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Pre-Service Teachers' Attitudes towards Information Communication Technology

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Abstract

Integration of Information and Communication Technologies (ICT) into education has been an important concern in many countries. The purpose of the study was to find out the attitudes of pre-service teachers towards Information and Communication Technology. Descriptive survey design was used for this study, and a semantic differential questionnaire with seven options was used to measure the attitudes of pre-service teachers towards ICT. Three hundred students drawn from Level 400 of a department in the University of Cape Coast in Ghana were selected to form the sample for the study using the stratified random sampling technique. From the study, the pre-service teachers showed positive attitude to ICT with a mean score of five for all the subscales of the questionnaire which translates as 'slightly important'. The research reviewed that overall, preservice teachers can be categorised at the "understanding and application of process" stage of the technology adoption stages. A further analysis was conducted to find out the predominant stage of technology adoption among the preservice teachers. It was realised that majority of the respondents rated themselves at the "understanding and application of process" stage which was followed by "learning the process" stage. A one-way multivariate analysis of variance was conducted to investigate if the mean differences among stages of adoption of technology and attitudes towards technology being observed are statistically significant. The study revealed that preservice teachers technology adoption stage differed based on their attitudes towards technology. The preservice teachers showed positive attitude to ICT.

Key words: Information and Communication Technologies; preservice teachers; technology adoption; attitudes towards technology.

Introduction

Debate and discourse in education over the last decade have been centred on how technology can and does affect teaching and learning (Al-Bataineh & Brooks, 2003; Hofer & Swan, 2008). The integration of technology into education has massive influence on educational system of a country. This has generated interest in how children and teachers are using technology in the classroom (Albion, Jamieson-Proctor, & Finger, 2010). Technology allows many people to generate and disseminate information, thus playing an active role in the process of interaction between professionals, learners, teachers, policy makers, peers and society at large (Leach, Ahmed, Makalima, & Power, 2005). Leach et al. (2005) further indicated that technology provides the prospect for teachers to meet the learning needs of individual students through which equal opportunities can be provided for learners which can lead to the promotion of interdependence of learning among learners. Moreover, students now enter educational institutions with the expectation that technology would be used in the classroom as a teaching tool and many students already have acquired the necessary technological skill sets that would support with their school work (Sivakumaran & Lux, 2011).

Considering the numerous benefits integration of technology brings to the educational process, as well as the demands of modern society, there is the need for the teacher to be literate in the use of technology in teaching. Teachers require extensive, on-going exposures to Information and Communications Technology (ICT) as well as appropriate pedagogical approaches in order to be able to evaluate, select and use the most appropriate resources to facilitate teaching and learning. Teachers need to be exposed to long term ICT training and professional development in order to keep up with rapidly evolving digital technologies and to train students for the rapid development in technologies in the world. The findings of this research creates awareness to school authorities on pre-service teachers' attitudes towards ICT in their teaching. The outcome of the study will also bring to the fore, the stage where preservice teachers are with regards to their adoption of technology in their teaching.

An accumulated body of research has found that teachers' contribution is very important for the implementation and success of any technological innovation in education (Eteokleous-Grigorious, Anagnostou, & Tsolakidis, 2012; Lim, Lock & Brook, 2011). A teacher

will be able to effectively achieve this goal if s/he has the right disposition towards the use of technology in teaching (Chen, 2008). Also, the success of student learning with computer technology as argued by Teo (2008) will depend largely on the attitude of teachers and their willingness to embrace the technology. There seems to be a consensus among educators that the teacher is an influencial component in the success of technology integration in the teaching and learning process.

It is therefore imperative that right at their preparation stages, teachers, are trained in how to use technology in their future classrooms. Such training will go a long way to boost their attitudes towards ICT integration in their teaching which will ultimately influence their usage of technology in their daily classroom activities. This is due to the fact that the beliefs and perceptions of preservice teachers is a critical determinant of how they will teach in the future (Wang, 2002). These pedagogical beliefs and teaching philosophies of pre-service teachers' do not influence only how they will go about their teaching but most importantly the way that technology will be adopted and the degree of technology integration within their classroom practices will also be affected (Chai, Teo, & Lee, 2010). The danger in not identifying pre-service teachers' pedagogical beliefs about technology is that changing and or modifying in-service teachers' beliefs about teaching and learning with computers in the classroom has been found to be always a challenge (Lim & Chai, 2008). This is because their pedagogical beliefs are formed over many years of experiences, from life as pupils in the classroom (Richardson, 2003). Cavas, Cavas, Karaoglan and Kisla (2009) therefore opined that teachers in training should be trained in using modern technologies in the field of education.

Ertmer and Ottenbreit-Leftwich (2010) emphasized that although knowledge of technology is necessary, it is not enough if especially, novice teachers do not also feel confident using that knowledge to facilitate student learning. This implies that understanding the thought of pre-service teachers with regards to the use of ICT will reveal their mindset on the merits and demerits of ICT in their teaching which could be used to help improve their professional preparation as noted by Pajares (1992). Although teacher educators seek to introduce the use of technology in teacher education

programmes with the aim of helping pre-service teachers acquire the needed technological skills and knowledge in order to successfully incorporate technology in their teaching, it should be noted that different pre-service teachers will have different worldview and appreciation of the merits and demerits of technology.

Russell (1995) described six stages of learning to use a new technology as: Stage 1: Awareness, Stage 2: Learning the process, Stage 3: Understanding and application of the process, Stage 4: Familiarity and confidence, Stage 5: Adaptation to other contexts, and Stage 6: Creative application to new contexts. In the Awareness stage, a person is aware that the technology exists. However, the person may have avoided using the technology out of fear or nervousness. In the Learning the Process stage, there is learning of new information and new skills are mastered. The learner may feel frustrated with the use of the new technology. Understanding and Application of the Process stage is reached when the learner begins to understand the logic behind the technological processes. There is a sense of community with the presence of other learners who are also learning the processes and provide moral support. Familiarity and Confidence stage is achieved when the learner applies the technological processes to the task at hand. Through familiarity, the learner is able to solve the problems. In the Adaptation to other contexts stage, the learner can now see the potential of the technology. The technology becomes invisible and there is a new sense of confidence in using the technology. In the final stage, Creative application to new contexts, the technological processes become invisible to the learner who recognises the implications and possibilities of the technology.

The stakeholders of education in Ghana have since 2007 seen the importance of ICT in the teaching and learning procees. This is evident in the promulgation of ICT as a major tool in teachers' pedagogy as well as making it a teaching and learning subject right from the basic level (CRDD, 2007). Further support of use of technology in the educational sector was found by Beccles and Ayebi-Arthur (2009) who reported that almost 65% of basic level students had had some form of computer usage in their lives. Even as the educational system in Ghana is gradually integrating ICT into the teaching and learning process, the attitudes pre-service teachers demonstrate towards Information and Communications Technology will have an impact on students' interest for a subject. It is important to ensure that teachers are

able to integrate technology into the curriculum. As such, the groundwork must be laid at the various educational institutions where pre-service teachers acquire teaching skills. Unfortunately, there seems to be no literature on the attitudes of pre-service teachers towards ICT integration in the teaching and learning process. This research sought to contribute in filling the gap by documenting the attitudes of pre-service teachers in a university in Ghana.

Purpose of the study

This study sought to find out the attitudes of pre-service teachers towards Information and Communications Technology. The study focussed on pre-service teachers attitudes towards electronic mail, World Wide Web (WWW), multimedia, using computers for professional productivity and using computers in the classroom. It also sought to identify the stage of technology adoption of the pre-service teachers. Again, the study sought to identify how individuals at the various stages of technology adoption differed on their attitudes towards technology.

Research Questions

The research was guided by three research questions.
1. What are the attitudes of pre-service teachers towards Information and Communications Technology?
2. What stage do the participants of the study fall in Russel's technology adoption model?
3. Are there possible differences in attitudes towards technology among participants at different stages of adoption?

Methodology

Research Design

Descriptive survey design was used for this study because the research sought to identify and describe the attitudes of pre-service teachers towards ICT. This design was used due to its ability to cater for large sample size, which could help in generalizing the outcome of the study. The survey design is capable of allowing participants to respond to the items at their own convenience without any influence from the researcher. Moreover, surveys can produce data that can be

used for descriptive, inferential and explanatory purposes. There is greater anonymity associated with surveys and thus respondents were able to respond freely, candidly and sincerely without interference from researchers.

Sample and Sampling Technique

The sample for this study was drawn from Level 400 students in a Department in the University of Cape Coast. The Level 400 students were selected because they had taken a course in computer applications. In addition, they had gone out for their off-campus teaching practice where they may have had the opportunity to use ICT in their teaching. The students were enrolled in Bachelor of Education (Science), Bachelor of Education (Mathematics) or Bachelor of Education (Computer Science) programme. Three hundred out of 350 students were selected to form the sample for the study using the stratified random sampling technique. This method gave the various strata (Science, Mathematics and Computer Science) within the population equal opportunity to be part of the sample for the study. The method ensured a high degree of representativeness of all the strata in the population. In all, 150 students from Mathematics, 100 from Science and 50 from Computer Science were used for this study.

Instrument

To explore pre-service teachers' attitudes toward Information and Communications Technology, a validated questionnaire, Teachers' Attitudes toward Information Technology (TAT v. 2.0) (Christensen & Knezek, 1998) was used to collect data from the sample. Teacher's Attitudes Towards Information Technology Questionnaire is a semantic differential instrument that measures attitudes towards information technologies. This instrument contains five subscales soliciting respondents' views on five dimensions of ICT, namely, electronic mail, World Wide Web (WWW), Multimedia, using computers for professional productivity, and using computers in the classroom. Each subscale contains 10 semantic differential items with seven options. Respondents were expected to indicate how they feel towards each pair of adjectives by placing a tick at the appropriate space.

Although this instrument is widely used the world over with high reliabilities, the researchers thought it necessary to estimate the reliability of the instrument since it was being used in this context for

the first time. Cronbach alpha reliability was therefore calculated for the various subscales. The estimates were 0.85, 0.86, 0.86, 0.86 and 0.87 for electronic mail, WWW, multimedia, using computers for professional productivity and using computers in the classroom respectively.

Data Collection Procedure

Data collection in research demands a high degree of co-operation and assistance from respondents. To receive the needed co-operation from the selected respondents, the procedure in responding to the questionnaires was vividly explained to the participants of the study. The confidentiality and anonymity of respondents and their responses were assured. No form of identification was required on the questionnaire. The respondents were asked to respond to the items of the questionnaire within a day and the filled questionnaire collected. There was 100% return rate.

Data analysis

The seven options of the questionnaire were quantitatively and qualitatively coded where values and their descriptions were provided. Options to each item on the various subscales in the questionnaire was assigned values of 1-7 where 1= Extremely Unimportant, 2= quite unimportant, 3= slightly unimportant, 4= neither important nor unimportant, 5= slightly important, 6= quite important and 7= extremely important. A mean of 4 or less therefore depicts negative attitude whiles a mean of 5 and above show positive attitude towards ICT in this study. Quantitative data analyses comprising means and standard deviation were used to analyse the research questions. In addition, one-way MANOVA, ANOVA and Tukey post-hoc tests were conducted through Statistical Package for the Social Sciences (SPSS version 22) software to test the hypothesis.

Results and Discussion

The results of the research have been presented according to research questions. The first research question sought to identify the attitudes preservice teachers hold towards ICT. Means and standard deviations were calculated for each subscale of the instrument. The results are presented in Table 1.

Table 1

Attitudes of Pre-Service Teachers towards ICT

Dimension of ICT	Mean	Std. Deviation	N
Electronic Mail	5.3915	1.12045	300
WWW	5.5723	1.10363	300
Multimedia	5.5200	1.12951	300
Professional Productivity	5.4689	1.14507	300
Students' use of Computers in the Classroom	5.4153	1.19075	300

The preservice teachers showed positive attitude to ICT with a mean score of 5 for all the subscales of the questionnaire. This means that the preservice teachers find the aspects of ICT assessed to be slightly important in their work as teachers. The demonstration of positive attitude towards ICT by preservice teachers albeit a weaker one is a good sign towards the integration of technology in their professional lives. As Baylor and Ritchie (2002) state, ''regardless of the amount of technology and its sophistication, technology will not be used unless faculty members have the skills, knowledge and attitudes necessary to infuse it into the curriculum'' (p. 398). The findings of the study support Cavas, Cavas, Karaoglan and Kisla (2009) discovery that, in order to use technology in the classroom effectively, teachers' attitude towards technology should be positive. As attitudes demonstrates one's disposition to react and act towards a phenomenon, this outcome is an indication that preservice teachers may react positively when it comes to the use of technology in their classrooms and in tandem with Kersaint, Horton, Stohl and Garofalo (2003) finding that teachers who have positive attitudes toward technology feel more comfortable with using it and usually incorporate it into their teaching. As Woodrow (1992) discovered, a necessary condition for effective use of ICT in the classroom is a teacher that has a positive attitude toward computers.

Preservice teachers' stage of technology adoption

The second research question sought to categories the stage at which preservice teachers were with respect to technology adoption. The research revealed that overall, preservice teachers can be categorised at the "understanding and application of process" stage.

This was due to the mean score of 3.36 (SD = 1.54001) realized for this scale. A further analysis was conducted to find out the predominant stage of technology adoption among the preservice teachers and the outcome plotted in a bar graph as can be seen in Figure 1. It was realised that majority of the respondents rated themselves at the "understanding and application of process" stage which was followed by "learning the process" stage.
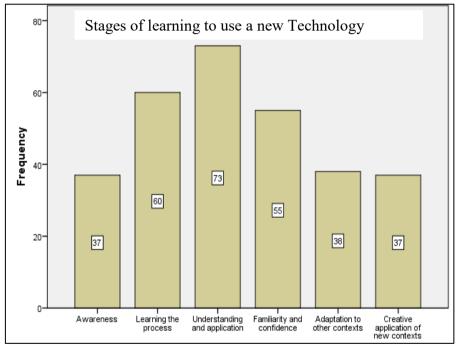

Figure 1: Stages of technology adoption

This finding indicates that the majority of pre-service teachers used in this study perceive themselves to be at a lower level of technology adoption and that they are now capable of identifying how useful a technological tool may be in executing a particular task. Moreover, they are at a stage where they are beginning to understand how technological tools can be used. The preservice teachers feel confident in using their knowledge of technological tools to facilitate student learning which is in tandem with the findings of Ertmer and Ottenbreit-Leftwich (2010). It is hoped that the preservice teachers will enhance their teaching with ICT to make lessons more exciting and

sustain the interests of their students. Pre-service teachers are expected to make the transition of utilising ICT tools for effective teaching and develop effective teaching resources when they have made the transition into full time employment. Teachers are more likely to incorporate ICT use in their classrooms if they see its relevance to their instruction and are convinced that the design of education software is compatible with educational goals and the individual learning needs of students (Williams, Boone, & Kinsley, 2004).

Differences among stages of adoption of technology and attitudes towards ICT

This section sought to provide an answer to the null hypothesis that there is no statistical difference among stages of adoption of technology and attitudes towards technology. First, analysis was conducted to determine the attitudes of respondents in the various stages of technology adoption towards ICT. Table 2 shows the results for this analysis.

Table 2
Attitudes towards ICT and Stages of Adoption

IT tool /Mean	1	2	3	4	5	6	7
Email				⬤⬆	⊠	⌘₵✈	
WWW				⬤⬆⊠		⌘₵✈	
Multimedia				⬤⬆⊠		⌘₵✈	
Professional Productivity				⬤⬆⊠⌘		₵✈	
Using computers in the classroom				⬤⬆	⊠⌘	₵✈	

Stages of adoption: ⬤ Awareness, ⬆ Learning the process, ₵ Understanding and application of the process, ⌘ Familiarity and confidence, ⊠ Adaption to other contexts, ✈ Creative application to new contexts

A one-way multivariate analysis of variance was conducted to investigate if the mean differences among stages of adoption of technology and attitudes towards technology being observed are statistically significant. Five dependent variables were used: Electronic mail, World Wide Web, Multimedia, Professional productivity and Using computers in the classroom. The independent variable was

Stages of technology adoption. Preliminary assumption testing was conducted to check for normality, linearity, univariate and multivariate outliers, homogeneity of variance-covariance matrices, and multicollinearity, with no serious violations noted. There was a statistically significant difference between Technology Adoption and Attitude towards Technology, $F = 3.01$, $p < .001$; Wilks' Lambda = .778; partial eta squared = .049. When the results for the dependent variables were considered separately, all the variables reached a statistical difference using Bonferroni adjusted alpha value of .01 (the original alpha level of 0.05 was divided by the number of analyses conducted). The results were: Email, $F = 11.53$, $p < .001$, partial eta squared = .164; World Wide Web, $F = 7.463$, $p < .001$, partial eta squared = .11; Multimedia, $F = 3.018$, $p < .001$, partial eta squared = .049; Professional productivity, $F = 3.238$, $p = .007$, partial eta squared = .052; and Using computers in the classroom, $F = 9.213$ $p < .001$, partial eta squared = .135.

Since the one-way MANOVA showed significant difference among the various dependent variables, it was necessary that further tests were conducted to identify the sources of the difference. Tabachnick and Fidell (2007) advocates a further test of ANOVA with the associated post hoc analysis when a significant result is obtained among multivariate tests. Thus, ANOVA with Tukey's HSD post hoc were conducted. Due to the number of tests to be conducted, the Bonferroni adjustment was used in order not to commit Type 1 error. The new alpha level was set at 0.01.

ANOVA test was therefore conducted to find out if respondents at the various stages of technology adoption differed in their attitudes towards the use of electronic mail. The results with the post hoc analysis are provided in Table 3. The ANOVA test was significant with F=11.533, p<0.01.

Table 3
ANOVA Comparisons of Electronic Mail

Group	n	Mean	SD	Awareness	Learning the process	Understanding and application	Familiarity and confidence	Adaptation to other contexts	Creative application of new contexts
						Tukey's HSD Comparisons			
Awareness	37	4.65	1.21	–	.913	.000*	.000*	.039	.000*
Learning the process	60	4.87	.87		–	.000*	.020	.210	.000*
Understanding and application	73	5.75	1.11			–	.977	.415	.855
Familiarity and confidence	55	5.61	1.00				–	.854	.519
Adaptation to other contexts	38	5.36	.89					–	.090
Creative application of new contexts	37	5.99	1.11						–

*   Sig < 0.01

It was seen that there were significant differences among the attitudes of respondents at 'awareness' and those in 'understanding and application', 'familiarity and confidence' and 'creative application of new contexts'. These respondents had better attitudes towards ICT as compared to those at the 'awareness' stage. This was not surprising since the 'awareness' stage is the lowest stage with the adoption of technology therefore individuals at that stage may not be frequent users of electronic mail. Significant differences were also observed between respondents at the 'learning the process stage' and those at 'understanding and application stage' as well as those at 'creative application of new contexts stage'. The respondents at the two latter stages (understanding and application stage' and 'creative application to new contexts) had more positive attitudes towards ICT as compared to their counterparts at the 'learning the process stage'. This was not perplexing in that 'learning the process stage' is at a lower level on the technology adoption model as compared to the other two stages. Thus, respondents at these two relatively higher stages are expected to have better appreciation for technology as compared to individuals at the lower level of 'learning the process stage'. There were however no significant differences among 'awareness' stage and those in 'learning the process' and 'adaptation to other contexts'. The former is not so

surprising since 'learning the process' is the stage after 'awareness' and therefore much difference are not expected among individuals at those stages. The surprising aspect is the lack of significance between 'awareness' and 'adaptation to other contexts'. It was expected that since 'adaptation to other contexts' is the second highest stage individuals at that stage would value and use electronic mail more than those at the lowest stage. However, among the respondents used for this study no significant differences were seen.

The second ANOVA was conducted to identify if there were differences in attitudes of respondents at the various stages of adoption towards WWW. The ANOVA results with the associated Tukey's HSD post hoc analysis are presented in Table 4. The ANOVA test was significant (F=7.463, p <0.01) and the post hoc analysis revealed that the differences were between 'awareness' stage and 'creative application of new contexts' as well as between 'learning the process' and 'creative application of new contexts'. In both instances individuals at the 'creative application of new contexts' had a more positive towards WWW than individuals at 'awareness' and 'learning the process' stages. This finding was because the 'creative application of new contexts' is the highest stage with the adoption of technology stages and thus individuals at this stage are expected to be at the highest level of technology adoption and integration. It is therefore appropriate that individuals at this stage will have a more positive attitude towards WWW as compared to individuals at the first two stages of adoption.

Table 4
ANOVA Comparisons of World Wide Web

Group	n	Mean	SD	Awareness	Learning the process	Understanding and application	Familiarity and confidence	Adaptation to other contexts	Creative application of new contexts
Awareness	37	5.02	1.19	–	.965	.020	.088	.365	.000*
Learning the process	60	5.20	1.00		–	.060	.282	.744	.000*
Understanding and application	73	5.85	1.12			–	.811	.552	.489
Familiarity and confidence	55	5.61	1.05				–	.995	.073
Adaptation to other contexts	38	5.49	.98					–	.035
Creative application of new contexts	37	6.22	.89						–

* sig <0.01

The third ANOVA analysis was conducted to identify if respondents at the various stages of technology adoption differed in their attitudes towards Multimedia. The ANOVA test was significant (F=3.018, p =0.01) as can be seen in Table 5. The post hoc analysis revealed that there was a difference between 'awareness' stage and 'creative application of new contexts'. However, this difference was significant at original alpha level of 0.05 but since we are using adjusted Bonferroni of 0.01 this outcome cannot be considered to be statistically significant at our new alpha level. Thus, we conclude that the respondents attitudes toward Multimedia is the same across the various stages of technology adoption. This indicates that the stages of adoption does not affect how respondents may use Multimedia in the course of their teaching.

Table 5
ANOVA Comparisons of Multimedia

Group	n	Mean	SD	Awareness	Learning the process	Understanding and application	Familiarity and confidence	Adaptation to other contexts	Creative application of new contexts
						Tukey's HSD Comparisons			
Awareness	37	5.16	.98	–	.994	.121	.490	.986	.040
Learning the process	60	5.29	.90		–	.216	.732	1.000	.073
Understanding and application	73	5.73	1.21			–	.976	.479	.951
Familiarity and confidence	55	5.58	1.24				–	.898	.689
Adaptation to other contexts	38	5.33	1.05					–	.193
Creative application of new contexts	37	5.93	1.15						–

* sig <0.01

In order to find out how the respondents at various stages of adoption viewed using computers for professional productivity, ANOVA test was conducted. The ANOVA test was significant (F=3.328, p=0.007) and therefore post analysis was conducted as presented in Table 6. The post hoc showed that there was no statistical difference among the various stages of adoption of technology and using computers for professional productivity at the adjusted Bonferroni of 0.01. The significance that was detected was at 0.05 which was not the new significance level set for this analysis. This finding indicates that the use of computers to affect professional competence is not dependent on the stage of technology adoption one is. Respondents at the various stages of technology adoption realize the important role computers play in ther professional life as would be teachers.

Table 6
ANOVA Comparisons of Professional Productivity

Group	n	Mean	SD	Awareness	Learning the process	Understanding and application	Familiarity and confidence	Adaptation to other contexts	Creative application of new contexts
						Tukey's HSD Comparisons			
Awareness	37	5.06	1.09	–	.970	.051	.447	.890	.022
Learning the process	60	5.24	.93		–	.171	.833	.999	.074
Understanding and application	73	5.71	1.18			–	.900	.573	.972
Familiarity and confidence	55	5.49	1.14				–	.986	.588
Adaptation to other contexts	38	5.34	1.14					–	.292
Creative application of new contexts	37	5.88	1.28						–

* sig <0.01

The last ANOVA analysis sought to identify whether respondents at the various stages of technology adoption differed in attitudes towards how their students will use technology in the classroom and the results have been presented in Table 7. The test was significant (F=9.213, p < 0.001) and therefore post hoc analysis was conducted. The post hoc analysis revealed that at the adjusted Bonferroni of 0.01, there were differences between 'awareness' stage and 'understanding and application' stage as well as between 'awareness' stage and 'creative application of new contexts' stage. Respondents at the 'understanding and application' and 'creative application of new contexts' stages had more positive attitudes with regards to their students using computers in the classroom as compared to those respondents at the 'awareness' stage. Significant differences were also observed between respondents at the 'learning the process stage' and those at 'understanding and application stage' as well as those at 'creative application of new contexts stage'. The respondents at the two latter stages (understanding and application stage' and 'creative application to new contexts) had better positive attitudes towards ICT as compared to their counterparts at the 'learning the process stage'. This was not surprising in that 'learning the process stage' is at a lower level on the technology adoption model as compared

to the other two stages. Thus, respondents at these two relatively higher stages are expected to have better appreciation for technology as compared to individuals at the lower level of 'learning the process stage'.

Table 7
ANOVA Comparisons of students' use of Computers in the Classroom

Group	n	Mean	SD	Tukey's HSD Comparisons					
				Awareness	Learning the process	Understanding and application	Familiarity and confidence	Adaptation to other contexts	Creative application of new contexts
Awareness	37	4.72	1.09	–	.955	.000	.016	.070	.000
Learning the process	60	4.92	.92		–	.000	.072	.248	.000
Understanding and application	73	5.77	1.15			–	.682	.599	.859
Familiarity and confidence	55	5.49	1.16				–	1.000	.185
Adaptation to other contexts	38	5.43	1.20					–	.162
Creative application of new contexts	37	6.05	1.21						–

* sig <0.01

Conclusion and Recommendations

In conclusion, the preservice teachers showed positive attitude to ICT. This means that the preservice teachers found the aspects of ICT assessed to be slightly important in their work as teachers. In addition, the research identified that overall, preservice teachers can be categorized at the "understanding and application of process" stage which was the third stage in a five-stage continuum. Finally, it was found out that preservice teachers' technology adoption stage differed based on their attitudes towards technology.

Based on the findings of the study, it is recommended that pre-service teachers should not just be introduced to basic concepts of technology during their preparation, but, should be allowed to use various technological applications in their teaching and learning process. Again, pre-service teachers should be motivated to move

beyond just learning about technology to a level where they will make good use of the affordances of technology in their teaching.

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