab made students feel more motivated, interested and effective because it provided the easiness and saved

substantial amount of time from the hand calculation by teachers. Students can play on their phones and lose focus any moment during class. They realized and agree with the fact that once they have jobs after graduation, there is a possibility to use these statistical functions to calculate real data. In fact, they cannot do the same with the complicated hand calculations. The qualitative data reveal clear implication about the level of understanding of the selected subject in this research. Despite the fact that 21st century students are likely to take shortcut and prefer the easiest way to pass the class, they realized and informed the understanding of statistic related class must come from calculation by hand. From the quantitative and qualitative interpretation, researchers have to continue the testing and investigation on how much value of technology to education in the hope of significantly outscoring the barriers [18].

4. CONCLUSIONS

This group of 4th year student prefers using technology in the statistics class and demand more technology in the future. Undoubtedly, the benefit of using technology in teaching the classroom is significant and technology itself has potential to be a powerful tool in education. Nevertheless, there are controversies in this topic and By evaluating this research findings and reviewing many technology-based learning and teaching research, educators and teachers need to realize that benefit of using technology does not solely determine by its effectiveness instead it is the pedagogy who does. To make a smooth transition from traditional teaching method to highly enriched-technological method, teachers are obligated to monitor, adapt and alter their teaching approaches to

achieve the near perfect results. That notion implies more additional outside-of-class work for teachers along with more sacrifices in their professions.

5. RESEARCH SUGGESTIONS

To get more thoroughly accurate research finding, the data based on the sex of the respondents should be separately collected. So, the research could see the differences and test whether they are significant. Furthermore, group of respondents should not only be limited within the International College ICRMUTK. Different majors such as engineers, liberal art, tourism, education, business Thai program and textiles are available to research.

6. REFERENCES

- [1] Grubler A., Technology and Global Change. Cambridge: Syndicate of the University of Cambridge; 2003.
- [2] O'Donoghue J., Singh G., Green C. A Comparison of the Advantages and Disadvantages of IT Based Education and the Implications upon Students. Interactive Educational Multimedia 2004; 9:63-76.
- [3] Ball DL., Forzani FM. The Work of Teaching and the Challenge for Teacher Education. Journal of Teacher Education. 2009; 60(5):497-511.
- [4] Saba A. Benefits of Technology Integration in Education. Synthesis paper, Boise: EducationTech 501; 2009.
- [5] Tas S. According to Candidate Teachers Views Classroom Management Problems of Teachers in Traditional and Technology-supported Classrooms. Universal Journal of Educational Research 2017; 5(11):2005-15.
- [6] Koedinger K., Anderson JR., Hadley W.H., et al. Intelligent tutoring goes to school in the big city. International Journal of Artificial Intelligence in Education 1997; 1(8):30-43.
- [7] Angrist J., Lavy V. New evidence on classroom computers and Pupil learning. The Economic Journal 2002; 112:735-65.
- [8] McIntyre D., Pedder D. and Rudduck J. Pupil voice: comfortable and uncomfortable learnings for teachers. Research Papers in Education 2005; 20(2):149-68.
- [9] Morgan P., Ritter S. An experimental study of the effects of Cognitive Tutor® Algebra 1 on student knowledge and attitude. Pittsburgh: Carnegie Learning, Inc.; 2002.
- [10] Harandi SR. Effects of e-learning on students' motivation. Procedia-Social and Behavioral Sciences 2015; 181: 423-30.
- [11] Temple E., Deutsch G., Poldrack R., et al. Neural deficits in children with dyslexia ameliorated by behavioral remediation: Evidence from functional MRI. Proceedings from the National Academy of Sciences 2003; 100(5):2860-5.
- [12] Yusuf MO. Information and communication education: Analyzing the Nigerian national policy for information technology, International Education Journal 2005; 6(3):316-21.
- [13] Funkhouser C. The Effect of Computer-Augmented Geometry Instruction on Student Performance and Attitudes. Journal of Research on Technology in Education 2002; 35(2):163-75.
- [14] Norton S., McRobbie CJ., Cooper TJ. Exploring Secondary Mathematics Teachers' Reasons for not using Computers in Their

- Teaching: Five Cases Studies. Journal of Research on Computing Education 2000; 33(1):87-110.
- [15] Nworie J., Haughton N. Good intentions and unanticipated effects: The unintended consequences of application of technology in teaching and learning environments. Tech Trends 2008; 5(5):52-8.
- [16] Riasati MJ., Allahyar N., Tan K. Technology in Language Education: Benefits and Barriers. Journal of Education and Practice 2012; 3(5): 25-30.
- [17] Younes MB., Al-Zoubi S. The Impact of Technologies on Society: A Review. IOSR Journal of Humanities and Social Science 2015; 20(2):82-6.
- [18] Davies TL., Lavin AM., Korte L. Student perceptions of how technology impacts the quality of instruction and learning. Journal of Instructional Pedagogies 2009; 1:2-16.