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RESEARCH ARTICLE

SUCCESSIVE FACTORS OF BHUTANESE EDUCATION BASED COMPUTER TECHNOLOGY

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ABSTRACT

Twenty first century education has focused on student centered learning toward the "whole child", the "whole person" education system. Currently, Bhutanese lives in an era of dramatic technological revolution. Educators can use technology as a support system to help students achieve proficiency in 21st century skills. This study investigates the perception of ICT by Bhutanese academic staff and also it's integration into classroom teaching. The result should provide guidance to the policy and curriculum designers of school and teacher training colleges for designing technology integrated teaching/learning system. A self report survey amongst 466 randomly chosen teachers around the country revealed that teachers are willing to learn, and integrate technology into their teaching.

INTRODUCTION

Traditional method of teaching is not the preferred method of instruction since the learners who assume a passive role can remain fully concentrated only for about 15-20 minutes (Damodharan & Rengarajan). New modern methods emphasizing on collaborative learning, communication skills, and problem based styles to stimulate critical thinking are emerging and adopted in schools. Technology can play a pivotal role in helping teachers to migrate from traditional to modern methods of teaching. According to Gyeltshen (2013) integrating ICT in classroom "creates stimulating and empowering learning experience, hone creativity and critical thinking skills, teacher enjoys a more varied and challenging teaching experience, creates ownership of their learning, and enhances learning resources". Khan and Hasan (2012) pointed out that ICT carries the potential to change the nature of education. The Education Ministry, Royal Government of Bhutan has recognized the benefits of ICT integration in education and included plans to increase ICT facilities in schools and teacher training colleges in the 10th Five Year Plan (Royal Government of Bhutan, July 2004). With the 10th Five Year Plan ended, much school has been equipped with basic IT infrastructures and almost every teacher have been trained in the use of ICT resources through various projects, workshops, SBIP (School Based In-service Program), and trainings. A module called FIT (Functional IT) is offered for every teacher trainee in the Teacher Training College. Despite these various efforts from the government, it is not clear if ICT adoption into the classroom is taking place. Ward (2003) found that even in very strong ICT Schools, ICT integration in classroom was found to be minimal. No study has been conducted to measure the extent to which adoption of technology has taken place in Bhutan. The survey carried out with 466 teachers across different schools in Bhutan aims to find out to what extent Bhutanese teachers practice ICT in their classroom, study the factors that encourage teachers to integrate ICT in classroom teaching and then suggests recommendations to ensure utilization of ICT in classroom.

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LITERATURE REVIEW

Internet in Bhutan

The Internet service in Bhutan started in June 1999 which was provided by the only ISP Druknet in the entire kingdom. In the year 2000 only 3000 computers existed in the country (Tshering, 2013). Though the internet was introduced late in the country, it spread rapidly and is now accessible throughout the country and almost everybody who wishes can have access to the internet from a number of services provided, especially via cellular network.

Overview of ICT in schools of Bhutan

Bhutan has 553 schools, 176647 students, and 7932 teachers as of May 2012. 3912 teachers have laptop and 687 have desktop (Gyeltshen, 2013). There are 137 computer laboratory (Ministry of Education, 2012) and 3046 working computers in different schools. 136 schools do not have electric connectivity. 118 schools do not have working land line phones. 409 schools have internet connection. 155 have internet access only to school administration while 245 provide access to teachers and students. Most schools that are connected to the internet use dialup connection which is too slow for distribution into the school lab. A few MSS and HSS have now access to lease line (Ministry of Education, 2012). 35 HSS are connected to lease line. 194 schools have projectors and 124 schools have scanners (Gyeltshen, 2013).

Areas of Technology use in Teaching

Maintaining students' records, compiling students results and developing question paper remain the prime use of technology by the teachers in the schools of Bhutan. According report by Gyeltshen (2013), academic usage of technology in Bhutanese school is

dominated by preparing question papers with more than 60% of teachers reported to have used technology for the purpose. Almost 50% of the teachers reported to have used computing technology for compiling results. The report also shows teachers do sometimes use technology for making classroom presentation, search information using Google and develop lesson plans.

ICT integration

ICT integration means the use of ICT tools to complement and assist teaching and learning (Buabeng-Andoh, 2012) (Reid, 2002). IT adoption in teaching has to be innovative to bring about change in learning and teaching and not just to supplement textbooks and chalk board (Ward, 2003). Many studies have pointed out that the success to implement ICT in classroom teaching depends on a number of interrelated factors and not on any single factor (Drent & Martina, 2007). Al-Senaidi *et al*. (2009) identified five factors in their study of 100 teachers to identify the barriers to adopting information and communication technologies in Omani higher education. The factors are lack of equipment, lack of institutional support, disbelief of ICT benefits, lack of confidence, and lack of time. In a qualitative study with teachers who were highly innovative, skilled and educated with technology, Bauer & Kenton (2005) found that these teachers were not successful in implementing technology on a daily basis for teaching or to aid learning. The reasons they pointed out were students' limited ICT skill which was worsened by shortage of time to practice ICT skills, while teachers also needed extra time for lesson planning. Lack of proper and appropriate software, difficulties in solving technical issues and hardware getting outdated and being unable to replace with latest ones were other reasons they identified.

Attitude

Studies have found that attitude explains more in technology adoption by teachers in their classes (Drent & Martina, 2007)(Afshari *et al*., 2009)(Nair & Das, March 2012). Abdulkafi (2004) pointed out that "teachers' attitudes toward computer are major factor related to both the initial acceptance of computer technology as well as future behavior regarding computer usage". Afshari *et al.* (2009) said that teachers need to possess positive attitude to use technology if they wanted to be successful in technology use in their classes.

Training

Positive attitude Afshari, *et al*. (2009) said could be developed only when teachers are sufficiently comfortable and knowledgeable on its use stressing the need for proper training. Other studies also suggest that proper training is necessary to bring about the required change in the attitude of teachers (Al-Senaidi *et al*., 2009). Reid (2002) also found that professional development activities to meet teachers' need were important to foster successful ICT integration. He suggested that appropriate computer trainings for teachers should be carried out in the schools. Serge *et al.* (2009) found many teachers willing to be trained in ICT, probably to boost up their confidence in ICT by feeling qualified and to feel the advantages of ICT in their class. To alter the view of computer use and foster positive change on attitude, Nair & Das (2012) also stressed the need to train teachers on ICT use. Inadequate preparation to use technology is cited by Afshari *et al.* (2009) as one of the reason why teachers do not use computer in their classroom. Almalk and Williams (2012) specifically stressed on the need for specific ICT trainings for teachers. Teachers in Bhutan are aware of existence of a world of useful information on the web, but fail to retrieve due to lack of skill and knowledge. With proper training teachers can be introduced to these tools and resources. Khan and Hasan (2012) observed that in-service teacher training as necessary and something that requires serious attention. Training would keep them in contact with the technology and their level of confidence and comfort would grow.

Resources

IT recourses would include hardware, software, internet and even the technicians and teachers who use the resources. Providing ICT equipments to schools or teachers will not necessarily make difference regarding ICT adoption in classroom (Higgins, n.d.) (Guoyuan *et al*., 2010). Baylor & Ritchie (2002) stated that use of technology will not happen unless faculty members have the right skill, knowledge and attitude regardless of the amount of technology or its sophistication. But Serge *et al.* (2009) identified technical hardware dependence or unavailability as a major concern in their study. A result of a study by Frank *et al.* (2011) showed despite a significantly high percentage of teachers (92%) being computer literate, less than 15% of these teachers adopted internet to innovatively improve teaching and learning. The reason they said may be attributed to lack of Liquid Crystal Display projectors in schools, emphasizing the fact that hardware unavailability could hinder ICT usage which contradicted the finding mentioned by Baylor & Ritchie (2002). In the same study, limited numbers of computers in the school were cited as a reason for teachers' not organizing computer based lessons.

Technical assistant

Technical problem is cited to be another reason why most teachers avoid using computers. System crash, slow system during a lesson waste time, and if immediate help is not available students and teachers becomes frustrated and lose confidence in technology leading to negative attitude to technology. Maintenance would require more than one trained fulltime technician (Reid, 2002).

Time

Reid (2002) had teachers expressing that technology needed more time, teachers involved in his study expressed that extra effort and time were required to learn new software and to create new products. New technology evolves at a rapid pace so teachers have to be a constant learner to keep up with the current ICT trend in education. Grainger & Tolhurst (2005) found additional training, support, and preparation time to be significant to make teachers confidently use technology. Increase preparation time especially without reward was also identified to be a concern to teachers in a study by Serge *et al.* (2009).

Teaching experience

Younger teachers seem to use technology more in the class room compared to older teachers as stated by Afshari *et al*. (2009) in their study. They explained that the reason could be because younger teachers are exposed to technology early in their life. Young teachers are much experienced with computer use and thus have positive attitude toward ICT use in the classroom (Hsu *et al*., 2007). This view was also supported by Fethi & Deborah (2010) and claimed that teachers with higher teaching experience tend to use computer less frequently.

Gender, academic rank, and academic field

Al-Senaidi *et al*. (2009) found gender, academic rank, and academic field to have no relation to ICT usage in classroom, but their study did revealed that males who used computer less, believed to encounter more barriers than did the females.

Administrative support

Administrative support is a critical factor to drive and keep teachers using ICT. Frank, Frank *et al.* (2011) recognized lack of support from leadership would kill the initiatives of teachers. If principal is unaware of the ICT benefit, he/she may not feel the need to develop ICT facilities in the school and see it as an added burden to the teacher's time and school budget. Almalk & Williams (2012)

suggested principals to be trained to increase their capability and understand the impact of ICT.

METHODLOGY

Data collection instrument

A self report questionnaire based survey consisting of 34 items, 5 scale Likert-type (5 rated strongly agree and 1 rated strongly disagree) statements were constructed for collecting data to study the teachers' perception of ICT and its integration in classroom. The items adopted were mostly utilized in previous studies and found to be reliable. They were extracted from two different papers Hsu *et al*. (2007), Toe (2011) and slight modifications were carried out to make it suitable to the Bhutanese context. The questions are divided into two sections, first section deals with demographic background of the participants. The next section contains questions related to examining the factors that affect ICT integration in classroom. Five factors which appear to affect the Bhutanese teachers most were considered while developing the questionnaire. They are perceived usefulness or belief, social influence, availability of adequate resources, teacher's attitude towards ICT, and perceived ease of use. Seven items measure perceived usefulness of which 5 were adopted from Hsu, *et al*., two items measure social influence both from Hsu, *et al*., four items measure availability of resources, three items were adopted from the measurement defined by Hsu, *et al*., and one from Teo, seven items measures attitude of teachers towards ICT of which three items were adopted from Teo, two items from Hsu, *et al*. and the other two were developed by ourselves, two items measuring ease of use were adopted from Teo, one item for measuring behavior intention to use was adapted from Teo, and all four items to measure high interaction practices were from Hsu, *et al*.. In the demographic background, questions regarding gender, teaching subject and experience, access to computer at school and at home, and ICT trainings acquired were presented. Age of the participants were omitted to reduce the number of questions since teachers could be grouped as young or old by looking at the number of teaching experience. A pre-test to identify any flaw in the questions was carried out where 10 participants were requested to filled up the questionnaire and provide comments and feedbacks regarding the clarity of the question. The questions were modified to incorporate the suggestions from the pre-test survey.

Research Participants

The survey was administered to teachers from different schools in the country after obtaining approval from Ministry of Education, Royal Government of Bhutan. The survey data was collected from 5th March 2013 to 30th March 2013. Questionnaire were printed and submitted to schools through friends who after obtaining permission from their principal distributed to those teachers willing to participate in the study. Effort was put to collect responses from all schools in the country, but due to a number of unforeseen obstacles it did not materialized. However the survey did cover the schools in entire region of the country, i.e. schools in southern, western, eastern, and central Bhutan. It also does not limit to a particular level, respondents includes teachers teaching in primary school to higher secondary school. After obtaining the responses it was punched through a form created using Google Docs into an excel sheet. 466 responses were accepted after rejecting those that were incomplete. The accepted responses were subjected to analysis using SPSS 17 statistical package. 62.2% were male and 37.8% were female. A major number of respondents were young teachers with few years of teaching experience, 32.4% with 1 to 5 years of teaching experience, 43.6% with 6 to 10 years, and 24% with greater than 10 years teaching experience. 93.6% of the respondent have computer at their home and 88.4% agreed to having access to computer in their school. 6.4% does not have access to computer at home and 11.6% doesn't get access in their school. 88.6% of the respondents have attended at least one form of ICT training while 11.4% have responded that they have not received any training on ICT.

Analysis

The final data was subjected to SPSS version 17 analysis. 466 responses were approved for the analysis after filtering the incomplete responses. The objective of the analysis was to study the characteristics of ICT integration in classroom by Bhutanese teachers. Categorical analysis using chi square and cross tabular data is employed to make comparison between gender and teaching experience with various factors that affect ICT integration in classroom. The statistical analysis used significance level of 0.05 to get 95% accuracy.

RESULT

The results are presented in two sections. The first section shows the descriptive statistic associated with various factors and in the second section chi square analysis is used to predict and generalize the findings.

Descriptive Statistic

The questionnaire asked teachers about their ICT skills and use in pedagogical practices. High percentages (88.6%) of teachers are IT literate having attended some form of ICT training. 93.6% of the respondent have computer at home and 88.4% of teachers get computer access in their school. This finding implies that majority of the teachers are well equipped with technology skills to undertake computer based teaching. However the percentage of teacher using computer for teaching is not high (50%) suggesting teachers ICT use may be concentrated for personal use such as entertainment and social media. The study also shows only a handful of their colleague use and share amongst themselves about technology. The use of technology is mostly concentrated in use of multimedia and document management software like word and PowerPoint as was also found by Gyeltshen (2013) in his annual report which showed the use of technology as concentrated in question paper development.

Table 1. Tools used in teaching

	Internet	Multimedia	Document Software	Social Media
Disagree	315	205	222	323
Agree	121	177	159	93
Strongly Agree	30	84	85	49

The reason for most of them not organizing technology based teaching could be because of lack of appropriate software, hardware, and technical help. Though majority of the teachers agreed that they get to use computer in the school, there may not be sufficient number of computers for students to use or could be due to lack of projectors in the school. The response to the items measuring availability of resources clearly shows that resources are not available in the schools.

Table 2. Resources Availability

	Hardware Support	Software Support	Technical Help	Financial Support
Disagree	67%	71%	57%	83%
Agree	27%	24%	32%	13%
Strongly Agree	6%	5%	12%	5%

Attitude towards computer influences the computer adoption in teaching (Guoyuan *et al*., 2010). Many other studies also have argued attitude to be an important factor leading to acceptance and finally integration. Only a slightly greater number of teacher in Bhutan seem to possess positive attitude towards ICT. Similarly the percentage of teachers who find learning to use computer easy is only a slightly

greater than those finding difficult to learn computer. This may also explain why less number of teachers is involved in teaching with technology.

Table 3. Perceived Ease of Use

	Disagree	Agree	Strongly Agree
Learning to use technology is easy for me	44%	44%	13%
I find it easy to use technology to do what I want to do	47%	41%	12%

Regarding the views of usefulness of technology, teachers believe technology integration to be useful with most teachers strongly agreeing to all the seven items that measured perceived usefulness and they also believed technology would be the future trend in education. They also like the idea of working with technology and look forward to it. Majority of the teachers plan to use technology in their future.

Inferential Statistic

Gender was found to have significant impact in possessing a computer at home, p-value = 0.000. More female possesses computer at home than man. But there is no difference when it comes to accessing computer at school between male and female. They are equally likely to access computer at school. However the analysis showed younger teacher (with less teaching experience) are more likely to use computer at school than older teachers (greater than 10 years teaching experience), p – value = 0.025. The descriptive statistic revealed that larger number of older teachers have computer access at home than younger teachers although inferential statistic did not reveal this difference. Younger teachers may not be in a position to own a computer at home and therefore seek access at school. Tshering (2013) revealed that income plays a significant role in technology usage in Bhutan. Older teachers may not be using school computer preferring to use their own machine since they could afford machine and internet services. Both male and female agree that using technology can create good relationship between student and teacher, however there is difference in the belief between gender group with more female teachers disagreeing that using technology can create good relationship between student and teacher compared to their male counterpart(p-value = 0.016). Teaching experience too has significant impact with regard to the belief they have regarding the enhancement of relation between student and teacher due to technology adoption. As the teacher gain more teaching experience, they believe through technology use, teacher student relationship can be enhanced comparing to younger teacher with less teaching experience (p – value = 0.021). Training has been found to be immensely influential in technology adoption in classroom by teachers. Both male and female teachers are confident enough to take up technology training declaring that they will not feel nervous or uncomfortable while taking software training classes.

But while making comparison between gender, more female are likely to take training compared to male, p – value = 0.029. The reason for more female desiring ICT training could be because while a slightly more than 50% of the man says they can do what they wish using technology, larger percentage of female says that they cannot do what they wish with technology, p – value = 0.001. It is also supported by the fact that more female compared to male are planning to use technology in their teaching (p – value = 0.028). Though the teachers are confident that ICT training would not make them nervous or uncomfortable, they do tend to agree learning ICT will not be easy and here also larger percentage of female teachers says learning ICT will not be easy compared to male teachers, p – value = 0.016, which could be because of their lack of earlier exposure or training. A greater number of male teachers design work for students that involve use of internet compared to female teachers, p-value = 0.041, and also the wish to work with technology varies based on gender differences. Male like to work with technology more than female, p – value = 0.005. The reason could be because more male teachers seems to be confident about computer knowledge with greater than 50% of the man saying they can accomplish what they wish with technology as stated earlier. When considering the availability of resources in the school, teachers who have been in the school for greater number of years have access to resources more than those who have been in teaching for shorter duration (p – value = 0.035) probably because they knows the policy as well as because of greater confidence to approach administration for such support. It is not a surprise to see the analysis result showing that older teachers find learning ICT much harder than younger teacher (p – value = 0.044). Younger teachers are more tech savvy and exposed to technology earlier in their life and naturally find easier to learn. Older teachers, especially teachers with teaching experience greater than 10 years are digital immigrants and thus has tendency to understand technology much less. The finding is in line with the result of a study of internet access and usage behavior in the Kingdom of Bhutan by Tshering (2013) where age was found to have a significant impact. His study showed that younger people use internet more than older people in the kingdom.

Conclusion

This study exhibited that Bhutanese academic staff have positive attitude towards technology and are willing to study and integrate ICT into their teaching methodology. The government should harness this positive aspect of teachers by providing adequate training and necessary resources which seem to be missing in the schools. Although a high percentage of teachers are ICT literate, the training provided may not be appropriate. Teachers find learning computer difficult and they have expressed their difficulty in accomplishing desired task using technology. While designing ICT training for teachers, it is shown by the study that age based training should be designed. The finding has shown that more female teachers wish to attend ICT training. Their negative views regarding ease of use of technology could be the reason that prevents female teachers from involving in technology teaching. They may not feel confident with their present ICT skills to implement ICT in their classroom. This group of female also intends to use ICT in their future work hence their greater desire for additional training. Therefore, in future technology trainings, more number of female participation should be considered. In the past technology integration the class rooms was dominated by male teacher. However, the study has revealed that the trend is gearing for a change. Females are more willing to take up training and have expressed their desire to adopt technology in their future teaching. The finding matches with Tshering's (2013) conclusion that found greater number of female than male using the internet in Bhutan.

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