A Multivariate Survey Analysis: Evaluation of Technology Integration in Teaching Statistics

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Teaching and learning in higher education has been influenced by the rapid rate of innovation in technology. We have experimented with the integration of technology in our foundation Statistics subject and measured students' performance relative to those taught statistics by the traditional teaching of the same subject: a total of 144 students of 30 different nationalities taught by the new methodology were surveyed at the end of the subject before the final examination.

Introduction

Statistics played a vital role in our daily math world. It is a method used on how to interpret, analyze and evaluate the findings of any research inquiries. Having this in mind, an increase of dilemma on how to cope with the shifting from traditional tool to modernize method. A growing movement has seen in introducing statistics in all levels of education (Garfield & Ahlgren, 1988). Many statisticians as well as mathematics teachers have been involved in this reform. In the modern society, there is a strong awareness with the relevance of statistics in any form of research and fact finding articles. Thus, university students and teachers' still find Mathematics and Statistics an anxiety-provoking and difficult subject. True enough that many research studies confirmed this perception (Baharun & Porter, 2009; Fortes & Tchantchane, 2010). Another challenge that called the attention of many statistic educators is the diverse group of students with different societal traits, expectations and backgrounds making the teaching methodology more diverse (Peiris & Beh, 2006; Fortes & Tchantchane, 2010). Therefore, it is important for teachers to put a standard method on how to teach statistic effectively with the use of either Scientific Calculator (traditional tool) or Excel Spread sheet (modernized tool or technology).

Integration of technology is really perceived by educators as a very important tool for effective delivery of teaching for all levels of education. This concept has been supported by National Council for Mathematics Teachers and American Statistical Association. In U.A.E., very seldom we see articles involving new

technology as a modernize tool in teaching Statistics as compared to the numerous studies conducted in Australia, USA, and New Zealand. Exploring the impact of teaching statistics with the use of Excel as a new technology has been a challenge not only to educators but to students as well. The University of Wollongong in Dubai, teaches introduction to statistics with the use of traditional method which is using only a Scientific Calculator. In the recent years, students were required to take down notes during class lecture or tutorial and solving problems with the aid of a scientific calculator; moreover graphic calculators were not allowed during examination. Currently, the University is using technological tools such as online course materials wherein we provide up dated lecture and tutorial materials which can be found by our students in the university website, but still we find this approach inadequate for students to learn statistic in a more simplified way. It is well-thought limited because students are not able to explore real, large and complex data and student are confined with formulas, sometimes they find it vague or abstract. More often than not, students find Statistics more difficult and complicated compared to Mathematics subjects.

Difficulty in understanding Statistic became a major concern to all educators. This has driven them to a question on how to improve the academic performance of the students and motivate them in understanding the concepts with the use of a new method to simplifying the operations of statistics. To address these issues, we attempted to integrate the new technology as a new tool in teaching statistics that will not only remain but will improve the curriculum and without sacrificing the content of the subject. Though we expect challenges ahead with this innovation and perceive that through the use of this new technology it will further facilitate students to learn statistical concepts with greater understanding and ease. It will rectify students from the burden of working out on the statistical formulas from which they can have more time to analyze, interpret simple or complex data, and justify their conclusions based on a data.

Students can develop positive attitudes in classes that include computer-based instruction and collaborative group work.

We therefore, aim to answer the following research questions:

i.   In teaching introduction to statistic, will the integration of a new technology have an effect on student's academic performance?

ii.   What will be the perception of the students in the integration of a new technology that will be used in statistic

iii.   Are the learning outcomes such as organizing data into tables and graphs, summarize data using appropriate statistical methods, able to draw conclusion from the data, and show relevance of statistics to a wide range of discipline in everyday life is achieve using technology

This study will attempts to fill the gap of literature from different countries for it can be comparable factor with UAE since the focus of teaching statistics is not yet as popular as teaching mathematics here in the region.

Technology in Teaching Statistics

In the advent of technology and its gaining popularity in the 21st century, there was a need to integrate technology in teaching and learning in the academic subject areas (Neiss, 2005). This reform radically affects what we teach and alter our way of teaching. Similarly, in 2005, Thomas and Hong (cited in Neiss, 2005) developed the concept of teachers such pedagogical technology knowledge (PTK), and recently known as (TPCK). From this concept, techology has been an important instrument for learning statistics, hence teachers must also develop an overarching conception of their subject matter in teaching with technology (Neis, 2005). Integration of technology in teaching and learning is about the content and effective pedagogy. In the case of Statistics, the substantial change in teaching statistics created strong synergies between technology, pedagogy,

and content (Moore, 1997; Velleman, 1995). According to Moore (1997) requiring students to work in groups and discussing their works orally and in writing, various diagnostic tools to analyze data, and computer-intensive statistical practive facilitates student learning. Figure 1. illustrates the framework of technology, pedagogy, content and knowledge.
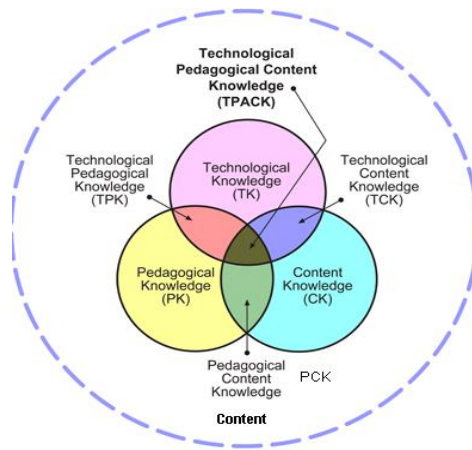

Figure 1. **The Venn diagram of TPACK**

In addition, National Council of the Teachers in Mathematics has this technology principle "Technology is essential in teaching and learning; it influences the mathematics that is taught and enhances learning" (NCTM, 2000). It further explained that technology such as calculators and computers are reshaping the mathematical landscape and encourage school mathematics to reflect the changes. In this principle, with the use of technology appropriately and conscientiously, students can learn mathematics more deeply, speculate and make inferences and be able to work at higher levels of generalization or abstraction (NCTM, 2000). These principles suggest therefore that technology plays a very important role in the learning curve of the students. Similarly, the American Statistical Association (ASA) supported the principle the use of technology for developing conceptual understanding and analyzing real data (GAISE, 2007).

Various investigations has been made on the different approaches of teaching methodology with the integration of technology and the impact in student's learning (Neiss, 2005; Baharun & Porter, 2009; Gorman, 2008; Sam & Kee, 2004; Prabhakar, 2008; Tsao, 2006). Many government agencies even invested huge amount of money in professional development of mathematics teachers in technology-enhanced teaching and learning. In Puerto Rico, the Institute for the Enhancement of Teaching and Learning (IDEAS) was created in 1994. One component of the institute is the Faculty of Development Program focused on content and pedagogical techniques through the use of technology in the classroom, non-traditional teaching and learning styles in enhancing teaching and learning to help students to learn (Morales & Roig, 2002).

Interestingly, the most important impact of the integration of technology in the classroom was the students enjoyed the learning experiences and resulted to a more responsible for their own learning. Though there may be drawback of technology-enhanced teaching and learning, still outweighed by the advantages based on the previous research findings. Here are some of the positive effects of integration to the new technology based on the research findings:

- *integration of technology can be used as a tool for supporting and enhancing student's learning*
- *wider learning benefits which may accrue from integrating ICT*
- *can provide unique opportunities for students to do mathematical tasks in new ways that may have*

foster learning and development
- *significant tool for promoting mathematical problem solving, reasoning, and exploration*
- *students are motivated to generalized and formalize so that they can device their own ways to command the computer to draw graphs or to solve numerical problems*
- *students can build their own understanding using computers as resource tools, or as a communication tool to share their ideas with other learners*
- *They can share and compare their individual understanding and experiences.*

Technological Tools in Statistics Instruction

The rapid popularity of the capabilities of technology increased, and more software tools have been released, and technology has been considered in facilitating students' learning of statistics (Garfield, Chance & Snell, 2000). While software has been available for doing statistical analysis, the use of technology in teaching and learning statistics is continuously developing. There are several types of technology being use in statistics instructions namely, statistical packages and spreadsheets, Web or computer-based tools, graphic calculator, or programming languages. Calculators and computers reduce the computational burden; allow more extensive exploration of statistical concepts.

In Malaysia, in 2000, there was call of for a need to integrate information technology in the teaching and learning of mathematics (Sam & Kee, 2004). Though some of the teachers as well as parents believed that the use of calculators may lose basic mathematical skills and understanding of the students as the prerequisite for advance mathematics, teachers introduced graphic calculator in teaching Math courses. The result indicated a positive impact on the culture of statistical learning, students became active in group participation, and students enjoyed learning statistics and also improved their understanding and skill in statistics. According to Liang (2000) computer programs showed students attracted to the interactive computer programs designed for business statistics course, students were motivated to attend classes when computer programs are applied to teaching. In addition, students were able to understand confusing topics, and felt that teaching them to use computer facilities really improves their own abilities to apply similar programs in analyzing real-world problems.

As mentioned in Sharma & Barrett (2007), supporting a course with technology can allow learners and teachers more flexibility in both time and place, and complements and enhances face-to-face teaching. Introducing new technology into the classroom can present challenges with students' reception acceptance (Gorman, 2008) and the use of technology for teaching statistics has been explored recently (Su & Liang, 2000; Morales & Roig, 2002; Baharun & Porter, 2009; Prabhakar, 2008; Velleman, 1995,) and findings suggested more on positive impact.

Nowadays, students are more confident with computers, this can support to motivate students, and apparently using computer applications is more effective learning (Peiris & Beh, 2006). It is clear that the need to strengthen research into statistics education is becoming more and more relevant in many workforces whot are involved in decision-making process (Peiris & Beh, 2006; Peiris & Peseta, 2004).Therefore, this study is based on the concept that classroom teaching blended with technology can be a significant factor in promoting academic innovation and in transforming the teaching and learning in statistics paradigm.

Teaching Methodology and Survey Design

The typical content of introduction to statistics is divided into three sections: descriptive statistics, probability theory and inferential statistics. Descriptive statistics includes presentation of data (charts, frequency distribution table, histogram, polygon, scatter plot, and box-plot), measures of central tendency (mean, median, and mode), and measures of dispersion (range, interquartile, variance, coefficient of variation, standard

deviation). Probability theory covers rules of addition and multiplication, independent and mutually exclusive events, marginal and joint probability, probability distributions, normal distributions, and inferential statistics includes sampling and estimating population mean and confidence interval. This new subject designed includes 1-hour lecture, 1-hour tutorial and 1-hour computer laboratory. We introduced MS Excel as part of the pedagogy which is a widely used package, user friendly, accessible and cost-effective. Students learn to set up a simple spreadsheet and use it in posing and solving problems, examining data, and investigating patterns/distribution of the data, producing summary statistics and charts, writing equations and using data analysis tools and Excel statistical commands. Students are expected to attend each lecture but not compulsory, while attendance is compulsory for each tutorial & computer laboratory class within a 13-week of session. All lecture notes, tutorial and laboratory works, review materials for all assessments were uploaded in the university intranet.

For the survey, a structured questionnaire was used to collect the demographic information about the students which also includes gender, nationality, and background in statistics (if there's any). There were questions about their perception towards Statistics, the teaching styles, expectations and their perception on the integration in the course. These items were measured using a 5-point Liker –type scale, ranging from Strongly Disagree (SD) to Strongly Agree (SA). A statistical analysis was carried out to test the hypotheses of this research.

Findings

Survey Analysis

There were 144 students responses out of 162 officially enrolled in the introductory Statistics offered by the Faculty of Computer Science and Engineering at University of Wollongong in Dubai. Demographic information such as nationality, gender, expected grades in Mathematics and Statistics, as well as the perception of students towards teaching with the use of technology data were collected through structured questionnaire. Out of 144 respondents, 47.22% were female and 52.8% were male from 30 different nationalities. About 60.4% (87 out of 144) are first time to study Statistics while 39.6% (57 out of 144) already studied in their secondary education or repeaters. Survey details showing the percentages of their responses in each item with the corresponding mean and standard deviation are given in Appendix A. The survey results indicate the following:

1- more than 86% of the students feel knowledgeable in organizing data in tables, producing graphs and summarizing data.
2- only 18% of the students feel that statistics is harder than Mathematics
3- 35% of the students feel that the 2 hours lab is too long while 47% are happy with that.
4- 53% among the good students (with C or D or HD) think that a one hour lecture is not enough.
4- 80% of the students have a positive perception towards the teaching staff
5- 40% among the weak students with (F or PC or P) recommend the book and found it helpful versus only 30% among the good students (C or D or HD)
6- 56% among the weak students find probability the hardest topic in Statistics
8- Among those who have already taken statistics 75.5% got above average compared to about 71% among those who have taken statistics for their first time.

Inference about the difference between the traditional and technology teaching

In order to measure whether students' performance when taught with traditional way vary significantly with those students' performance taught with integrated technology, the differences between the proportions are transformed to an approximate standard normal distributed random variable Z. For each performance category (HD, D, C, P, F) the calculation of the Z value is obtained using:

$$Z = \frac{\hat{p}_{techno\log y,c} - \hat{p}_{traditional,i}}{\sigma_{p_{technology,c} - p_{tradition,c}}} \tag{1}$$

Where for each category of performance the corresponding sample proportions are determined:

$$\hat{p}_{traditional,C} = \frac{X_{traditional,c}}{n_{traditional}} \tag{2.a}$$

$$\hat{p}_{technology,C} = \frac{X_{technology,c}}{n_{techno\log y}} \tag{2.b}$$

Where $X_{traditional,c}$ and $X_{technology,c}$ are the number of students in each of the performance category respectively in the traditional class and the technology class. $n_{traditional}$ (=100) and $n_{technology}$ (=159) are the total numbers of students who attended respectively the traditional teaching and the technology teaching. $\sigma_{p\text{-technolgy-}p\text{-traditional}}$ is the standard error of the difference between the two populations' proportions:

$$\sigma_{p_{technology,c} - p_{tradition,c}} = \sqrt{\frac{p_{techno\log y,c}(1 - p_{techno\log y,c})}{n_1} + \frac{p_{traditional,c}(1 - p_{traditional,c})}{n_2}} \tag{3}$$

However since the standard error is unknown, we use the pooled proportion estimate defined by:

$$\hat{p}_C = \frac{X_{traditional,c} + X_{techno\log y,C}}{n_{traditional} + n_{techno\log y}} \tag{4}$$

As can be seen from Table 1, the results reveal that students tend to achieve significant better performance with technology and the failure rate is reduced significantly from 37% from 14% (p_{value}= 0.00).

Table 1. Inference about the difference between the traditional and technology teaching using Z-distribution

Performance Category	Traditional Teaching	proportion %	Teaching with Technology	proportion %	Pooled Proportion	Standard error	Z stat	p_{value}
High distinction	10	0.10	51	0.32	0.24	0.05	-4.08[**]	0.00
Distinction	14	0.14	30	0.19	0.17	0.05	-1.02	0.15
Credit	18	0.18	27	0.17	0.17	0.05	0.21	0.41

Pass	17	0.17	21	0.13	0.15	0.05	0.84	0.20
Pass conceded	4	0.04	8	0.05	0.05	0.03	-0.38	0.35
Fail	37	0.37	22	0.14	0.23	0.05	4.33[**]	0.00

[**] The difference is significant at 0.01

Chi-Square test

To test the hypothesis that there is no relationship between teaching methodology and the students' performance, a chi square test has been conducted to test the homogeneity of proportions of the various performance groups:

H_0: $\pi_{HD} = \pi_D = \pi_C = \pi_P = \pi_{PC} = \pi_F$

H_a: At least one of the proportions differs than the others.

A two-way contingency table Chi-square analysis reveals a chi-square value of 28.7 (p_{value}=0.0) indicating that the null hypothesis is rejected. Therefore there is a significant variation in the performance proportions between traditional and teaching with technology. However, conducting a sub-hypotheses of the $\pi_D = \pi_C = \pi_P$ could not be rejected with a chi-square value of 0.5 (p_{value}=0.7) indicating that the difference in proportions between these three categories are not that significant. The sub-hypothesis $\pi_{HD} = \pi_F$ is rejected with a chi-square value of 27 ($p_{value} = 0.0$). These results are in concordance with those determined using Z distribution.

Factor Analysis of the survey

We have employed factor analysis as a data reduction technique in order to define the underlying structure among the variables (item 1 to item 40). Such technique would group highly correlated variables into groups or factors which would help us to find patterns of relations among the variables. Figure 2 illustrates the overall model of our analysis.
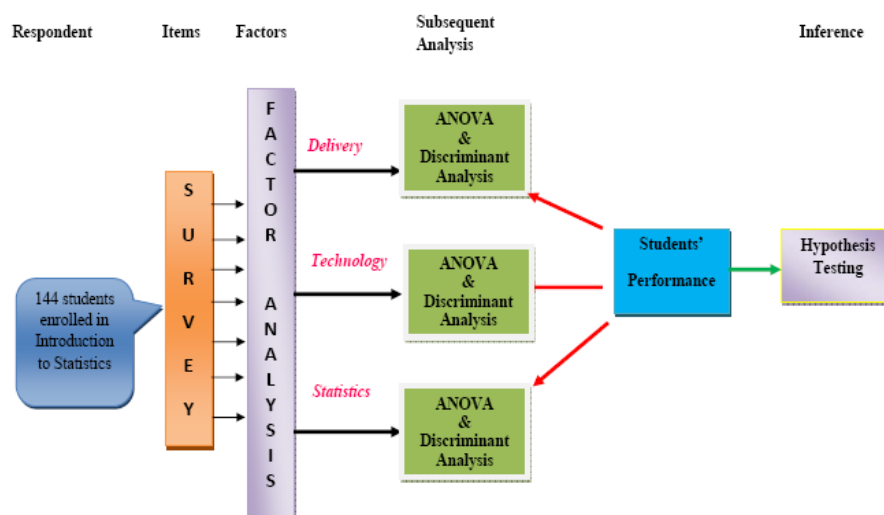

Figure 2. Overall model of the analysis

To start this analysis, we issued the following SPSS commands: *Analyze->Dimension Reduction->Factor*. Based on the 40 items correlation matrix, *Principal Component* and *Varimax* were selected respectively as the extraction and rotation methods in the analysis. In order to make the output easier to scan and since factor loading less than 0.5 are too small to be considered, we suppressed the low absolute loadings at 0.5. Analysis results revealed that the first factor explains 44.21% of the total variance of all items. The second factor added 7.2% to the accumulated variance and the third factor explained only about 4% for a total of about 56%. Examining the items clustering to each of the three factor, we conclude that the first factor concerns students' perception and satisfaction towards the delivery of the subject and teacher evaluation clusters twenty one items of the survey questions (8, 11, 14-16, 18, 19, 22, 23, 25, 27, 28, 30, 31, 33-40). The second factor concerned perception towards the use of technology and includes 7 items (1-3, 5-6, 20, 24). The third factor consisting of 5 items (4, 12, 21, 29, 32) concerns students perception towards statistics. Items 9 and 17, corresponding to whether statistics is easier than Mathematics and whether the computer lab timing was too long, did not hang to any of the three factors. As well the two items related to the text book did not cluster to any factor. Note that while the results are not sensitive to the extraction and rotation methods, the number of factors retained is very crucial. We have retained three factors based on the Scree plot and the interpretability of the factors. Further, we have measured the reliability of each of the three sets of items corresponding to the three factors retained. The reliability analysis test conducted confirmed a Cronbach's alpha=0.96 for the first set of items, Cronbach's alpha=0.85 for the second set and Cronbach's alpha=0.83 for the third set. For the reliability analysis, no item had to be reverse-scaled. The values of the Cronbach alphas and their corresponding split half coefficients were the same suggesting that there are no anomalies in the data survey and that each set measures a single construct. Based on this analysis three new variables were constructed by averaging the items corresponding to each factor and were labelled by *delivery*, *technology* and *statistics*.

Factor Analysis subsequent Analysis: One Way ANOVA

A one way ANOVA analysis was conducted to examine any association between the three new constructs *delivery*, *technology* and *statistics* and students' performance. Students were grouped into three performance categories (Fail+Pass Conceded, Pass+Credit and Distinction + High Distinction). The categories means' for each construct are compared by ANOVA. As can be seen from Table 2, the means for the students' perception towards *technology* differ significantly (p=0.005) among students performance. Similarly, the means for the students' perception towards *statistics* increases with the respect to the performance but the difference is only significant at 5%. However students' perception towards the subject *delivery* and teacher evaluation did not depend on students' performance.

Table 2. Means comparison as a function of students' performance

Construct	Fail and Pass Conceded	Pass and Credit	Distinction and High Distinction	F_{STAT}
Delivery	3.78	4.01	4.11	2.1(.132)
Technology	3.90	4.01	4.32	5.5(.005)[**]
Statistics	3.44	3.85	3.88	3.1(.05)[*]

In parenthesis are p values. Means' scale is 1-5.

[**] Null hypothesis is rejected at 1%.   [*] Null hypothesis is rejected at 5%.

Factor Analysis subsequent Analysis: Discriminant Analysis

Discriminant Analysis is performed to establish whether differences in perceptions (subject delivery, technology benefits and Statistics) exist between the three students' performance groups. To start this analysis, we issued the following SPSS commands: *Analyze->Classify->Discriminant*. The three constructs are defined as independent variables and the three levels students' performance as the grouping variable. Stepwise method reveals that only the factors *Technology* and *Statistics* are significant to predict students' performance from his/her response to the survey. The hit ratios using the two predictors are given in Table 3. As can be seen, students who did not do well in the subject were poorly discriminated from the other groups. This is due to the fact that even the students who did not perform well in the subject had a relatively similar positive perception towards the delivery, the introduction of technology and Statistics.

Table 3. Hit Ratio of the two predictors

Performance Group	Hit ratio	Hit ratio with cross validation	Hit ratio by chance
Fail and Pass Conceded	5%	1%	14%
Pass and credit	30%	21 %	30%
Distinction and high distinction	90%	89%	56%

Conclusion

The inclusion of technology has given the students the opportunity to apply the statistical concepts to real-world situations. The students learned to present data into frequency tables, histograms and contingency tables with the use of Excel program. They also learned to summarize data using Excel data analysis tools and to produce box plots. Furthermore, the analysis of the survey highlighted the students' positive perception regardless of their overall performance and the failure rate was reduced from 34% with traditional teaching to only 14% with the inclusion of technology. Overall, the survey expressed a significant result showing that the use of Excel as new technology, students performed much better.

The application of Excel at the foundation level of statistic will help the students in various situations; maximize their time in analyzing the data and other quantitative subjects such as accounting, finance, computer application, and management decision making tools. Nevertheless, we must remain deliberately cautious with the use of new technology is not the subject but only tools that will help simplify the approach in statistic. Thus, we need to keep in mind that we still have to focus on teaching the concepts of statistics and not the technology used.

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Appendix A

Table1. Percentages, Mean and Standard Deviation for each item

Items	1 S.D	2 D	3 N	4 A	5 S.A	Mean	SD
1	I can organize data into tables and graphs using Excel program.	.7	3.5	5.6	43.1	47.2	4.00	.79
2	I can summarize data using computer program.		2.8	11.1	42.4	43.8	4.27	.76
3	I can easily interpret the data using Excel Program.	.7	3.5	9.0	46.5	40.3	4.22	.80
4	Statistics is relevant in my everyday life	.7	9.7	35.4	29.9	24.3	3.67	.97
5	Working with my classmates in the computer lab is very useful.			17.4	41.0	36.8	4.08	.89
6	Using computer program is very helpful in problem solving.	2.1	4.9	11.8	31.3	50	4.22	.97
7	The textbook is very helpful in answering my assignment.	11.8	14.6	36.8	23.6	13.2	3.12	1.17
8	Exercises given in the tutorial is very helpful			11.1	35.4	47.9	4.24	.91
9	I find Statistics easier than Mathematics	6.9	11.1	23.6	25	33.3	3.67	1.24

10	I recommend the textbook for Statistics related subjects	12.5	16.7	39.6	19.4	11.8	3.01	1.15
11	The concepts of Statistics is well explained in the lecture	.7	2.8	11.1	47.9	37.5	4.19	.79
12	The subject is interesting and fun	2.1	5.6	20.1	39.6	32.6	3.95	.97
13	One hour lecture is not enough to discuss concepts of statistics	8.3	25.0	19.4	29.2	18.1	3.24	1.24
14	Teachers are very helpful and supportive	2.1	5.6	11.8	38.2	42.4	4.13	.97
15	Hand-outs are helpful and excellent	2.1	2.8	7.6	43.8	43.8	4.24	.87
16	I can ask questions and get points clarified	1.4	6.9	15.3	44.4	31.9	3.99	.93
17	The tutorial and computer lab is too long	10.4	25.0	18.1	29.9	16.7	3.17	1.20
18	There is a sufficient review materials provided for the exams	1.4	3.5	16	43.8	35.4	4.08	.88
19	I can learn concepts when my teacher gives examples based on real life situations	1.4	7.6	16.7	49.3	25.0	3.89	.91
20	Computer lab session is better than purely lectures and tutorials	1.4	6.9	17.4	40.3	34.0	3.99	.96
21	I find statistics interesting and relevant	1.4	8.3	19.4	45.1	25.7	3.85	.94
22	I can easily learn and apply the concepts learned in the lecture using computer program and in the tutorial	.7	5.6	16.7	48.6	28.5	3.99	.86
23	Exercises given in the computer lab is very helpful	1.4	3.5	9.7	48.6	36.8	4.16	.84
24	Using computer program, I can analyze data better	1.4	4.2	13.9	47.2	33.3	4.07	.87
25	The teaching staff are approachable when I need help	2.8	6.3	14.6	41.7	34.7	3.99	1.00
26	I find probabilities hardest topic in Statistics	12.5	24.3	23.6	29.2	10.4	3.01	1.20
27	The teacher gives presentation helpful for examination	1.4	4.9	18.8	48.6	26.4	3.94	.87
28	The teacher encourages me to think on my own	2.8	4.9	16.7	45.8	29.9	3.95	.95
29	I can apply in other subjects what I have learned in Statistics	1.4	9.0	21.5	47.2	20.8	3.77	.92
30	My learning experience in this subject made me enthusiastic about further learning	3.5	6.9	25.7	41.7	22.2	3.72	1.00
31	The teachers give consultation hours where I can reach them and offer additional help	.7	6.3	18.1	47.2	27.8	3.95	.88
32	I can relate that Statistics is used in the real world	2.1	7.6	18.1	50.7	21.5	3.82	.92
33	The teaching staff gives regular feedback		6.3	19.4	50.0	24.3	3.92	.82
34	The lecture notes, hand-outs are well-organized, well written and useful	.7	4.9	10.4	43.1	41.0	4.19	.86
35	The type of questions assigned for homework helps me learn the material better		6.3	7.6	44.4	41.7	4.22	.83
36	The midterm review lecture was informative and helpful	2.1	3.5	11.1	41.0	42.4	4.18	.91

37	The midterm exam difficulty level is fair	2.1	6.9	18.8	41.7	30.6	3.92	.97
38	Explanation of concepts is adequate	1.4	5.6	12.5	51.4	29.2	4.01	.87
39	Demonstration of solution process is adequate	.7	4.9	17.4	50.7	26.4	3.97	.83
40	There are enough examples given per lecture/tutorial	2.8	5.6	11.1	51.4	29.2	4.00	.93

Likert Scale: 1 – Strongly disagree, 2 – Disagree, 3: Neutral, 4- Agree, 5: Strongly Agree

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