A qualitative and statistical analysis of students' perceptions in Internet learning

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ABSTRACT

As the global economy is increasingly becoming knowledge-based and knowledge-intensive, many experts and professionals predict that there will be a huge demand for educational products. Apparently, a major part of the demand is being met by the emergence of tens of thousands of electronic courses via the Internet provided by many education entities. Despite the huge number of these Internet courses, few researchers have addressed the students' perceptions or experiences in Internet learning. Therefore, a study as reported in this paper on the students' Internet learning experience is much needed. The results of this study have shown that both the students' competence in PC skills and their Internet surfing usages are significantly correlated with the students' usages of e-learning via the Internet. Additionally, the results have also shown that the e-learning usage is significantly correlated with the respondent' feelings of enjoyment for using the Internet learning materials. Alarmingly, the respondents agreed that Internet learning increased their workloads in studying. Practitioners in the relevant fields then can make use of these findings when developing their e-learning courses.

Keywords: Internet learning, e-learning, business model, E courses, WebCT

1. INTRODUCTION

Today's global economy is becoming increasingly more and more knowledge-based and knowledge-intensive, therefore, many experts and professionals believe that knowledge and information are the sources for the new competitive advantages [1-5]. As a result, this new knowledge-base trend in the global economy impacts both the corporations and workers. The corporations throughout the world are pressured to compete for knowledge workers or re-train their existing workers to stay competitive while individual workers are pressured to update and upgrade their knowledge in order to stay and become employable. The end result is a tremendous demand for educational products. For example, an IDC report predicted that a half of the US work force would be working for information technology (IT) related industries by 2006 [4]. Similarly, there are reports predicting a significant increase in the demand for IT personnel in Hong Kong [2, 3]. Hence, it is very important for today's workers to become lifelong learners in order to be competitive in the job market and to realize the advantage of the expected huge demand for knowledgeable workers in the near future [6]. Expectedly, the ever-increasing demand (for educational products) in the future is well exceeding the available capacities provided by all the educational concerns through the traditional mode of education (i.e. face-to-face lectures/instruction in same physical locations). In the recent slow growth years in the world economy and the ever-increasing cost of education, many countries are facing with the budgetary constraints and can ill afford to expand their physical resources to meet this huge foreseeable demand for education capacity. As a result of the gaining popularity of the Internet and the World Wide Web in recent years, many education entities have adopted various Internet education business models to deliver their educational products to meet these demands cost-effectively and to overcome the capacity limitation of the available physical resources [7]. Indeed, about fifty-five per cent of America's colleges and universities have courses available off campus in 1997 [8]. Globally, some well-established institutions even offer degrees for students to complete strictly via Internet without requiring the students to attend any courses on campus. University of Phoenix of USA, the Open University of Hong Kong, and the City University of Hong Kong are three of

the well-known representatives in this group that offer on-line distance learning degrees via the Internet. Undeniably, the huge growth in online education alone has demonstrated the increasing importance of online education to today's lifelong learners. For example, the online enrollments have doubled or tripled each year since 1994 and surpassed 40,000 online enrollments in 2001 in the University of Maryland University College (UMUC) [6]. Meanwhile, the huge demand for educational products has also attracted many new and non-traditional entrants into the education market, which was used to be populated with only traditional institutions. For example, OnlineLearning.net has the exclusive rights to distribute the UCLA courses online and has delivered more than 4,600 of UCLA Extension's courses [5, p.19]. Another example, the Yipinet (www.yipiunet.com), an acronym for "Your Interactive Personal Instructor on the Net", provides Internet-based continuing education for professionals in the regulated industries including accounting, securities, legal, doctors, nurses and architects [5, p.18]. Yipinet is the exclusive provider of online education to about 40,000 members of the California CPA Education Foundation. Yet another example, the ChinaCyberU.net and the cybersiwdom.net are newer entities providing online educational products such as online platform and courseware for the Hong Kong and China markets.

Since this new mode of education, viewed from the learners' point of view, is often referred as "Internet learning" and "e-learning" (via the Internet), the terms "Internet learning" and "e-learning" (via the Internet) are used interchangeably for discussion purpose in the remaining sections of this paper.

Because of the ever-increasing number of electronic courses, and the rapid development and well acceptance of the Internet, Internet learning has received much attention among all the existing possible learning modes. Globally, managements in and policy makers for education are now pushing for Internet learning as the future direction for education [9-11]. However, Internet learning is a relatively new area in the field of education and there is a lack of researches for it [12], therefore, all kinds of researches in Internet learning are needed. Considering Internet learning as a form of distance learning via the Internet, many authors have resorted to the literature of distance learning for answers to Internet learning [9-11,13]. At present, there are mixed views in the literature regarding to the significance of e-learning's effectiveness. For example, Noam believes e-learning is the future (and the future is now) and even predicts for the disappearance of the traditional university's dominance and the erosion of its economic foundation [14]. Holding an opposite view, Saunders and Weible's find that the majority of the accounting chairpersons in universities feel that e-learning courses are simply "correspondence courses" presented with new technology, "more hype than substance" and have "no significant improvement" over traditional pedagogy for educating students [15]. Hundreds of research reports echoing numerous mixed results and opposite views can be found on the two popular Web sites [16,17].

In particular, the results of a recent quantitative study have shown that student users of Internet learning performed better than non-users by a large margin [13]. The research model corresponding to that study is depicted in Figure 1. It is noteworthy that this same study has also shown that a large percent of the student participants did not attempt any of the Internet learning for the duration of the experiment. Therefore, despite the encouraging results of performance improvement for Internet learning users, many questions deserve further investigation: Why is such a high non-attempting rate? How can we attract more students to use Internet learning? Which of the students' characteristics and perceptions differentiate an Internet-learning user from a non-Internet-learning user? If these non-users became users, could Internet learning also improve their learning? Surely, knowing the answers to these questions is very important and useful for the practitioners in designing and developing the effective Internet learning courses to fit different types of students. In particular, the answer to the third question seems to preclude the answers to the remaining questions. Therefore, as a further research and a follow-up research of this recent research in Internet learning, the key objective of this paper is to find out the answer to the third question listed above. To state it precisely, in this study we want to find out which of the differences in characteristics /perceptions among the students (in the students' point of view) affect(s) their usages of Internet learning. Obviously, these results can be used by other practitioners in education to develop better and more effective Internet learning materials and courses that will both improve the learners' learning that also meet the learners' expectation.

2. RESEARCH METHODOLOGY

2.1 Background of Population Studied

This study was conducted in the Hong Kong Institute of Vocational Education (HKIVE) of Vocational Training Council (VTC) of Hong Kong in 2001. VTC is currently the largest education entity in Hong Kong, which has more 4000 full time staff and provides vocational training for 120,000 students per year through its nine HKIVE campuses, one SBI campus offering self-funded courses and eighteen VTC training centers. The nine campuses of HKIVE and SBI are, equivalent to the USA junior colleges, best known for offering the two-year and three-year programs leading to the awards of diplomas and higher diplomas in various disciplines. The HKIVE piloted the WebCT courseware in 1999 and has selected WebCT as the sole key platform to deliver the Web-based courses and instruction in 2000. The WebCT is currently the world market leader in the emerging integrated learning software programs, and is developed by the department of Computer Science at the University of British Columbia, Canada and is very user-friendly for the instructors and students.

In this investigation, the target population was a group of more than two hundred students who had participated in a recent Internet learning study [13]. These students had been exposed to the WebCT [18] environment for Internet learning in a period of three months in 2001.

2.2 Research Questions

Many questions, as explained above, have not been answered conclusively in the literature. In this paper, our focus is to address the question, "Which of the students' characteristics and perceptions differentiate an Internet-learning user from a non-Internet-learning user?" This research question is a loaded (compound) question, which can be further decomposed into several simpler research questions so as to facilitate this research investigation. In facts, we have formulated four sub-questions equivalent to the leading research question. They are: Does the students' computer competency affect their usages of Internet learning? Does the students' perceived benefit(s) of Internet learning affect their usages of Internet learning? Does the students' preference of the traditional learning style/mode (paper-based with textbooks, paper and pencil) affect their usages of Internet learning? Does the accessibility of resource (computer and Internet) affect their usages of Internet learning? Correspondingly, we have constructed a research model with five variables. They are respectively Competency (C), Perceived Benefit (B), Study Habit (H) and Accessibility (A) to Internet learning Usage (U). The research model depicted in Figure 2 shows the possible potential inter-relationships among these variables in this study. As indicated, the dependent variable is the Internet learning usage (U) versus the other four potential independent variables: (B), (A), (C) and (H) that we hypothesized to have impacts to the students' Internet learning usage (U).

2.3 Sampling Strategy and research Design

Clearly, the main objective of this investigation is to examine the relationships among the five model variables as depicted in Figure 2. Intuitively, the values of some of the model variables are clearly not directly measurable, observable and quantifiable. To work around this problem, we have to rely on the carefully designed questions in the questionnaire in order to measure the underlying values of these variables indirectly.

Since the targeted sampling population in this study was quite large (more than two hundred student participants) and we wanted to collect as much data as possible, the survey method was chosen to collect the data relating to the model in Figure 2. Specifically, we adopted the anonymous questionnaire method for data collection to encourage more honest responses. We assured the respondents that the results of this research were only used to help the research and other practitioners to develop better Internet learning courses to solicit for a higher return rate. We encouraged the respondents to give their honest and helpful responses. We had developed a questionnaire that consisted of forty questions to capture the data for all the model variables. Each model variable was measured by several questions as follows. The respondents were asked to mark their responses corresponding to their agreements or disagreements to each question statement in the questionnaire according to a five point Likert scale such that 1-Strongly Disagree, 2-Disagree, 3-Neutral, 4-Agree, and 5-Strongly Agree.

In the study, several techniques had been employed to increase the valid return rate and the

validity of the responses (data). Firstly, the survey took place right after the previous Internet learning experiment so that the students still had the fresh memory of their Internet learning experience. Secondly, we spent 20 minutes during a regular class meeting to explain and clarify the purpose of the study before the questionnaires were distributed to the students. They were asked to return the questionnaires when ready. Finally, one week after the questionnaires were distributed, we reminded the students in class to return the questionnaires.

3. RESULTS AND DISCUSSION

The data collection process was carried out for a period of three weeks. Apparently, the data collection techniques that were employed to increase the valid return rate (described in last section) were quite effective. We had a high response rate of 85%, i.e. two hundred and twelve valid questionnaires returned out of a total of two hundred fifty questionnaires distributed. As explained previously, the questionnaires were used to investigate the relationships among the five variables, namely, Competency (C), Perceived Benefits (B), Study Habit (H), Accessibility (A) and students' Usage (U). The analysis of the collected data reflecting the variables in the research model will be carried out by means of the response averages (RA) and Pearson-R correlation.

3.1 Response averages (RA) analysis

The descriptive statistics (means and averages) of the responses to questionnaire's questions are presented in Table 1. There were a total of forty questions in the survey questionnaires. In the discussion that follows, Qj denotes question j in the questionnaire. Among the forty questions, questions Q1, Q2, and Q37-40 were used to collect data on the gender, class registration and other open-end opinions respectively. Since these data were not relevant to the analysis of the current research objective, they were excluded in the Table 1. Based on our design of the questionnaires, the responses to Q3 to Q36 were restricted to range of 1 to 5 (in Likert scale), corresponding to five categories, namely, 1 for Strongly disagree (SD), 2 for Disagree (D), 3 for Neutral (N), 4 for Agree (A) and 5 for Strongly Agree (SA). To analyze this huge volume of responses data from more than two hundred participants, we first examine the response averages (RA) (i.e. the mathematical averages) to facilitate the discussion of the results. The RA to each question produces a rough idea (or a good indicator) of the aggregate direction towards the two ends of the scale for each question. With the responses being restricted to a 5-point Likert scale, the RA value of 3 is the mid-point value of the scale and implies a neutral stance to the aggregate response to each question. Therefore, the RA value of less than 3 for any question implies that the overall response to that question lies in the "disagree"- direction. Otherwise, the overall response lies in the "agree"- direction.

Two questions, Q5 and Q6, in the survey were used to measure the Internet and e-learning usages (U), namely, Q5: *"I surf the Internet very often (excluding WebCT) each week" and* Q6: *"I am a frequent* Internet *learning user"*. For this study, Q6 (reflecting the students' e-learning usages) is the key dependent variable in our research model. The goal is to determine how Q6 is relating to the other research variables. In Table 1, it can be seen that the RA values for Q5 and Q6 are 3.51 and 1.99, respectively. The respondents agreed that they were frequent Internet surfer but disagreed that they were frequent Internet learning users. However, simply based on these RA results alone, we cannot conclude whether the Internet usage and the Internet learning usage are directly and statistically related. Specifically, we need to use other technique such as the correlation analysis (CA) to test and verify the significance of the relationships found for these variables and this is described in the following section.

There are four questions for measuring the study habits (H). These questions are Q10*: "I prefer paper-based exercises more than interactive Internet exercises"*, Q11*: "I prefer to study hardcopy lecture notes more than softcopy lecture notes"*, Q23*: "I enjoy doing the interactive exercises in WebCT for these courses", and* Q33*: "I prefer reading the same e-learning materials (five pages and above) in hardcopy format instead of soft copy on line"*. Table 1 shows that the values of RA for Q10, Q11, Q23 and Q33 are 3.13, 3.53, 2.68 and 3.57 respectively. The resulting RA values for questions Q10, Q11 and Q33 are higher than 3, indicating the agreements with three of the question statements, while the RA value for Q23 is less than 3, implying a disagreement with Q23. The combining results show that the students preferred the traditional mode (paper-based) of study and did not enjoy using the e-learning materials. How these variables are relating to the

e-learning usage is further analyzed in the next section.

Four questions are used to measure the respondents' perceived competencies (C). These are Q8: *"I have adequate PC skills"*, Q17: *"I have received adequate instruction for using WebCT"*, Q5: *"I am a frequent Internet user (excluding WebCT)"*, and Q3: *"I have learned PC skills in other formal computer course(s) prior to this course"*. It can be seen in Table 1 that the respective RA values for Q8, Q17, Q5 and Q3 are 3.8, 3.1, 3.51 and 1.44. The resulting RA values imply that the respondents agreed to have possessed adequate PC skills and received adequate instructions on using the e-learning materials, while they disagreed that they had taken formal computer courses to learn these skills.

There are seven questions used to measure the students' Accessibility (A). They are Q12: *"I have easy and adequate access to computer resource on campus"*, Q14: *"I have easy and adequate access to computer resource away from campus"*, Q16: *"I have adequate access to computer resources for this course"*, Q18: *"I have no difficulty in log-on WebCT"*, Q19: *"I have encountered slow response time from WebCT"*, and Q25: *"I can easily find the supplement materials in WebCT"*. In Table 1, the RA values for Q12, Q14, Q16, Q18, Q19 and 25 are 3.01, 3.18, 3.33, 3.65, 3.55 and 3.1 respectively. The results of the RA values for these questions are consistently higher than 3, implying the agreements with the question statements. These RA values indicate that the students agreed to have adequate accesses.

Finally, eight questions are used to measure the students' perceived benefits. They are Q26: *"The e-learning materials in WebCT help me understand the subject contents more in-depth"*, Q27: *"The e-learning materials in WebCT help me understand the subject contents quicker"*, Q28: *"The e-learning materials in WebCT help me understand the subject contents better"*, Q29: *"The e-learning materials increase my interest in the subject contents"*, Q30: *"Using the e-learning materials in WebCT for this course increases my workload"*, Q31: *"I prefer to study my other courses using the WebCT"*, Q34: *"I can learn from the e-learning materials in WebCT alone instead of from textbook & lecture"*, and Q36: *"I recommend this course to be continuously using WebCT"*. Table 1 shows that the RA values for Q26, Q27, Q28, Q29, Q30, Q31, Q34 and Q36 are 2.79, 2.69, 2.8, 2.67, 3.17, 2.83, 2.49 and 2.93, respectively. The RA values for the responses of all questions were less than 3 except for the response of Q30. In other words, the respondents in general disagreed with the apparent perceived benefits of the Internet learning - learn faster, quicker and better. Additionally the respondents in general agreed with the apparent perceived cost using Internet learning - increasing their workloads. Together, these RA values show that the respondents in general had a consistent negative view towards the perceived benefits using Internet learning materials.

Collectively, we have the followings findings according to the results of the RA analysis:

- The respondents disagreed that they were frequent Internet learning users.
- The respondents disagreed that they realized the perceived benefits of using Internet learning in their experience.
- The respondents agreed that they were frequent Internet users.
- The respondents agreed that they preferred traditional mode of study.
- The respondents agreed that they had adequate computer competencies.
- The respondents agreed that they had adequate access to Internet learning.
- The respondents agreed that Internet learning increased their workloads in studying.

3.2 Correlation analysis

In the previous section, the RA analysis produces a general picture of the respondents in this study. In this section, we further analyze the data by means of the correlation analysis, based on PEARSON R, to determine whether there is any statistically significant correlation(s) existed between the e-learning usage and the other variables in our research model. Due to the time and space limitations, here we will only discuss and analyses the results for Competence (C) and Habits (H) to Usage (U) (both Internet usage and e-learning usage). The PEARSON R values for (C) & (U) and for (H) & (U) are shown in Tables 2A and 2B, respectively, where Q5 represents the Internet usage and Q6 represents the e-learning usage.

Table 2A shows the correlation between Usages (U), i.e, responses to Q5 and Q6, and Competence (C), i.e., responses to Q3, Q5, Q8

and Q7. It can be seen that the two competence questions, Q5: *"I surf the Internet very often (excluding WebCT) each week"* and Q8: "*I have adequate PC skills*", have significant correlation (significant at the 0.01 levels and the Pearson R values are 0.312 and 0.305) with the e-learning usage question, Q6: *"I am a frequent e-learning user"*. These highly statistically significant values suggest that we can confidently believe that both frequent Internet surfing users and confident users with perceived adequate PC skills have effects on their Internet learning usage. To encourage effective use of Internet learning, the practitioners in the field shall attempt to familiarize their users with the Internet more. Q3: *"I had taken a formal computer course prior to this course"* and Q17: *"I have received adequate instruction for using WebCT in this course*" have low or no statistically significant relationship to the e-learning usage at all. Therefore, we cannot confidently believe that the respondents who had taken formal computer courses or received adequate instructions using WebCT before the experiment would have any direct impact on their e-learning usage. The results may sound a bit confused at first. Confident users are likely users of Internet learning while prior PC courses and alone training have no effect. The results may suggest that the prior course or instructions alone are not adequately providing the respondents with the needed PC skills or confidence to use the Internet learning practically. The respondents tend to acquire the needed skills through personal experience with PCs and the Internet. Moreover, Table 2A also shows that Q5: *"I surf the Internet very often (excluding WebCT) each week"* and Q8: "*I have adequate PC skills*" have a highly significant correlation (at the 0.01 level) with Pearson R equal to 0.259. The respondents' perceived Internet usage highly correlates with their perceived PC skills. One can confidently believe that Internet usage impacts the respondents' perceived PC skills. Together, both appear to correlate with and have influence to their perceived e-learning usage. All these sound confusing and conflicting with the above results. However, in further reasoning, they are not in a disagreement with the above explanation. The Internet surfing usages of the respondents have simultaneously some influences over the respondents' Internet learning usage and their confidence of their own perceived PC skills. However, these perceived PC skills alone are not affecting the usage. This is consistent with the above explanation that formal computer course might not necessarily improve their Internet usages, nor improve their needed PC skills.

Table 2B shows the correlation between the e-learning Usages (U) and Habits (H) of the respondents in this study. Of the four questions, only Q23: *"I enjoy using the e-learning materials for the course"* has a significant relationship (significant at the 0.01 level and the Pearson R value equals to 0.284) with the e-learning usage. This result has shown that those respondents who used e-learning would also enjoy using the e-learning materials. This would be a point of interest for further research. Intuitively, it makes senses that frequent users for certain items must enjoy using those particular items. It will be an interesting research project to find out how to keep someone's interest in certain items. Moreover, the other questions including Q10: *"I like paper-based mode of study more than the Internet exercises"*, Q11: *"I like to study hardcopy lecture notes more than softcopy"*, and Q33: *"For reading five pages (or above) of materials, I prefer to read the hardcopy instead of on line*" have no significant relationship with the e-learning usage. However, Table 2B has also shown that the Internet usage (Q5) and the respondents' preference to lecture notes format (Q11) have a significant correlation at the 0.05 level and the Pearson R value equal to 0.246. In the previous section, we find that respondents in general prefer the traditional mode of learning and here we find that there is a significant relationship of the preferences to the traditional mode of learning to the usage of Internet learning. Habits that were building up over the years are hard to change over night. This suggests that further development in Internet technology is needed to reduce the gap for the transition from traditional mode of study to the Internet learning. Finally, according to the (RA) analysis above, the students generally agreed that Internet learning increased their workloads in studying. Further investigation is needed to find out if it is a generally true statement or there can be ways to avoid increasing the workload of the users.

4. CONCLUSIONS

We have conducted a survey study to answer the question, "Which of the students' characteristics and perceptions differentiate a user from a non-user?" The survey results indicated several findings. Firstly, the results have shown that the respondents had adequate computer resources to use Internet learning. Secondly, the results have shown that those respondents who enjoy using

the e-learning materials (Q23: *"I enjoy using the e-learning materials for the course"*) are likely to report a higher e-learning usage (with statistical significance). This finding is similar to the findings of a previous related study that students who felt that e-learning increased their interest in the subject would use e-learning more [19]. Finally, the results have indicated that both the students' PC skills and their regular Internet usages significantly correlated to their e-learning usages, while taking a formal computer course has no significant relationship to the e-learning usage or the students' (perceived) PC skills. One possible implication of this study is that the existing Internet technology is not adequate to successfully replace the traditional mode of learning completely as the habits to prefer the traditional mode are building up over the years and could not be changed in a few years while the transition gap is large. This may partially explain why the respondents agreed that the Internet learning usage increased their workloads in studying. Further investigation is needed to find out if it is a generally true statement due to something else.

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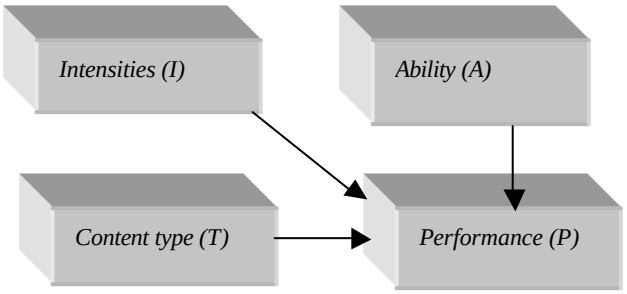

Figure 1. Research Model of previous study

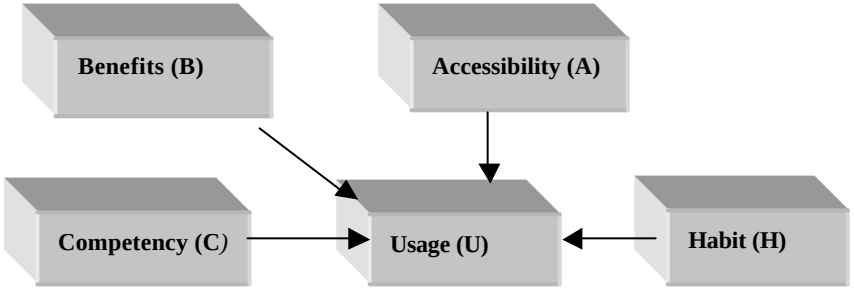

Figure 2. Research Model of this study

	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12	Q13	Q14	Q16	Q17	Q18	Q19	Q20
RA	1.44	1.59	3.51	1.99	2.88	3.84	3.66	3.13	3.53	3.01	2.36	3.18	3.33	3.09	3.65	3.55	3.28
STD	0.5	0.49	1.37	0.99	1.29	1.09	1.01	1.08	1.3	1.04	1.01	1.1	0.97	1.01	1.1	1.13	1.12
	Q21	**Q22**	**Q23**	**Q24**	**Q25**	**Q26**	**Q27**	**Q28**	**Q29**	**Q30**	**Q31**	**Q32**	**Q33**	**Q34**	**Q35**	**Q36**	
RA	2.81	2.69	2.68	3.12	3.1	2.79	2.69	2.8	2.67	3.17	2.83	3.03	3.57	2.49	2.69	2.93	
STD	0.94	1.02	1.03	1.2	1.01	0.89	0.91	0.91	1.07	1.02	1.14	0.99	1.36	1.1	0.95	1.22	

Table 1 Response average (RA) and standard deviation (STD) for Q3-Q36

	Q3	Q5	Q8	Q17
Q5	0.18	1.00	.259**	0
Q6	-0.13	.312**	.305**	.186
** Correlation is significant at the 0.01 level = 99% Confidence level				
* Correlation is significant at the 0.05 level = 95% Confidence level				

Table 2A. Correlation of Usage (U) with Competence (C)

	Q10	Q11	Q23	Q33
Q5	-0.021	.246*	0.16	0.08
Q6	0.01	0.185	.284**	0.15
** Correlation is significant at the 0.01 level = 99% Confidence level				
* Correlation is significant at the 0.05 level = 95% Confidence level				

Table 2B. Correlation Between Usage (U) and Study Habit (H)