Contextual Conditions for Faculty Pedagogical Use of ICT: A Survey of Two Teacher Training Universities in Ghana

Dr. Issifu Yidana
Department of ICT Education, University of Education, Winneba
iyidana@uew.edu.gh

Wilson Osafo Apeanti
Department of ICT Education, University of Education, Winneba
woapeanti@uew.edu.gh

ABSTRACT: Globally, universities now see the integration of technology into the curriculum and instruction as an effective response to the demands of the information revolution staring at us in every sphere of our lives. For this purpose, universities and other tertiary institutions in Ghana have invested substantially in ICTs since the early 2000s. However, the uptake of available ICT facilities and tools by faculty for instructional purposes is still low. This situation is worrying, particularly for teacher education institutions. This study investigated the relationship of teacher education faculty members' attitudes and other perceived factors with faculty pedagogical use of ICT in two Ghanaian tertiary teacher education institutions. Survey methodology was used in the study. One hundred and thirty-two (132) teacher education faculty members participated in the study. The results showed that: (i) faculty perceptions of the effects of technology use on pedagogy and students' learning, (ii) faculty perceptions of barriers and challenges to the adoption and use of technology for teaching and learning, and (iii) faculty motivation for adoption of instructional technology made unique significant contributions to explaining faculty use of technology for teaching and learning. The findings could inform university management about technology decisions to promote the use of instructional technology among faculty members. The findings also contribute to a deeper understanding of faculty concerns and needs as contextual conditions for effective pedagogical integration of ICTs.

KEYWORDS: Faculty, Technology Integration for Teaching and Learning, ICT, Faculty Attitudes, Faculty Use Of Educational Technology

I. INTRODUCTION

The deployment of Information and Communication Technology (ICT) in higher education is still in an early adoption stage in Ghana. Technology integration into instruction and across the curriculum has not yet gained widespread acceptability and practice in Ghana. However, almost all the public universities and other tertiary institutions have made heavy investment into ICT infrastructural development and facilities in line with the Information Communication Technology for Accelerated Development (ICT4AD) policy with the view of enriching the teaching and learning environment.

Globally, universities now see the integration of technology into the curriculum and instruction as an effective response to the demands of the information revolution staring at us in every sphere of our lives. Research indicates that when integrated with emerging models of teaching and learning, technology can transform education [1], [7], [56]. To integrate technology effectively, Palak [41] and Protheroe [42] advise that educators should note that:
teachers, not technology, are the key to unlocking student potential,
curriculum design is critical for successful integration,
the nature of the technology design largely determines the impact of integration efforts on student achievement, and
ongoing formative evaluations are necessary for continued improvements in technology integration.

The pre-tertiary teachers’ computer-based technology literacy levels are generally believed to be very low or nonexistent [38], and until recently most faculty members in all Ghanaian public universities do not use computer-based technologies in their classrooms. The Faculty of Education of the University of Cape Coast (UCC) and the University of Education, Winneba (UEW), as tertiary teacher education institutions, have accepted the challenge to produce technologically literate graduate teachers to meet the national educational goals. Both universities have made huge investment in technology facilities and infrastructure in the past four years to enrich their teaching and learning environments.

However, the success of any academic innovation lies on the shoulders of faculty members, since they form the bridge between students on one side and curriculum and learning environment on the other [19], [41]. Therefore, faculty beliefs, values, concerns and perceptions of technology integration into the curriculum and instruction are factors that could associate with their technology use in instruction.

Research indicates that the three important factors that relate to technology integration across the curriculum are:

technology-oriented curriculum [17], [27], [43], [51], [31]
faculty attitudes, perceptions and values attached to the integration program [32], [41], [49] and
on-going faculty technology professional development needs [18], [30], [31], [32]

Faculty attitudes towards technology integration in teacher education, faculty perceptions of technology professional development issues, faculty use of instructional technology may be inter-related, but the literature does not show clearly how these factors interact. The advantages of computer and web-based teaching and learning, and the use of technology in classroom activities are well-documented [25], [50] but the impact of technology integration on instructional strategies and learning, and the inherent barriers/challenges associated with this paradigm shift, in the Ghanaian context, need to be addressed and investigated further.

This survey seeks to investigate the dominant faculty attitudes and concerns towards technology integration into the teacher education curricula and how these factors relate to faculty use of technology for teaching and learning in the Faculty of Education of the University of Cape Coast (UCC) and the University of Education, Winneba (UEW).

The factors investigated in this study, based on literature e.g. [17], [18], [20], [33], [27], [30], [41], [43], [49], [51] include:

Factor 1: faculty attitudes towards technology integration in teacher
education curriculum

- Factor 2: faculty motivation for adoption of instructional technology
- Factor 3: faculty perceptions of the effects of faculty instructional technology use on students and pedagogy
- Factor 4: faculty perceptions of barriers and challenges to adoption of instructional technology
- Factor 5: faculty perceptions of technology professional development needs, and
- Dependent Factor: faculty use of instructional technology.

II. RESEARCH QUESTION

This study seeks to answer the research question:
To what extent are these factors related, individually and in linear combination, to faculty use of technology for teaching and learning (Use)?

III. LITERATURE

A teacher who believes that integrating technology into teaching would result in greater student learning is more likely to use technology than one who holds a contrary belief. Recent research works [17], [18], [33] [27] [30] [41] [43][49] [51] [31], [23] have identified factors the contribute to faculty use of technology as:

- faculty attitudes towards technology integration in the teacher education curriculum,
- faculty motivation for adoption of instructional technology (IT),
- faculty perceived barriers and challenges to adoption of IT, and
- faculty perceived effects of IT on students and pedagogy.

A study by Palak [41] revealed that instructional technology practices of teachers in substantial ways relate to:

- their beliefs about teaching and technology and
- the contextual conditions in their teaching environments.

He reported that teachers' beliefs are the primary agents for their instructional technology decisions specifically for their selections of technologies for student use, and that the types of technologies teachers have their students use are directly related to the ways teachers approach teaching and technology.

Becker [2] mentioned teachers’ comfort and skills in using computers, allocation of sometime in the school schedule for students to use computers as part of class assignment, availability of sufficient technology facilities and equipment, convenient access to these facilities, and teachers’ personal philosophies that support student-centered, constructivist pedagogy as some of the conditions that enhance classroom use of computers.

Kelly [28] reported that despite the availability of instructional technology on college campuses, faculty members tend to under-use technology for instruction. The present level of technology use was compared to the desired level of technology use for instruction and communication, the perceived level of organizational support and the professional development activities of the faculty. The findings also revealed that the faculty desired more technology for instruction, a higher degree of organizational support for technology and more professional development related to technology.
IV. METHODOLOGY

A. RESEARCH DESIGN

The study used a survey research design complemented with semi-structured interviews to investigate the predictive relationship of faculty perceived technology integration factors with faculty technology use for teaching and learning among tertiary-level teacher educators in Ghana.

The population for this study was faculty members from the University of Education, Winneba (UEW) and from the Faculty of Education of the University of Cape Coast (UCC). The study focused on these two research sites because the topic deals with technology integration issues in tertiary teacher education in Ghana. Faculty members from these two universities have similar characteristics in terms of age distribution, computer experience, and their access to ICT facilities and equipment.

Purposive sample technique was used to sample 132 faculty members who responded to the survey. This is because random sampling is not required for regression analysis [15] and also purposive sampling technique was found to be suitable in selecting participants from the Faculty of Education of the University of Cape Coast (UCC). However, to mitigate the problem of non-randomness the quantitative findings were supported with qualitative data from open ended questionnaire response.

A four-part survey was designed to gather data relevant to faculty adoption and use of technology for teaching and learning in tertiary teacher education. For Part A, 20 items were set for faculty technology use for teaching and learning (USE). For Part B, 65 items were set on:
  - Factor 1: Faculty attitudes towards technology integration in the teacher education curriculum (12 items)
  - Factor 2: Faculty motivation for adoption of instructional technology (13 items)
  - Factor 3: Perceived effects of faculty use of instructional technology on Students and pedagogy (15 items)
  - Factor 4: Faculty perceived barriers and challenges to adoption of instructional technology (10 items), and Factor 5: Faculty perceived technology professional development needs (15 items). These items were adopted and modified from various sources [6] [45], which are duly credited in the survey. The reliability scales (Cronbach’s Alpha values) for the five factors of Part B of the survey ranged from .76 to .85 which indicate a high degree of reliability.

The survey used a Likert scale with five options (Strongly Agree = 5, Agree = 4, Neutral = 3, Disagree = 2, and Strongly Disagree = 1). Factor scores were obtained by averaging the numeric values of the responses for the related items on the factor. A score near 5 was considered a very high agreement, between 3 and 4 a high agreement, and a score between 1 and 2 was regarded as a strong disagreement. In addition to the closed ended survey items, open ended questions were used to investigate the views of participants about technology integration.

The process of predicting the dependent factor based on its association with other independent factors is called multiple regressions. In a multiple regression, each factor has its own regression coefficient that gives its relative importance in the relationship.
B. MULTIPLE REGRESSION ASSUMPTIONS

- **Sample Size:** Sample size is central to the generalizability of results. For multiple regressions, Stevens [46] recommended a ratio of 15 cases per factor for a reliable regression equation. With a sample size of 132 and five factors, this ratio for the study was approximately 26:1. Thus with a sample size of 132, this condition is met.

- **Test for Multicollinearity Assumption:** Multicollinearity refers to the relationship among the independent factors. Multicollinearity exists when the factors are highly correlated \((r \geq .9)\) [46]. Multicollinearity is important because the violation of this assumption (i) limits size of the multiple correlation coefficients, \(R\), because of shared variance among overlapping factors, (ii) makes the determination of the importance of independent factors difficult, because of the overlaps, and (iii) increases the variance of the regression. From the bivariate correlation table (Table 2), it can be seen the correlation between the factors are less than 0.9 \((r<0.9)\). Thus this condition was met.

- **Test for Normality, Linearity, Homoscedasticity, and Independence of Residuals:** Normality, linearity, homoscedasticity and independence of residuals all refer to various aspects of the distribution of scores and the nature of the underlying relationships between factors [46]. The normality assumption was met because the distribution of the regression standardized residuals is almost normal about the predicted factor, Use (mean = 4.59E-16, standard deviation =.977) as shown in Figure 1a. From the normal probability plot(Figure 1b), it is clear that the scores lie in a reasonably straight diagonal line from bottom left to top right, thus linearity assumption was met since the residuals have a straight-line relationship with the predicted factor, Use.

V. RESULTS

A. DESCRIPTIVE STATISTICS FOR FACTORS

The descriptive statistics for Factors 1 through 5 consisted of the mean scores of items related to each factor. These aggregate scores on factors were used in the multiple regression analysis. Table 1 displays the descriptive statistics for these factors, for Use and age.

![Figure 1](image-url)
Factors 1, 2, 3, and 5 and Use average scores range from 3.46 to 3.97, indicating moderately high attitudinal scores. The mean of Factor 4 (2.84) indicates a disagreement with the aggregate scores on barriers and challenges. Since all negatively stated items were recoded, a disagreement with a “no barrier” should be interpreted as an agreement with a “yes barrier”. Thus, this score indicated that, faculty members perceived barriers and challenges to technology adoption and use for teaching and learning as an important factor.

### B. BIVARIATE CORRELATIONS AMONG THE FACTORS

From the bivariate correlations among the factors are shown in Table 2, factors 1, 2, 3, and 4 correlated strongly (.49 ≤ r ≤ .64) with the dependent factor, Use. Only Factor 5 correlated weakly (r = .15) with Use, but since it also correlated weakly with all the other independent factors, it posed no great concern here in terms of multicollinearity. Factors 1, 2, 3, and 4 correlated strongly (.45 ≤ r ≤ .71) with each. Factors 4 and 5 correlated negatively, indicating an inverse relationship between them.

### C. HYPOTHESES TESTING

The multiple linear regression was conducted to test the following hypotheses which are related to the research question:

- **H_{01}:** $R = 0$, i.e. linear combination of independent factors does not significantly relate to faculty technology use. **H_{A1}:** $R \neq 0$, i.e. linear combination of independent factors significantly relates to faculty technology use.

- **H_{0i}:** Beta_{i} = 0, i.e. Factor i does not significantly relate to faculty technology use, $i = 1, 2, ..., 5$. **H_{Ai}:** Beta_{i} ≠ 0, i.e. Factor i significantly relates to faculty technology use, $i = 1, 2, ..., 5$.

- **H_{0f}:** $R = 0$, i.e. there is not any other significant combination of factors better than the full-model. **H_{Af}:** $R \neq 0$, i.e. there is a significant combination reduced model better than the full model.

**Test of significance of the combined factors:** A standard linear regression analysis was conducted to determine the relationship of a linear combination of Factors 1 through 5 with faculty technology use. The standard regression model summary (Table 3) and ANOVA results (Table 4) indicated that the test was statistically significant (F (5, 126) = 27.49, p = .000 (< .0005); $R^2 = .52$; Adjusted ($R^2$) = .50) at $\alpha = .05$. Therefore, we reject H_{01} and conclude that the linear combination of independent factors significantly relates to faculty technology use. The value of the multiple correlation, R, which indicates how
The adjusted $R^2 = .50$ means that all the factors combined accounted for 50% of the variance in the dependent factor, Use.

- **Test of significance of individual factors:** The significance of the individual regression coefficients, or Beta weights (Table 5), was used to test the hypothesis (H0i) that each of the factors was not significantly related to faculty technology use for teaching and learning.

  For Factor 1, the test was not statistically significant ($t = .559$, Beta = .051; $p = .577$). We fail to reject the null hypothesis that Factor 1 does not significantly relate to faculty technology use. In other words, faculty attitudes towards technology integration in the teacher education curriculum were not significantly related to faculty technology use for teaching and learning.

  For Factor 2, the test is statistically significant ($t = 2.486$, Beta = .252; $p = .014$) and we reject the null hypothesis that Factor 2 does not significantly relate to faculty technology use. In other words, faculty motivation for adoption and use of technology is significantly related to faculty technology use for teaching and learning.

  For Factor 3, the test was statistically significant ($t = 3.523$, Beta = .295; $p = .001$) and we reject the null hypothesis that Factor 3 does not significantly relate to faculty technology use. In other words, faculty perceptions of the effects of technology use on students and pedagogy were significantly related to faculty technology use for teaching and learning.

  For Factor 4, the test was statistically significant ($t = 3.641$, Beta = .292; $p = .000$) and we reject the null hypothesis that Factor 4 does not significantly relate to faculty technology use. In other words, faculty perceptions of barriers and challenges to adoption of technology for teaching and learning were significantly related to faculty technology use for teaching and learning.

  For Factor 5, the test was not statistically significant ($t = 1.177$, Beta = .088; $p = .241$) and we fail to reject the null hypothesis that Factor 5 does not significantly relate to faculty tech use. In other words, faculty perceptions of their technology professional development needs and concerns did not appear to relate to faculty use of technology for teaching and learning.

- **Test of significance of the reduced model:** From Table 5 Factor 1 and Factor 5 did not significantly contribute to the regression model. The multiple linear regression was run again after the exclusion of these two factors to verify if the remaining factors 2, 3 and 4 would still significantly account for the variance in faculty use of technology for teaching and learning. To test this hypothesis (H0f), a number of regression procedures were used to select the best possible model. The hierarchical procedure was selected because it addresses this hypothesis more appropriately. The factors

<table>
<thead>
<tr>
<th>Model</th>
<th>Used Coefficients</th>
<th>Std Coefficients</th>
<th>t</th>
<th>Sig</th>
<th>95% Confidence Interval for B</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>B</td>
<td>Std. Error</td>
<td>Beta</td>
<td></td>
<td>Lower Bound</td>
</tr>
<tr>
<td>1</td>
<td>Constant</td>
<td>-0.4</td>
<td>-0.1</td>
<td>0.94</td>
<td>-0.81</td>
</tr>
<tr>
<td>Factor 1</td>
<td>0.05</td>
<td>0.05</td>
<td>0.05</td>
<td>0.56</td>
<td>0.58</td>
</tr>
<tr>
<td>Factor 2</td>
<td>0.25</td>
<td>0.1</td>
<td>0.25</td>
<td>2.49</td>
<td>0.01</td>
</tr>
<tr>
<td>Factor 3</td>
<td>0.33</td>
<td>0.09</td>
<td>0.3</td>
<td>3.52</td>
<td>0.14</td>
</tr>
<tr>
<td>Factor 4</td>
<td>0.22</td>
<td>0.06</td>
<td>0.29</td>
<td>3.64</td>
<td>0.1</td>
</tr>
<tr>
<td>Factor 5</td>
<td>0.11</td>
<td>0.1</td>
<td>0.09</td>
<td>1.18</td>
<td>0.24</td>
</tr>
</tbody>
</table>

  a. Dependent Variable: Faculty use of instructional technology
were entered in the following order: Factor 1 and Factor 5 first, and then Factors 2, 3 and 4. This decision was based on the results of the standard regression, used as preliminary exploratory analysis.

The results (Tables 6 and 7) showed that a linear combination of faculty motivation for adoption of instructional technology (Factor 2), faculty perceptions of barriers and challenges to adoption of IT (Factor 3), and faculty perceptions of the effects of IT on pedagogy and students’ learning (Factor 4) were significantly (F (5, 126) = 27.49, p= .000) related to faculty technology use for teaching and learning over and above, faculty attitudes towards technology integration into the teacher education curriculum, and faculty perceptions of their technology professional development needs and concerns (R^2 = .522, Adjusted R^2=.503, R^2-Change= .245, F-Change (3, 129) = 21.544, Sig. F-Change = .000 (<.0005)). These three independent factors still accounted for 50% of the variance in faculty technology use for teaching and learning.

Since the second model explains just about the same proportion of variance in faculty technology use for teaching and learning with fewer factors, we reject the null hypothesis that there does not exist other significant combination models better than the full model and accept the alternate hypothesis that there exists another significant combination model better than the full model. In other words, a linear combination of faculty motivation for adoption and use of instructional technology, faculty perceived effects of technology use on pedagogy and students’ learning, and faculty perceived barriers and challenges to technology adoption and use gave a better model than the full model. Table 8 shows the regression coefficients for the reduced model with only three factors.

The final regression equation for the unstandardized B-coefficients was: Predicted Use = .308*Factor2 +.360*Factor3 + .191*Factor4 + .348.

The final regression equation for the reduced model involving significant factors was:


VI. DISCUSSION

A. FACULTY ATTITUDES TOWARDS TECHNOLOGY INTEGRATION INTO TERTIARY TEACHER EDUCATION CURRICULUM (FACTOR 1)

The regression analysis showed that faculty attitudes towards technology integration into the teacher education curriculum (Factor 1) did not significantly relate to faculty technology use for teaching and learning. This finding contradicts the finding of other studies [16], [18], [32], [27], [30], [41], [43], [49], [51], [31], [23] which have
identified attitudes towards technology integration in the teacher education curriculum as a significant factor that contribute to technology integration by faculty. However, responses from the open-ended questions indicated that faculty members of these institutions believe in the efficacy of technology integration into the teacher education curriculum. They see technology as a major tool in the teacher education curriculum.

This result showed that there is a gap between faculty attitudes and their actual use of technology. Faculty should therefore be encouraged to move beliefs into practice. Additionally data from the open-ended question on the survey suggested that faculty members now need hands-on experience with instructional technology. This is in line with Rogers’ [43] trialability condition for technology integration, which states that an innovation may experience an increased rate of diffusion if potential adopters perceive that the innovation can be tried on a limited basis before adoption. It is not enough to talk about the benefits of using technology in teaching and learning environments, the innovation systems of these two universities should provide the necessary opportunity for potential adopters to try out technology integration into instruction. This study supports the view that faculty members no longer resist technology innovation, but rather the lack of technology resources and expertise appeared to be the problem.

B. FACULTY MOTIVATION FOR TECHNOLOGY INTEGRATION FOR TEACHING AND LEARNING (FACTOR 2)

Faculty motivation for technology adoption and use for teaching and learning made a significant unique contribution to the explanation of variance in faculty use of technology for teaching and learning. This is in consonance with other studies [57], [1], [7], [57] which indicates that teachers and faculty need motivation to integrate instructional technologies into their curricula and instruction.

Motivation, therefore, is an important factor in faculty adoption and use of technology for teaching and learning in this study. Ely’s [12] conditions for successful technology implementation indicate that faculty members’ dissatisfaction with the status quo (feeling a need to change), rewards or incentives (internal and external motivators preceding and following technology adoption) and faculty participation in decision-making are important ways of motivating faculty to adopt and use technology for teaching and learning. Some participants cited the beneficial effects of technology on instruction and students’ learning as issues that motivate them to adopt and use technology in the open ended questionnaire items.

Others see the provision of technology equipment such as computers, presentation equipment and
subject-based software as motivating factors in their efforts to integrate technology into teaching and learning. The commitment on the part of academic administrators in terms of firm and visible evidence of continuing endorsement and support for technology integration seemed to be lacking or at best half-heartedly practiced in the universities. Other research [57] showed that including technology integration as a criterion in faculty evaluation would motivate them to use instructional technology. Research [41] also indicates that the active involvement of faculty in implementing technology innovations for teaching and learning could motivate them to integrate technology in their teaching and learning.

C. FACULTY PERCEPTIONS OF THE EFFECTS OF TECHNOLOGY USE ON PEDAGOGY AND STUDENTS’ LEARNING (FACTOR 3)

Faculty perceptions of the effects of technology use on pedagogy and students’ learning was a significant factor that made a unique contribution to explaining faculty use of technology for teaching and learning, when the variance explained by all the other factors in the model was controlled. From the open-ended responses, faculty members expressed positive perceptions of the likely impact that educational technology integration may have on their instructional strategies and methodology as well as on their students’ learning. They saw technology integration into their teacher education curriculum as a way of improving the teaching and learning process. They also believed technology integration in instruction would alleviate problems associated with large class sizes and teaching loads.

This finding of the study supports the conclusion that faculty members are aware of the beneficial effects of technology integration on pedagogy and students’ learning, and were willing to adopt instructional technology, if the contextual conditions were created for them. Wilson, Sherry, Dobrovolny, Batty, and Ryder [58] indicate that how the technology fits into existing social purposes and practices will largely determine its prospects for its appropriation and use by the community. Instructional technology practices of teachers in substantial ways relate to the contextual conditions in their teaching environments as observed by Palak [41]. In this study, the faculty beliefs about teaching and technology are generally positive, but based on responses to the open-ended items, it would appear that the contextual conditions are lacking for the effective implementation of technology integration in these two Ghanaian universities.

D. FACULTY PERCEPTIONS OF BARRIERS AND CHALLENGES TO THE ADOPTION AND USE OF TECHNOLOGY FOR TEACHING AND LEARNING (FACTOR 4)

Faculty perceptions of barriers and challenges to the adoption and use of technology for teaching and learning made a unique significant contribution to explaining faculty use of technology for teaching and learning. Perceived barriers and challenges from the perspectives of faculty are relevant because unless these barriers, challenges, needs and concerns are addressed, the technology integration into teaching and learning would remain an elusive educational goal [41]. The lack of technology
resources and facilities were the commonest concerns of participants in this study. Participants also saw the lack of hands-on experience for students and faculty members as one of the barriers to faculty’s use of technology for teaching and learning.

The lack of communication between faculty and academic leadership with regards to technology integration was identified as another barrier in this study. These observations of the participants in this study indicated the contextual conditions that facilitate the implementation of educational technology innovations were not fully met in the participating institutions. Ely [12] identified among other issues the lack or availability of resources (hardware, software, maintenance support and infrastructure that are needed to make technology integration work), time (prioritized allocation of time to make technology integration work), faculty participation (shared decision-making, full communication, and good representation of faculty interests), commitment (firm and visible evidence of continuing endorsement and support by institutional leadership) and expertise (faculty access to the knowledge and skills required to implement technology innovations for teaching and learning) as important factors that influence technology adoption and use by educators. To address these challenges, effort has been made in by the participating institutions to facilitate technology integration in the curriculum.

For instance in addressing the challenges posed by large class sizes and inadequate teaching and learning facilities the University of Education, Winneba with founding from the Partnership for Higher Education in Africa Educational Technology Initiative (PHEA ETI) and the South African Institute for Distance Education (SAIDE) initiated a Hybrid online instructional delivery modes for residential programmes to meet the diverse learning needs and styles of 21st Century learners through the development and deployment of hybrid courses on MOODLE Learning Management System.

E. FACULTY PERCEPTION OF TECHNOLOGY PROFESSIONAL DEVELOPMENT NEEDS (FACTOR 5)

Surprisingly, faculty perceptions of their technology professional development needs did not significantly relate to faculty technology use for teaching and learning. This finding seems to agree with studies by Lambert [33] and Wade [54], who argued that professional development has been only moderately effective in bringing about changes in schools. This factor did not interact meaningfully with any of the other independent factors either. However, the factor’s mean score was 3.84 with standard deviation .40, which indicated that faculty had a high positive view of technology professional development.

Thus, even though faculty members of these two Ghanaian universities may value the importance of technology professional development, they may not have had the opportunity to implement whatever they have learnt because of the lack of resources and technical support, or in fact they may not have had sufficient technology expertise to integrate technology into their teaching and learning. It would appear that large-group technology workshops, though they have been helpful in creating a general awareness of technology issues in education, have not had significant impact on faculty use of technology for teaching and learning. This was a common observation from the responses to the open ended questions.

Kelsey and D’souza [29] and Schell [44] observed
that since the levels of individual expertise and technology use differ significantly among faculty members, the choice of mode of in-service training on the use of technology for instruction should be based on the preferences, expertise level and particular needs of faculty members. The “one size fits all” technology professional development plan does not work with a heterogeneous group of faculty members like those in this study. Leh’s [34] study of faculty use of technology may be relevant for change agents of the two institutions under the study. Using (i) large group workshops, (ii) small group meetings, (iii) individual mentoring, and (iv) just-in-time training, according to Leh [34], had a positive impact on faculty members’ ability to use technology in instruction.

Many other researchers [4], [19], [24], [30], [47] support the view that professional development should involve faculty in the identification of what they need to learn and the process to be used to achieve the desired goals. Faculty members need to be convinced about the relevance and purpose of institutional changes or innovations.

VII. CONCLUSION

This study investigated the relationship between faculty technology use for teaching and learning as a dependent factor and five independent factors:

Factor 1: faculty attitudes towards technology integration in curriculum,
Factor 2: faculty motivation for adoption of instructional technology,
Factor 3: faculty perceptions of the effects of instructional technology on students and pedagogy,
Factor 4: faculty perceptions of barriers and challenges to adoption of instructional technology, and
Factor 5: faculty perceptions of technology professional development needs

Factors 2, 3 and 4 were the significant factors that related to faculty use of technology for teaching and learning. These three factors accounted for 50% of the variance in faculty technology use. This means that faculty motivation, perceptions of the effects of instructional technology and barriers to the adoption of instructional technology are important issues to consider when planning for technology integration across the curriculum.

It can also be concluded that even though faculty attitudes towards technology integration and their perception of technology professional development needs were positive, these factors did not significantly relate to faculty pedagogical use of technology. This can be accounted for by the inadequate technology resources, particularly network infrastructure and access to the Internet, and low faculty technology competence, which are still a major concern to educators in Ghana.

VIII. RECOMMENDATIONS

- Harnessing and integrating the efforts of all tertiary institutions to form a higher education national or regional network would help to address the technology integration challenges, particularly in the area of Internet connectivity. This is likely to cut down broadband and technology maintenance costs. This approach may also enhance collaboration among these institutions, nationally and internationally.

- Educational innovators of these two institutions should capitalize on the positive view that faculty members have about the use of ICT for teaching and learning to equip
faculty members with the technology knowledge and skills needed for effective technology integration into their teaching and teacher education curricula. The need for an ongoing technology professional program in these institutions cannot be overemphasized.

- It would be more enlightening to include Colleges of Education in a similar study in the future, because such a longitudinal survey is more likely to give a clear insight into technology integration into teacher preparatory programs in Ghana. This would help inform government’s ICT policy on education as stipulated in the Ghana government’s ICT for Accelerated Development (Republic of Ghana, 2003) policy document.

- Another view of the use of ICT for teaching and learning is that all Ghanaian university faculty members, not only teacher educators, need the knowledge and skills for ICT integration into their teaching and students’ learning. Therefore, future studies in this area might consider expanding this study to include non-teacher educator faculty members of the other public and private universities in Ghana.

IX. REFERENCES


[7] Collier, S., Rivera, M., & Weinburgh, M. H. (2004) Infusing technology skills into a teacher education program: Change in students’ knowledge about and use of


concerns-base approach. Austin, TX: Research and Development Center for Teacher Education, University of Texas.


