A Preliminary Study on the Use of Online Resources in Quantitative Techniques for First Year Business Students in a Malaysian Private University

Chee-Keong Chong
chongck@utar.edu.my

You-How Go
goyh@utar.edu.my

Ying-Yin Koay
koayyy@utar.edu.my
Faculty of Business & Finance
Universiti Tunku Abdul Rahman, Malaysia.

Chee-Heong Lee
leech@utar.edu.my
Centre for Foundation Studies (Kampar Campus)
Universiti Tunku Abdul Rahman, Malaysia.

Abstract: *In this paper we intend to find out the awareness of students and the use of online resources provided by text book publishers. The online resources identified are MS PowerPoint slides (plain and narrated), audio lectures, MS Excel templates and Java applets on statistical concepts. The usage level of these was found to be low except for plain MS PowerPoint slides which are common among students. On the other hand after the demonstration by the lecturer, most of the students considered these to be useful in their Quantitative Techniques studies. Recommendations were made to integrate MS Excel and Java applets for the study of Quantitative Techniques.*

1. Introduction

Quantitative Techniques is an important subject offered to all business students for their undergraduate studies. The main objective of this subject is to provide the basic mathematical and statistical skills for business students to use as analytical tools so that they can be better decision makers. This study is carried out in a traditional private university in Malaysia where this subject is being offered to all undergraduates in business studies. The syllabus outlines all the topics covered but it is silent on the use of technology in delivering the course contents. The Committee on the Undergraduate Program in Mathematics (CUPM) [11] has outlined the general expectations in mathematics for students. CUPM opined that students are not only required to master the mathematical contents and level of skill development for mathematics, but technology should be given due emphasis too. Therefore, it is important for lecturer to integrate technology into the teaching and learning of mathematics. How to use the right technology to solve problems has became an important consideration for teaching and learning mathematics so that the students are well prepared for the job market. In view of this the authors are trying to introduce the right technologies for this subject. With the fast-growth of e-learning and mobile-learning, book publishers have started to offer online resources like *PowerPoint* slides (plain and narrated), audio lectures, *Java* applets (animations), data sources and online assessments. Most of these resources are free of charge for their users. However, whether the lecturers and students are aware on these online resources or not and the level of utilization (if they are aware of) are among the aspects that

we should look into. The purpose of this paper is to explore the potential use of some of these text book resources in enhancing the teaching and learning of quantitative subjects. This study intends to find out whether students are aware of these technologies, which resource they like most, and the level of experience in using certain technologies. Finally some recommendations are suggested during their adoptions.

2. Literature Review

The use of teaching aids or technologies in teaching and learning of any subject is an important issue that needs to be addressed because it will affect the outcomes of teaching and learning. For the teaching and learning of mathematics, McCray [7] and Oldknow [10] opined that technology gives opportunities to students to apply mathematics in real-world situations and makes mathematics more exciting, relevant and challenging. The effectiveness on the use of technology on teaching and learning is highly dependent on the teacher [11]**.** It is the teacher that makes the technology works and not the technology on its own. Oates [9] strongly supported this as he said that the effective integration of technology into teaching and learning of mathematics poses a significant challenge to tertiary mathematics educators. Therefore teachers or lecturers are the prime movers of technology in education. Without their initiatives, technology is hard to penetrate into the teaching and learning processes although it is full of advantages.

Many countries have started integrating technology into the teaching and learning of mathematics. Studies of implementation which include Yahya [1] from Malaysia, Ang and Lee [2] from Singapore, and Gao [5] from China have unanimously shown progresses in their respective country. In Malaysia, examination plays an important part in the education system, hence, teachers are more concerned in helping students to pass examinations and are reluctant in doing extra teaching that are not examined in the examinations [1]. Therefore, integration of technology into teaching and learning mathematics is slow in Malaysia but the authority is aware of the importance of technology in teaching and learning mathematics. The authority has taken positive steps to integrate technology into the teaching and learning of mathematics. In view of the challenge posed by a fast-changing workplace there is a move to change the paper and pencil type of assessment at the end of the year to a more realistic problem solving type of assessment. There is an opportunity for greater use of technology in the teaching and learning; whereby the students will be able to get better insight into subject matters.

The integration of technology into education involves three stages: preparation of infrastructures, teachers training in using the technology and finally the initiation of change. In this respect there are many ways of implementing the change; some use the parallel method where technology is interwoven into the contents without reducing the subject matters; whereas some reduce the subject matters so that the technology used can be better understood. In Singapore curriculum content was reduced by some 30% across all subjects to facilitate for more use of IT in the classrooms [2]. This is a much debatable issue whether we are going to teach the subject matters or the technology. It needs to reach a balance between subject matter and the use of technology, and on the other hand if we do not have the skills in handling the technology then we cannot use them efficiently and effectively. Therefore it is an art in its nature and the authority concerned has to strike a balance between these. Ang & Lee [2] noted that at lower levels, technology is used to help students learn the skills and concepts. At the higher levels they are seldom used for their full potential in experimentations and symbolic computations, so there is room for improvement in using technology in these areas. Teachers in Singapore are exposed to use tools like *Graphatica*, *Geometers' Sketchpad* (*GSP*) and *MS Excel*. If examination prevails, the curriculum and textbooks

do not change much, changes only occur in the way the content is delivered. We need technology to enrich and enhance the teaching and learning of mathematics. Ang & Lee [2] advocates that "Technology will continue to play a major role in education, and particularly in mathematics education. The challenge for us is to move and align our curriculum and assessment in such a way that mathematics is not diluted but in fact enriched because we have the technology".

There are three types of knowledge involved in the use of technology for teaching mathematics: Technology Knowledge (TK): how to use the technology for teaching and learning, Content Knowledge (CK): what students need to learn and what teachers need to teach, and Pedagogical Knowledge (PK): how to deliver those contents to students [8]. Students need only technological and content knowledge. To master the contents of mathematics, students need to use technology in the learning process. Figure 2.1 depicts the knowledge needed by lecturers or teachers to implement technology into the teaching and learning of mathematics. Teachers or lecturers need another extra knowledge, which is the pedagogical knowledge. Figure 2.2 shows that TCK region is where Technology meets Content, the place where learning takes place through the use of technology.
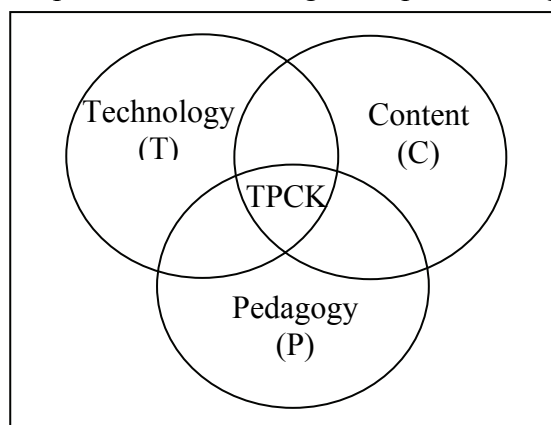

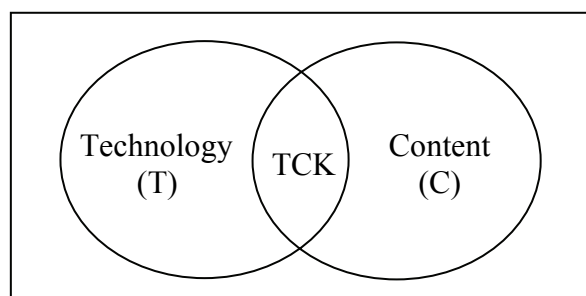Figure 2.1 The original TPCK model by Mishra & Koehler (2006)

Figure 2.2 Technological Content Knowledge (TCK) needed by students

Although the Content Knowledge is the most vital one among the three types of knowledge put forward by Mishra & Koehler [8] and any teaching and learning must focus on content, yet in order to ensure the success of integrating technology into teaching and learning, students will need Technological Content Knowledge (TCK) whereas teachers or lecturers will need Technological Pedagogical Content Knowledge (TPCK) [8]. This technological knowledge can be learnt through formal or informal way.

One of the most frequently used and popular software for mathematics education is *MS Excel*. *MS Excel* has a high education value in the teaching and learning of Quantitative Techniques because it is not only good in carrying out computation works but it is a tool for constructing mathematics concepts. Baker & Sugden [4] pointed out that spreadsheet has potential to become a universal tool

for teaching and learning mathematics and what we need is to explore more applications using spreadsheets. Besides that Baker & Sugden [4] also noted that the lack of facilities to use spreadsheets in assessment need to be removed, and this can be done by changing the methods of assessment. Another technology that can be used by mathematics educators is the use of computer in visualization and animation. Malkowshy [6] stated that visualization and animation are very important methods in the study of mathematics concepts. These methods enhanced and enriched the understanding of concepts in mathematics. His opinion is further supported by Apotol & Blinn [3], they said that visual representation of mathematical ideas, principles or problems has always played an important role in the teaching and learning of mathematics which will be more effective when images are animated. Animated *Java* applets have certain advantages over other teaching and learning aids. For example, to explain Central Limits Theorem, lecturers will have a hard time in explaining how to sample and calculate the means of the samples until we can get the sample means and show that they are normally distributed. If *Java* applet is used, it can be explained very well in a step-by-step manner and it will show exactly how it becomes normally distributed by graph. Students value this animated step-by-step approach whereby traditional teaching is much lacking of because the process will take a long time and it is very tedious.

3. Research Questions

This paper intends to find out the awareness of undergraduates on online resources provided by text book publishers, the level of usage on these resources, the experience and knowledge on using them, and finally recommendations on how to integrate these technologies into the teaching and learning of Quantitative Techniques.

4. Methodology

A briefing was conducted to a group of 245 undergraduate business students who were then present at a Quantitative Techniques lecture class (Table 5.1) at the second half of a 2-hour lecture. The students were exposed to all the resources found in a text book website of which include *Microsoft PowerPoint* slides (plain and narrated), audio lectures, *Java* applets on statistics and *Microsoft Excel* templates on data analysis. Demonstrations on how to use all these resources were conducted by the author. A questionnaire survey is administered anonymously right after the briefing and the questionnaires were collected at the end of the lecture class. The data was later processed and analyzed using SPSS.

5. Results and Discussion

About 245 questionnaires were distributed and a total of 168 were return, of which 68.5% comprised of female respondents and the rest male (31.5%) with majority (50.0%) under the programme of Bachelor of Business and Administrative majoring in Banking and Finance (Table 5.2). It is believed that those who were present in the briefing but did not participate in the survey were not interested in this study.

Table 5.1 Components of students present in the briefing based on programme.

Programme	Students	Percentage (%)
Accounting	32	13.1
Business Administration	22	9.0
Banking & Finance	110	44.9
Entrepreneurial	16	6.5
Financial Economics	25	10.2
Marketing	25	10.2
Finance	15	6.1
Total	245	100.0

Table 5.2 Demography of the respondents based on gender and programme.

Gender	
Male	53 (31.5%)
Female	115 (68.5%)
Total	168 (100%)
Programme	
Accounting	22 (13.1%)
Business Administration	18 (10.7%)
Banking & Finance	84 (50.0%)
Entrepreneurial	2 (1.2%)
Financial Economics	14 (8.3%)
Marketing	22 (13.1%)
Finance	6 (3.6%)

Table 5.3 shows that most of the respondents used ICT in social networking (92.9%), information look-up (77.4%), accessing Web-Based Learning Environment (WBLE) for study materials (75.0%) and e-mailing (72.0%) respectively. From the data obtained, we can conclude that most of the respondents are computers and Internet literate. Table 5.4 depicts the popularity of commonly installed and used business application software by the respondents in their studies. The most common used is *MS Word* (96.4%) for word processing followed by *MS PowerPoint* (72.6%) which is generally used for presentation as well as a tool to disseminate lectures. *MS Excel* which is used mainly as spreadsheet that can handle tedious calculation easily and provides charts for presentation merely made up of 22.6% and *MS Access* has the least with 3% only.

Table 5.3 ICT activities engaged by the respondents

Social networking	92.9%
Email	72.0%
Surfing for information	77.4%
WBLE	75.0%

Table 5.4 Popularity of business application software used by the respondents in their studies.

MS Access	3.0%
MS Excel	22.6%
MS PowerPoint	72.6%
MS Word	96.4%

Table 5.5 Online resources used by the respondents

PowerPoint slides	90.5%
Narrated *PowerPoint* slides	29.2%
Audio lectures	17.9%
Animation	31.0%
Excel templates	11.3%

Among the online resources available, Table 5.5 shows that 90.5% of the respondents used *MS PowerPoint* slides in their studies. This is in congruent to a report by Gao et al [5] which shows that the simple or direct usage of technology is in presentation. Teachers can explain the concepts of mathematics more clearly and students can understand the ideas more easily with the use of technology. However, only about 29.2% made use of narrated *MS PowerPoint* slides and this low popularity of usage is attributed to the robotic sound which is boring to the users. The respondents prefer to attend lecture. About one third (31.0%) of the respondents used animation in their studies whereas *MS Excel* templates were not used very often (11.3%). As such, there is a potential to

extend the use of *MS Excel* among students because it is a very useful analytical tools as well as a good tool to construct mathematical concepts. Audio lecture is another resource that helps students in their learning because of its portability. MP3 and MP4 are common among students and we can capitalize on these so that they can listen to the lectures whenever and wherever they need them.

The respondents considered their knowledge and use of *MS Excel* to be low (70.2% and 82.7% respectively in Table 5.6). The respondents mostly use *MS Excel* in simple repeated calculation (57.1%) and graphing (54.2%). They also perform simple data analysis with *MS Excel* (32.1%) but they seldom use *MS Excel* for "what-if-analysis" and modeling in business where these required higher knowledge in *MS Excel*. The use of *MS Excel* in "what-if-analysis" and business modeling are two potential uses of *MS Excel* that can be extended in the study of Quantitative Techniques. These imply that if *MS Excel* were to be integrated into the teaching and learning of Quantitative Techniques, special training need to be carried out before the implementation. This is to ensure that the students possess the minimum skills to use *MS Excel* in their studies.

Table 5.6 Level of knowledge and use in MS Excel

	Low	Moderate	High
Your knowledge in *MS Excel*	70.2%	28.6%	1.2%
Level of use in *MS Excel*	82.7%	14.9%	1.8%

Table 5.7 Applications of *MS Excel*

Graphing	54.2%
Simple repeated calculation	57.1%
Data Analysis	32.1%
What-if-analysis	3.0%
Modeling in business	6.5%

Table 5.8 Survey on the use of online text book resources

	Yes	No	Not sure
Do you buy any recommended text for Quantitative Techniques?	30.4%	69.6%	-
Are you aware that some text books provide online resources for students?	27.5%	72.5%	-
After demonstrating the use of *MS Excel* templates to you, do you think that they are useful in helping you to understand certain statistical concepts?	56.9%	12.0%	31.1%
Are you able to perform the tasks demonstrated to you after the class?	27.4%	26.8%	45.8%
Besides *MS PowerPoint* slides, are you comfortable in using the narrated *MS PowerPoint* slides or audio lectures?	43.5%	37.5%	19.0%
If you have used narrated *MS PowerPoint* slides in your study (in revision), do you find them to be useful?	45.2%	22.0%	32.7%
After demonstrating the animations to you, do you think that they are useful in helping you in understanding certain statistical concepts?	67.9%	7.1%	25.0%
On the whole, do you agree that all these resources are helping you in your studies?	72.4%	6.0%	21.6%

Table 5.8 depicts that about 30.4% of the respondents did purchase the recommended text for Quantitative Techniques and not all of them are aware (about 27.5% are aware) that some text books do provide online resources for students. Therefore it is vital for the lecturers to make the students aware that there are resources online for their studies. A demonstration was conducted to show to the respondents on the use of the five resources found in an online text book website that can be used in their studies. The impending use of those five resources in helping students in their Quantitative Techniques studies is very positive as 72.4% of them agreed that those resources are helpful in their studies.

After the demonstration, around 56.9% of them think that *MS Excel* templates are useful in helping them to understand certain statistical concepts. Unfortunately only about 27.4% of them are able to perform the tasks demonstrated to them. Apart from that, about 67.9% think that animations can help them to understand certain statistical concepts. This is the area worth explorations into so that it can make the teaching and learning of statistical concepts much more interesting and effective.

Table 5.9 Resources considered helpful in their studies

MS PowerPoint slides (plain)	84.5%
Narrated *MS PowerPoint* slides	59.5%
Audio lectures	50.0%
Animation	60.1%
MS Excel templates	46.4%

Table 5.9 shows that students considered plain *MS PowerPoint* slides (84.5%), animations (60.1%), narrated *MS PowerPoint* slides (59.5%), audio lecture (50.0%) and *MS Excel* templates (46.4%) helpful in their studies. The potential of using *MS Excel* in teaching Quantitative Techniques is high as *MS Excel* is still underutilized. Nevertheless, implementation of *MS Excel* in teaching Quantitative Techniques should be well planned and closely guided as merely 27.4% of them believe that they are able to perform the tasks demonstrated to them after the class.

6. Conclusion & Recommendations

On the whole the authors found that most students know how to use computer in general, but the use of computer for certain functions such as learning mathematics is still low. Most respondents were not aware of the online resources make available by the publishers. This is clearly exemplified as the respondents seldom use the online resources such as animations (*Java* applets) and *MS Excel* templates in mathematics learning. This could be attributed to the lack of initiative and the skills needed as well as the necessity or urge that drive them to pick up the technologies.

Undoubtedly, some might argue that in order for students to learn effectively and efficiently technology may help them to a certain extent and it is the content knowledge that we should focus at. However, studies have shown that technologies have been playing positive roles not only in learning and teaching but in the business world too. Therefore, the lecturers should lead in the use of the technology throughout their lectures and learning activities. In order to change students' mindset on the use of technology in mathematics learning, it is recommended that the assignments and assessments should be carefully planned and administered to encourage the students to make use of the online resources in addition to the technologies available to them. Furthermore, guidance and close monitoring the students are important to help to overcome the initial barrier of use of technologies in mathematics learning. Educators should always strike a balance between content knowledge and technological knowledge delivered to students. Content knowledge is the focus for

teaching and learning and technological knowledge is the catalyst for the teaching and learning process.

References

[1] A. H. Yahya (2007). Mathematics Education and Technology: Past, Present and Future. *The Electronic Journal of Mathematics & Technology*, Vol. 1, No. 1, pp 90-94.

[2] Ang, K-C and Lee, P-Y (2009). The influence of Technology on the Teaching and Learning of Mathematics in Singapore. *The Electronic Journal of Mathematics & Technology*, Vol. 1, No. 1, pp 79-84.

[3] Apostol, T. M. & Blinn, J. F. (1993). Using Computer Animation to Teach Mathematics. *CBMS: Issues in Mathematics Education*, Vol. 3, pp 13-38.

[4] Baker, J. E. & Sugden, S. J. (2003) Spreadsheets in Education-The First 25 Years. *eJSiE*, Vol. 1, No. 1, pp 18-43.

[5] Gao, Xiao-Shan, Fu, Ma., Wang, Pengyuan and Wang, Jiyang (2007). Technology Usage in Mathematics Education in China. *The Electronic Journal of Mathematics & Technology*, Vol. 1, No. 1, pp 85-89.

[6] Malkowsky, E. (2004). Visualisationand Animation in Mathematics and Physics. *Proceedings of Institute of Mathematics of NAS of Ukraine 2004*, Vol. 50, Part 3, pp 1415-1422.

[7] McCray, P. D. (2001). Business View on Math in 2010 C.E. *CUPM Discussion Papers about Mathematics and the Mathematical Sciences in 2010: What Should Students Know?* USA: The Mathematical Association of America.

[8] Mishra, P., & Koehler, M. J. (2006). Technological pedagogical content knowledge: A framework for teacher knowledge. *Teachers College Record*, 108(6), 1017-1054.

[9] Oates, G. (2009). Integrated Technology in Undergraduate Mathematics: Issues of Assessment. *The Electronic Journal of Mathematics & Technology*, Vol. 4, No. 2.

[10] Oldknow, A. (2009). ICT bringing mathematics to life and life to mathematics. *The Electronic Journal of Mathematics & Technology*, Vol. 3, No. 2.

[11] The Committee on the Undergraduate Program in Mathematics, CUPM (2001). *CUPM Discussion Papers about Mathematics and the Mathematical Sciences in 2010: What Should Students Know?* USA: The Mathematical Association of America.