

E-learning: Working-adult Students' Attitudes and Performances

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This paper's objective is to examine how the working-adult students' attitudes influence their e-learning performances. This research study involved two cohorts of students in the Principle of Project Management course at the Singapore University of Social Sciences (SUSS). The research methods comprised a questionnaire survey and analysis of their learning assessments. In the first study, the Exploratory Factor Analysis (EFA) and Pearson Correlation were used to determine the factors and their items that influenced the students' e-learning attitudes. The second study involved determining the students' familiarities with technology as used in teaching and learning. Students indicated their usage frequency for daily, weekly and monthly accesses. In the third study, the repeated measures ANOVA (ANalysis Of VAriance) and comparison of average scores were used to compare the students' performances in four different assessments. Subsequently, the results were used to compare the students' performances in the traditional face-to-face learning and the online virtual classes. Conclusions were made on the students' e-learning attitudes, their familiarities with technology and comparison in the learning performances between the traditional classroom learning and virtual learning. Results from this study will contribute to the e-learning strategic development in the SUSS.

Keywords: Working-adult students, attitudes, e-learning, learning performance

Introduction

Online learning, or e-learning, and Information & Communications Technology (ICT) are now a strategic part of Singapore's effort to improve education and upgrade our workforce. It is particularly suited to working-adult education as institutions of higher learning (IHLs) offer flexible educational programmes to the working-adult population. The Singapore University of Social Sciences (SUSS), being the sixth autonomous university of Singapore, leverages e-learning to provide lifelong learning and disciplines with social impact and applied degree pathway (Davie 2017).

Using digital technologies, all six autonomous universities of Singapore now provide our working-adult population access to higher education programmes. The Singapore Government continually ensures that improvements are made to strengthen the infrastructure and university network capacity. However, e-learning still faces several challenges. One challenge is to gauge the students' e-learning attitudes, their familiarities with technologies and finally, their performances in their various assessments. This is an attempt to continuously improve e-learning quality and make e-learning more responsive to working-adult students.

The current research examined the students' e-learning attitudes, familiarities with technology and their assessment performances in the "Principles of Project Management" course.

Literature Review

In the paper by Ngampornchai and Adams (2016), the authors were interested in the undergraduate students' acceptance and readiness for e-learning in a Northeastern Thai university.

They designed their questionnaire based on two theories. The first one was the UTAUT (Unified Theory of Acceptance and Use of Technology) by Venkatesh et al. (2016). The second one was the TAM (Technology Acceptance Model) by Moore and Benbasat (1991). These theories provided the theoretical foundations for the questionnaire construction.

Of particular interest are the findings from the survey on the familiarity with technology among the students. They found out that most of the students own smartphones and notebook computers. Only 23% of them own desktop computers.

In the second paper, Chun and Lee (2013) proposed and listed six areas that affected student attitudes to blended learning. These were attitudes toward learning flexibility, online learning, technology, study management, online interaction and classroom learning. These six types of attitudes help to determine the student's adaptability towards blended learning. Ultimately, students needed to be surveyed before the researchers could establish a certain readiness for blended learning. Chun and Lee (2013) structured these as hypotheses in their research on readiness for blended learning. Although the authors did explain what blended learning was all about, they were not able to provide a better classification such as that as shown in Figure 1: Classification and definition of e-learning courses (Gavril, et al. 2017).

For the third paper, Neuhauser (2010) compared two sections of the same course that were taught in two difference modes: face-to-face classes and online via asynchronous means. The purpose was to determine whether there were any differences in the students' test scores, assignments, participation grades and final grades. The author examined the students' gender, age, learning preferences and styles, media familiarity, effectiveness of tasks, course effectiveness, test grades, and final grades. Her study showed no significant differences between learning preferences and styles and grades in the two groups. She concluded that equivalent learning activities can be effective for online and face-to-face learners.

In their paper, Cooper et al. (2017) proposed the Expectancy Value Theory (EVT) as a framework that can be applied to active learning. Their proof of concept has prompted us to adopt the EVT as the basis for a theoretical foundation in the design of our questionnaire survey. Active learning plays an important role in e-learning. Yet we do experience much student scepticism about active learning. Using interviews and analyses, they checked for students' self-efficacy in active learning, value of active learning, and potential cost of participating in active learning. The results showed positive changes in the EVT components and increased engagement in active learning. These are the values which we hope our students can imbibe.

Some definitions

Traditional classroom

The traditional classroom is based on the teacher-centric model. The teacher is regarded as the knowledge dispenser, more of the "sage on the stage". The students are generally passive listeners. It is efficient in terms of delivery of the course contents but it inhibits classroom interaction.

Virtual class

A virtual classroom is an environment meant for online learning. The environment can be web-based and accessed through an LMS. It usually requires an executable file. In a virtual classroom, the teacher and the students participate in synchronous instruction. They normally log into the virtual learning environment at an agreed time. They can communicate with one another, view presentations or videos and interact amongst themselves (e.g. by chat or whiteboard). They can also engage with other resources in work groups (Rouse 2010).

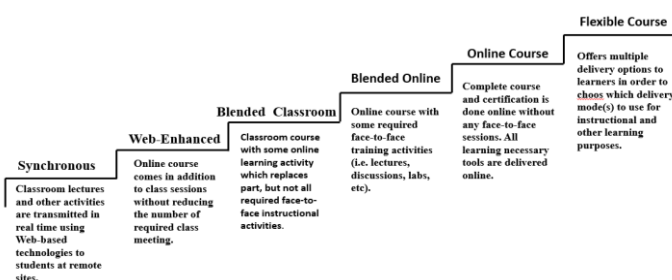


Figure 1: Classification and definition of e-learning courses (Gavril, et al. 2017)

Figure 1 above shows a classification on the distinction between synchronous or virtual class and blended or online course (Gavril, et al. 2017). At the lowest end, it is a synchronous session and is just an online delivery of the contents. At the highest end we have a flexible mode with the choice of delivery mode. In between are different levels of "blendedness".

Research Method

Research Questions

1. What are the relationships of the e-learning attitudes of students and items of the Expectancy Value Theory like motivation, attainment, intrinsic, utility and cost?
2. In the familiarity with technology area, how do the students rank the use of typical software tools / technology that are used for teaching and learning, e.g. eBooks (or etextbooks from publishers) and iStudyGuide - or interactive study guide developed internally by SUSS?
3. Is there a difference in the students' assessment performances whether they were taught in the traditional face-to-face classroom mode or the online virtual class mode?

Questionnaire Design

The questionnaire was designed in five parts. Part 1 covered the Expectancy Value Theory (EVT) with five sub-parts for Motivation, Attainment, Intrinsic, Utility and Cost. Each component in Part 1 comprised three questions. Part 2 comprised three questions on Constructivist versus Traditional learning. Part 3 comprised four questions on Change Management. Part 4 comprised four questions on technical support for e-learning. The bi-polar scale is chosen as the students do not have to choose a sociable desirable scale like "Highly disagree" or "Disagree" or "Neutral" or "Agree" or "Highly Agree". Instead, a simple bi-polar scale from 1 to 7, with "7" being the most extreme, will make the questionnaire easy to use (Hirst 2016). There were altogether 26 questions from Part 1 to Part 4.

Part 5 of the Students' Questionnaire Survey is about Familiarity with Technology. It has been modified from Son, Robb, and Charismiadi (2011). This part aims to obtain feedback from students on the frequency of usage of the various software tools/technology they use in the SUSS. The feedback ranges are on a 6-point Likert scale: 1 - "Never", 2 - "Several times a month", 3 - "Once a week", 4 - "Several times a week", 5 - "Every day" and 6 - "Several times a day".

The technologies listed in Part 5 are iStudyGuide, eBook, Search Engine, Google drive/One Drive, Forums, text chat, voice chat, video chat, Computer Games, Web Video, Photo-focused web, blogs. The Interactive Study Guide (iStudyGuide) is a summary of the course and it includes course overview, learning outcomes, assessment components and subject matter. It may contain videos, lesson recordings, audio clips and formative assessments (Learning Services Cluster, Singapore University of Social Sciences 2017a). These technologies were selected as they were widely used for e-learning.

Administering the Questionnaire Surveys

The paper-based questionnaire survey was administered to the two student cohorts (i.e. July 2018 semester and January 2019 semester) on 16 October 2018 and 16 April 2019, respectively, during the last 15 minutes of the last lecture. This method was found to be more efficient and responsive than the online version as we had a captive audience. In an online version, the students would probably procrastinate their replies until they forgot about them. The responses to the two questionnaire surveys for the students were encouraging. The students' participation rates in the two questionnaire surveys were 53% and 40.3% for the two cohorts respectively.

Data Analysis

The data obtained from the student inputs to the questionnaire surveys were entered into an Excel file. Thereafter, the IBM SPSS software (version 25) was used to process the data and obtained the factor.

Results

Questionnaire Survey

The attitudes of the students towards e-learning, in terms of motivation, constructivist learning, change management, and technical support were investigated using the results of the questionnaire survey with the July 2018 and the January 2019 cohorts of students studying the course in SST101e Principles of Project Management. Altogether 260 students participated in the survey (i.e. 132 out of 249 students in the 1st cohort and 128 out of 318 students in the 2nd cohort). This represented 45.9% of the combined two cohorts of students – i.e. 260 students. The results were entered into an Excel spreadsheet file and the IBM SPSS software (Version 25) was used to carry

out EFA (Exploratory Factor Analysis) on the data. Processing was done using Maximum Likelihood and Oblimin with Kaiser Normalization.

The focus was on analysing the students' attitudes with respect to the EVT (Expectancy Value Theory). This theory was first developed by John William Atkinson and expanded by Jacquelynne Eccles in education in 1983 (Eccles 1983). Essentially, the students were surveyed on their e-learning attitudes in motivation, attainment, intrinsic, utility and cost.

Table 1: Expectancy Value Theory

S/No.	Value	Explanation
1	Motivation	What spurs the student to e-learn despite the unfamiliarity with the technology
2	Attainment	Importance for identity or self
3	Intrinsic	Enjoyment or interest
4	Utility	Usefulness or relevance
5	Cost	Financial, time, effort or stress

The first analysis revealed three factors but with many items that were overloaded. Altogether ten items were deleted because of double or triple loadings. Thereafter, a second analysis was performed and this resulted in only one factor with the following items:

Table 2: Output of EFA on Students Questionnaire Survey data

Mean	Item identified	Std. Deviation	Analysis N
5.35	Motivation	1.291	260
5.37	Attainment	1.212	260
4.70	Intrinsic	1.638	260
4.75	Utility	1.580	260
5.03	Motivation	1.407	260

(Reliability: Cronbach's alpha = .809 for N = 5)

This factor showed that some relationships exist amongst the various items. Two aspects of motivation (i.e. coping well and confidence), attainment, intrinsic and utility are the items that greatly influenced the students' attitudes toward e-learning. The cost item (i.e. time, effort and expenditure) did not matter to the students.

Further, in order to see the relationships amongst the five items, a Pearson Correlation analysis was carried out (LibGuides: SPSS Tutorials: Pearson Correlation 2019). Pearson Correlation measures the degree of the linear relationship between two variables. A linear relationship can mean that the relationship is characterised by a straight line. For example, there is a linear relationship between a person's age and his income. The older he gets, the more his income will grow. Correlation ranges from -1.0 to +1.0. Pearson correlation is given by the letter r, for example, $r = .55$. As such, there is no such correlation as +1.20 or -1.8, for example. Both of these will indicate mistakes.

The following table summarised the results:

Table 3: Pearson Correlation Table for the 5 items in Factor)

Expectancy Value Theory components	Test	Motivation1-coping	Motivation2 - confidence	Attainment	Intrinsic	Utility
Motivation1	Pearson Correlation	1	.686**	.324**	.450**	.399**
Motivation2	Pearson Correlation	.686**	1	.350**	.471**	.486**
Attainment	Pearson Correlation	.324**	.350**	1	.365**	.388**
Intrinsic	Pearson Correlation	.450**	.471**	.365**	1	.801**
Utility	Pearson Correlation	.399**	.486**	.388**	.801**	1

(In carrying out the Pearson Correlation tests, N = 260 and p = .000)

Table 3 shows the Pearson Correlation values for the five items (Motivation1, Motivation2, Attainment, Intrinsic and Utility). Motivation1 refers to the student's confidence in coping with the downloaded documents for e-learning. Motivation2 refers to the situation when the student feels confident doing e-learning. The Pearson Correlation tests showed that the students ranked items like "utility", "intrinsic" and "motivation1 – coping" and "motivation2 – confidence" have strong correlations as $|r| > .5$. The other item on "attainment" has medium correlation with the other items (Table 4).

Table 4: Strengths of Pearson Correlations

Pearson Correlation Coefficient (r)	Strength of correlation	EVT value 1	EVT value 2
.801	$ r > .5 \Rightarrow$ large / strong correlation	Utility	Intrinsic
.686	$ r > .5 \Rightarrow$ large / strong correlation	Motivation2	Motivation1
.486	$.3 < r < .5 \Rightarrow$ medium / moderate correlation	Utility	Motivation2
.471	$.3 < r < .5 \Rightarrow$ medium / moderate correlation	Intrinsic	Motivation2
.450	$.3 < r < .5 \Rightarrow$ medium / moderate correlation	Attainment	Motivation1
.399	$.3 < r < .5 \Rightarrow$ medium / moderate correlation	Utility	Motivation1
.388	$.3 < r < .5 \Rightarrow$ medium / moderate correlation	Utility	Attainment
.365	$.3 < r < .5 \Rightarrow$ medium / moderate correlation	Intrinsic	Attainment
.350	$.3 < r < .5 \Rightarrow$ medium / moderate correlation	Attainment	Motivation2
.324	$.3 < r < .5 \Rightarrow$ medium / moderate correlation	Attainment	Motivation1

What this mean is that "usefulness and relevance" are strongly correlated to "enjoyment and interest" whilst "coping with e-learning (motivation1)" is strongly correlated with "confidence (motivation2)".

Familiarity with Technology

The questionnaire survey also provided data where we can assess the technology competencies of the students.

Table 5: Comparison of the popularly used software tool/technology

1 st Student Cohort			2 nd Student Cohort		
S/No.	Software tool / technology	Mean	S/No.	Software tool / technology	Mean
1	Text Chat	1.05	1	Text Chat	12.02
2	Search Engine	0.89	2	Search Engine	8.69
3	Photo-focused Web (e.g. Instagram)	0.88	3	Photo-focused Web (e.g. Instagram)	6.06

Table 6: Comparison of the least frequently used software tool/technology

1 st Student Cohort			2 nd Student Cohort		
S/No.	Software tool / technology	Mean	S/No.	Software tool / technology	Mean
1	iStudyGuide	0.17	1	Voice Chat	3.86
2	Computer Games	0.35	2	Computer Games	4.16
3	eBook	0.41	3	eBook	4.60

There is a similar pattern amongst the two student cohorts. They agree on the top three software tool/technology that were most frequently used (Please see Table 5). For the least frequently used software tool/technology, they agreed on Computer Games (Please see Table 6). Somehow, the students might have given up playing computer games when they needed to work, study and even looked after their families. Their responses might or might not be true but that is not the intention of the questionnaire survey. The results in Tables 5 and 6 showed that the questionnaire survey for the Familiarity with Technology part was largely consistent over the two student cohorts. [N.B. Please note that the means are calculated from the usage frequency and the percentage of occurrence. An example is given in the paper by Ngampornchai and Adams (2016), p 8.]

Performances in Assessments

SST101e Principles of Project Management is a 5-credit unit course. This means that the course will last for six weeks with three hours of teaching/learning per week. For the part-time students, they are required to attend lectures one night per week. Typically, this is from 7 pm to 10 pm. For the SST101e course, half of the course will be conducted in the traditional face-to-face classroom lecture mode (Tclass). The other 3 sessions will be conducted via online virtual classes (Vclass). During virtual classes, students need not be present on campus. They can be located anywhere – at home, in the office, or even overseas – as long as they have a PC connected to the Internet.

Before attending the lectures, either in the traditional mode or in virtual classes, they need to read the textbook and complete the MCQs (Multiple-Choice Questions) Pre-Class Quizzes. There were three of such Pre-Class Quizzes (PCQs). In addition, they will be grouped into small groups to work on an assignment. This is the Group-Based Assignment (GBA). At the end of the course, they need to take the Online Quiz (OLQ) which comprised MCQs for the whole course. The final assessment is the 2-hour closed-book Examination (EXAM).

Table 7 summarized the weightages for the various assessments

Table 7: Weightages of the various assessments

Assessment	Description	Weight Allocation (%)
Pre-class Quiz	Pre-class Quiz (3 quizzes of 2% each)	6
Quiz	Online Quiz	8
Assignment	Group Based Assignment (GBA)	16
End-of-Course Assessment	Written exam (closed book)	70
TOTAL		100

Each assessment in Table 7 comprised the Tclass and the Vclass components. The Tclass component represented the students' marks obtained from contents taught during traditional face-to-face lectures. The Vclass component represented the students' marks obtained from contents taught during online virtual classes. In this way, we were

able to compare the students' performances in contents taught during the traditional face-to-face lectures versus those taught during online virtual classes. Please see Figures 1 and 2 for the results of the repeated measures ANOVA (Grande 2015) for the two student cohorts.

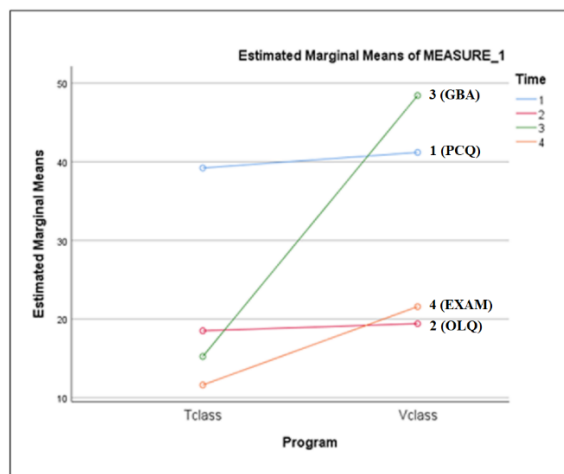


Figure 1: Comparison of Assessment Performances (July 2018 Semester)

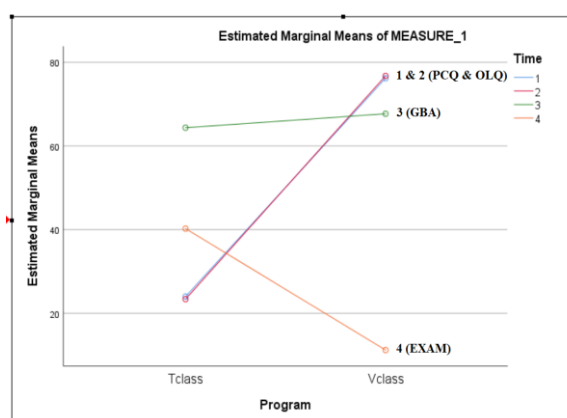


Figure 2: Comparison of Assessment Performances (January 2019 Semester)

From Figure 1, it appears the Vclass results for the Pre-Class Quizzes and the Online Quiz were very close to those from the Tclass (i.e. 1 and 2 are almost level). But the results for both the GBA and the EXAM showed that the Vclass results were very much higher than those from the Tclass. However, the scores for the GBA and the EXAM have to be benchmarked to the 50% level (i.e. half of the course are taught in Tclass and Vclass equally). Tables 7 and 8 showed the results after the GBA and EXAM scores were benchmarked to the 50% level.

Table 8: Comparison of average marks for the Tclass vs Vclass cases (July 2018 Cohort)

Questions set on contents:	Group-Based Assignment (GBA)	Benchmarked to 50% (GBA)	Examination (EXAM)	Benchmarked to 50% (EXAM)
Taught in the Tclass (i.e. traditional face-to-face classroom lectures)	24% N = 252	50/24 * 15.42 = 32.12	35% N = 237	50/35 * 12.25 = 17.50
Taught in the Vclass (i.e. online virtual classes)	76% N = 252	50/76 * 48.85 = 32.14	65% N = 237	50/65 * 22.76 = 17.51
Differences		32.14 – 32.12 = 0.02		17.51 – 17.50 = 0.01

Table 9: Comparison of average marks for the Tclass vs Vclass cases (January 2019 Cohort)

Questions set on contents:	Group-Based Assignment (GBA)	Benchmarked to 50% (GBA)	Examination (EXAM)	Benchmarked to 50% (EXAM)
Taught in the Tclass (i.e. traditional face-to-face classroom lectures)	75% N = 314	(50/75) * 50.33 = 33.55	26% N = 328	(50/26) * 11.93 = 23.94
Taught in the Vclass (i.e. online virtual classes)	25% N = 314	(50/25) * 16.78 = 33.56	74% N = 328	(50/74) * 37.53 = 25.36
Differences		33.56 – 33.55 = 0.01		25.36 – 23.94 = 1.42

Tables 8 and 9 summarized the assessment scores of the two student cohorts in the GBA and the EXAM. The assessment scores in both the GBA and EXAM were analysed and the average scores obtained by the students in those questions taught during the traditional face-to-face sessions (Tclass) and the virtual classes (Vclass) were separated.

In the GBA case, the difference between the Tclass and the Vclass scores were less than 1. In the EXAM case, the difference between the Tclass and Vclass scores were 0.01 and 1.42 for the July 2018 and the January 2019 semesters, respectively. The differences were small (i.e. less than 2). These mean that there is little difference between the assessment scores between contents taught in the face-to-face lessons and those taught in virtual classes for the two student cohorts in the two semesters.

The comparison results showed that the performance scores obtained by students who were taught in the traditional face-to-face classroom environment were similar to or very close to those taught in the online virtual class environment. These were reflected in the assessment scores in the two student cohorts of July 2018 and January 2019.

Discussion and Conclusion

The result of the EFA indicated that only one factor determined the attitudes of the students towards using e-learning. This factor comprised items from the Expectancy Value Theory (i.e. Motivation, Attainment, Utility, Intrinsic, except the cost). This factor was an acknowledgement by the students that they value the soft skills aspects of learning. From the Pearson Correlation analysis, it can be seen that the students ranked these items in the following order: Utility, Intrinsic, Motivation and Attainment.

In the survey on the Familiarity with Technology, the two student cohorts rated the following three software tools/technology as being most frequently used: text chat, search engine and photo-focused web (e.g. Instagram). For the least frequently software tools/technology, the lowest three were iStudyGuide, Computer Games and eBook for the 1st student cohort and Voice Chat, Computer Games and eBook for the 2nd student cohort. Out of

the three software tools/technology, the two student cohorts have Computer Games and eBook as their least frequently used software tools/technology.

These two developments further showed that the two student cohorts were similar in the use of the software tools/technology. Text chat, search engines and photo-focused web were used very frequently not only when they are studying but also when they communicate socially with their friends. What was surprising was that they did not use computer games and eBook more frequently. Most probably, they have gone past the age of playing computer games. These students might not have the time to play computer games as they worked and studied. Some of them even have families to support.

Perhaps most disappointing of all is the low usage of eBook or even e-textbook by extension. Although there are differences between eBook and etextbook, they share common characteristics like being digital publication that can be read on computer, e-reader, or other electronic devices (Retterbush 2010). Some differences can be in their format, e.g. eBook can be in a proprietary format whilst etextbook can be in the PDF format. Etextbook is regarded as the digital “textbook”.

Perhaps the students have been so used to using the printed version of books that they need time to adjust to using digital books and e-textbooks for study. This is a big concern to the SUSS as using e-textbook is the new direction of the university (Learning Services Cluster, Singapore University of Social Sciences 2017a). From the standpoint of efficiency, cost reduction and convenience, it makes sense to provide e-textbooks to the students. With more book publishers providing the digital versions of their textbooks and other reference books in the form of eBooks, it makes sense to promote the wider use of eBooks and e-textbooks. The students can also download the eBooks and e-textbooks quickly and start learning early. With effect from January 2019 semester, only the e-textbook version will be made available to the students. The print version is still available but only for purchase.

For the second research question, the research authors had expected the students to rank the iStudyGuide and eBook highly in their familiarity with technology. Unfortunately, they ranked them very low in their familiarity with technology questionnaire survey.

Only slightly less than half of the student numbers participated in the Questionnaire Surveys. One reason could be that the attendance in lectures or virtual classes was not compulsory. This might not be a good policy as by skipping lectures, they demonstrated a lack of self-discipline in their study habits.

As for the third research question, the results of the research study showed that there was no difference in the students’ assessment performances whether they were taught in the traditional face-to-face classroom mode or the online virtual class mode. This was not surprising. There were reports that no significant differences in learning outcomes were observed between face-to-face and online learning (Arbaugh 2000; Clark 1999; Dobrin 1999; Navarro and Shoemaker 1999; Trinkle 1999; Werhner 2007).

It is heartening to know that our working-adult students are valuing the intangible benefits of learning especially with the results of the questionnaire survey. The survey has shown that they put values like “Utility, Intrinsic, Motivation and Attainment” from the Expectancy Value Theory as the important items in the factor to embrace e-learning. Secondly, this research has also shown that our students have a high familiarity with technology that is used in teaching and learning. Thirdly, the research has also shown that our students learn just as well in virtual classes and in the face-to-face classroom environment.

As the Singapore University of Social Sciences (SUSS) moves towards digital learning, more has to be done to ensure that both our students and lecturers learn and teach well regardless of the instructional mode or technology. Technology comes and goes but there is a need to make sure that our students can continue to learn well. After all, “I do not think that education, like some other industries, will be replaced by robots and computers. A teacher cannot be replaced, a principal cannot be replaced,” said by Singapore’s Minister for Education, Mr. Ong Ye Kung, on the 17 May 2019 (Yip 2019).

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