Full Length Research Paper

Educators' theories and beliefs and the use of computers in secondary schools

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Schools and educators are under considerable pressure to change. Educators have reported varying attitudes to the use of computers, ranging from supportive to negative. However, there is an acceptance that cannot simply be overlooked. It will also be important to consider all aspects of the educators' beliefs, resistance and the anxieties that many express towards the use of computers. Educators' theories and beliefs are shaped by their teaching philosophies. For the use of computer technology to be successful in classrooms, educators must be keen to change their beliefs and roles. Educators must be confident and competent when using computers so that these skills may be transferred to their students as well. Educators' theories and beliefs are not easy to change and many educators do not enjoy changing them. Therefore, it may be suggested that computer technology should synchronise with the existing theories and beliefs of educators. By only focusing on how to use computers, and by not dealing with the issue of how to teach students more efficiently, the use of computer technology integration into education has failed. The findings recommend that education teaching programs must provide pre-service educators with a conducive and non-threatening learning environment so that they may experience success in using computers in their instruction.

Key words: Beliefs, computers, educator, secondary schools, classroom.

INTRODUCTION

For the use of computer technology to be successful in classrooms, educators must be keen to change their beliefs and roles (Strydom et al., 2005; Baylor and Ritchie, 2002). In order for educators to be effective, they must remain abreast of any computer technologies used in education and in their areas of specialisation as well, a task which becomes increasingly impossible when educators have to deal with large classes and undertake onerous administrative duties (Haddad and Jurich, 2002). According to Zhao and Cziko (2001), using technology obliges educators to adopt different teaching styles. Consequently, educators may resist the use of computers in their classrooms. In their study, Zhao and Cziko (2001) concluded that educators must have the will and believe they have the ability to use computer technology.

Drenoyianni (2006) states that computers will act as a conduit in educators' pedagogical thoughts and beliefs and offer the incentive for a fundamental change to more progressive practices. Research has indicated that educators with more 'student-centred-beliefs' often use computers more frequently and allow their learners to engage in more technology-supported practices (Becker, 2000). In addition, Becker (2000) states that educators with more 'traditional-beliefs' tend to use computers less often. Richardson (2003), however, suggests that educators' personal experiences with schooling and instruction will have an impact on their theories and beliefs about computer technology. Another study by Lim and Khine (2006) reported that educators believed that the mere use of computers in their lessons excited and motivated their students to learn. The educators in their study only used computers to break the "monotony of chalk and board" (Lim and Khine, 2006). Ward and Parr (2010) found that educators are sensitive to change and if they do not see a change without any clearly recognised benefits, such as increased efficiency in administrative tasks and improvement in the learners' understanding of the subject, they will be hesitant to use

computers in their teaching.

Byrd and Koohang (1989) developed a simplified model of the professional development process. These scholars strongly believed that practical experience must be combined into the structure of professional development activities that are linked to computers. Based on their model, the authors stated that it is important that educators learn what is relevant and how such issues could improve teaching and learning in their classrooms. Therefore, the relationship between the educators' development and their beliefs in regard to the use of computers in the classroom will depend on quality development programs. Such a program will, in turn, support educators in changing their theories and beliefs towards computer technology (Byrd and Koohang, 1989). In addition, Byrd and Koohang (1989) point out that "if feelings of success come from these changes then significant change takes place in the teacher's beliefs and attitudes towards usage which leads to increased usage". The 'perception of future usage' means that those educators who perceive to use computers in the future will also have "increased perceptions as to the usefulness of computers" (Byrd and Koohang 1989).

Rogers (2003) on the other hand postulates that educators who tend to have positive intentions to adopt an innovation in the earlier stages, normally have "more years of formal education than do later adopters". In addition, he states that early adopters usually have bigger schools, and these schools are generally wealthier institutions. Furthermore, he states that there are more risks involved if the innovator is one of the first to adopt computers. These risks can be avoided by later adopters. Evidence in the literature suggests that educators do not have the time to take risks and are more appreciative of technology that works 'the first time' for them (Martin et al., 2004; Ward and Parr, 2010).

Rogers (2003) argues that educators who are among the first to adopt an innovation may be less dogmatic than are the later adopters. Dogmatism can be related to those educators who have very strong belief systems that are not easily compromised. Therefore, educators who possess highly dogmatic beliefs about computer technology not being successful are not likely to entertain computer innovations.

Purpose of the study

This study investigated the following question:

Do educators' theories and beliefs have any impact on computer usage?

METHODOLOGY

The survey-correlational research methodology was considered a suitable methodology for this study. It is focused on selecting a sample of individuals from a population and then analysing this information using statistical techniques to make inferences about the population. When the population is large, as in the case of this study, Hussey and Hussey (1997) recommends that only a sample of the whole population should be used.

Sample

This study made use of a convenience sampling technique (Sekaran and Bougie, 2010). In this study the population was 1816 (n=1816) secondary school educators. In some studies the entire population is surveyed, providing it is of a manageable size. The original intention was to survey all the educators in 60 secondary schools. However, due to the unwillingness of administrators at seven schools, no educators from those schools could be included in the study. Amongst educators from the remaining 53 schools, only 812 out of approximately 1528 responded, to give an overall response rate of 53%. The 812 respondents might be considered a convenience sample. The initial intention was not to take a 'convenience sample', although, the outcome of the process functionally resulted in this option.

Instrument

Information from the literature review was used to identify the variables regarding the educators' theories and beliefs to influence the use of computers in classrooms. Items adopted for use were those that had shown high degrees of internal consistency in their particular studies. This ensured the reliability of the questionnaire. The questionnaire was categorised into three different sections. Each of the sections was aimed at obtaining responses in accordance with the main objectives of the study. Section one contained five items relating to the educator's personal information. Section two contained 29 items relating to general information. Section three contained 22 items regarding the educators' theories and beliefs.

Data analysis techniques

Before describing the characteristics of the sample (that is, mean, standard deviation and skewness), it is advisable to determine the quality of the measuring instrument to be used. To investigate this quality, two procedures can be used, namely: Exploratory factor analysis and reliability analysis. According to Field (2005), exploratory factor analysis provides an indication as to the number of possible dimensions underlying the variable (that is, latent construct). To calculate how many dimensions need to be evaluated, parallel analysis can be used. Once the possible dimensions underlying each variable have been determined, it is important to determine the reliability of each dimension and variable. To determine the latter, Cronbach's coefficient alpha can be used. After conducting both exploratory factor analysis and reliability analysis, the study can continue reporting both descriptive and inferential statistical results, without any fear of the impact of poorly measured constructs.

Psychometric properties for educator theory and beliefs

Twenty-two items were used to capture educator beliefs (assuming a unidimensional structure). Cronbach's Alpha was computed and returned a score of 0.629 (before correction). Two items were removed because of insignificant factor loadings and the final Cronbach's Alpha after deletion was 0.805. There were 14 items, which reported on negative beliefs, yielding a Cronbach's Alpha of 0.774. Eight items returned positive beliefs and reported a Cronbach's Alpha of 0.748. No items were removed. Before deciding

Table 1. KMO-statistic and Bartlett's test for educator theory and belief.

KMO and Bartlett's test		
Kaiser-Meyer-Olkin measure of sampling adequacy		0.794
	Approx. Chi-Square	4310.206
Bartlett's test of sphericity	df	231
	sig.	0.000
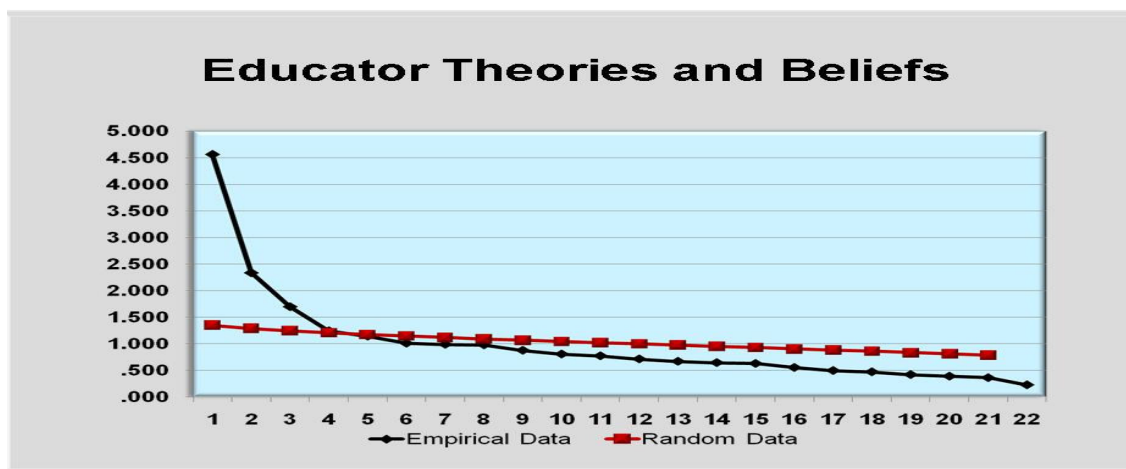
Figure 1. Parallel analysis on educators' theories and beliefs.

on how many factors can be extracted, it is essential to determine whether the variables can be factor-analysed. This is done by calculating both the Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy and Bartlett's test of sphericity. Table 1 presents the results of this test.

As illustrated Table 1 the Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy score is above 0.6. The values of 0.6 are regarded as a suggested minimum. Bartlett's test of sphericity is significant at (p< 0.000). These two tests combined provide a minimum benchmark that must be passed before factor analysis or principal component analysis can be conducted. From Table 1, it is evident that the educator theory and beliefs construct can be factor-analysable due to the appropriate statistical levels. In order to determine the number of factors to extract, parallel analysis was conducted and the results are presented in Figure 1.

As illustrated in Figure 1, it seems that a three-factor solution based on the results from the parallel analysis test is appropriate. It should be noted that a two-factor solution was chosen because the three-factor solution 'did not converge'. The results of the two-factor solution are illustrated in Table 2.

As seen in Table 2, it is suggested that a two-factor solution could be used due to the extraction sum of squared loadings of eigenvalues being greater than one. The values in the 'rotation sums of squared loadings' represent the distribution of the variance after the oblique rotation. Results of the EFA for a two-factor solution for the questionnaire that was used in this study. Pattern matrix resulted in a two-factor solution that loaded significantly on each of these two factors for the educator theory and belief construct. Because an oblique rotation technique (Table 3) was used during the exploratory factor analysis, a pattern matrix should be interpreted to identify the factor structure.

As illustrated in Table 3, two factors extracted from the educators' theory and belief construct, correlate negatively with each other. Furthermore, the table indicates that an oblique rotation occurred. The results from Figure 2 of the confirmatory factor analysis suggest that all of the revalidated measures provided better-fit statistics than the original scores. In addition, factor analysis was conducted and after a few rounds of testing, the final results are presented in Figure 2.

FINDINGS

The descriptive statistic for the educators' instructional method reveals that 19.1% of the educators used a largely teacher-directed discussion in their classroom (n=155), while 27.7% of these educators used a more teacher-directed than student-centred learning strategy in the classroom (n=225), and 41.6% of the educators had an even-balance between being teacher-directed and student-centred in their activities (n=338). Only 7.1% of these educators employed a more student-centred than teacher-directed teaching style (n=58). Finally, a mere 4.4% of the educators used a largely student-centred teaching method to conduct lessons in their classroom (n=36).

The descriptive statistic for the educators' level of computer usage reveals that a mere 1.4% of the educators had had no experience with computer technologies (n=11), while 6.3% of these educators had

Table 2. Total variance explained and Eigen values.

	Total variance explained						
Factor	**Initial Eigen values**			**Extraction sums of squared loadings**			**Rotation sums of squared loadings[a]**
	Total	**Variance (%)**	**Cumulative (%)**	**Total**	**Variance (%)**	**Cumulative (%)**	**Total**
1	4.565	20.751	20.751	3.859	17.543	17.543	3.209
2	2.336	10.616	31.367	1.632	7.418	24.961	2.994

Table 3. Factor-correlation matrix.

Factor correlation matrix		
Factor	**1**	**2**
1	1.000	-0.321
2	-0.321	1.000

Extraction Method: Principal Axis Factoring, Rotation Method: Oblimin with Kaiser Normalisation.

Figure 2. Properties of the educators' theory and belief constructs.

attempted to use computer technologies, but still required help on a regular basis (n=51). Only 15.1% of these educators were able to perform basic functions in a limited number of computer applications (n=123); and 49.6% of these educators could demonstrate a general competency in a number of computer applications (n=403). Only 23.6% of the educators had acquired the ability to competently use a broad spectrum of computer technologies; and finally, 3.9% of these educators were extremely proficient in using a wide variety of computer technologies. These statistics indicate that educators employed an even-balance between being teacher-directed and student-centred in their instructional method in this sample.

The descriptive statistic for the educators' computer training reveals that 90.9% of these educators had received some form of computer training (n=738), while 9.1% of these educators had received no training at all (n=74). Most of the educators who did not participate or receive training complained about the time at which the training was scheduled, which in many cases was after school hours. A few mentioned that the training personnel were not sufficiently well trained themselves to deliver training material. Some educators were concerned that the training that was offered was too advanced for them; and it was assumed that all educators needed to be at that advanced level. Educators who had been teaching for 20 years and more reported that they had no faith in

Table 4. Differences regarding educators' computer expertise in terms of educators' theories and beliefs

Dependent variable	(I) Recoded level of expertise (3 groups)	(J) Recoded level of expertise (3 groups)	Mean difference (I-J)	Std. error	Sig.	95% confidence interval lower bound	95% confidence interval upper bound
Educator theories and beliefs	Beginner	Average	5.13669[*]	0.82964	0.000	3.1022	7.1712
		Advanced	11.68106[*]	0.92809	0.000	9.4051	13.9570
	Average	Beginner	-5.13669[*]	0.82964	0.000	-7.1712	-3.1022
		Advanced	6.54437[*]	0.77857	0.000	4.6351	8.4536
	Advanced	Beginner	-11.68106[*]	0.92809	0.000	-13.9570	-9.4051
		Average	-6.54437[*]	0.77857	0.000	-8.4536	-4.6351

computers and that these technologies demanded a large amount of their time in getting educational programs to work efficiently.

The most frequent descriptive statistic regarding observation of educators' theories and beliefs was "using computers in school makes my administration efficient" (42%); this is followed by "I have made progress during the past year in learning new computer skills" (59.6%). The most frequent observation on which educators strongly disagreed was "my biggest fear in using computers in the class is embarrassment in front of my learners" (42%), followed by "I am afraid that if I begin to use computers I will become dependent upon them and lose some of my reasoning skills" (43%). These descriptive statistics suggest that educators do not feel threatened by students who are skilled computer users, and that they will use computers during their lessons in the classroom.

It is reported in Table 4 that when educators' theories and beliefs are compared with the educators' level of computer expertise, the scores indicate that there are significant differences between the highlighted variables. The significant difference is between educators who rated themselves as beginners with respect to the various levels of computer usage compared with those educators who rated themselves as advanced computer users (p<0.05). In addition, there seems to be a strong negative relationship between educators who have rated themselves as advanced computer users when compared with educators who have rated themselves as beginners of computer usage (p<0.05).

DISCUSSION

This study also investigated the secondary school educators' personal characteristics to establish whether there were any differences in the ways in which the educators used computers as teaching tools in their classrooms. The findings indicated that the majority of the secondary school educators were females (58%).

Respondents aged 40 to 49 years accounted for 39.4% of the total response. Jones (2004) argued that age does not always seem to be a significant variable in the use of computers. However, some studies have shown that young pre-service educators seem to have more positive attitudes towards computers and computer applications (Becta, 2004). In this study, contrary to the literature review, educators were adamant that they had no fear when using computers or if they were struggling to use them during their lessons. Furthermore, this study has indicated that educators (43%) who were strong in their beliefs stated that they would not become dependent on computers and lose some of their pedagogical skills. Educators (59.6%) responded that they had made steady progress in trying to adopt new computer technologies, which could be used during their lesson delivery in the classroom. This finding is contrary to the Becta (2004), study, where educators who believe that they are not well skilled in using computers feel nervous about using them in a class of learners, some of whom perhaps know more than they do. Another contradictory finding in the literature suggests that in the teaching profession, there is an inborn resistance to change (Balanskat et al., 2006); which can be seen as another obstacle to some educators' use of computer technologies. The findings of this study clearly indicate that since the Balanskat study was conducted, educators have made significant progress in altering their theories and beliefs about the use of computers.

Rogers (2003) argued that people hold to their beliefs during the introduction of any innovations. Therefore, it should be acknowledged that educational change is a slow process; and some educators require more time to gain experience with computers. It is worth noting that most of the educators (81.5%) irrespective of the geographic location of the school and its resources, believed that computers are a teaching aid which could improve the way learners learn. This finding supports McCormick and Scrimshaw's (2001) study, who suggested that it is known for educators to regard the use of computers as an efficiency aid.

It is evident from the findings that educator change is a complex process and it involves more than merely changing their theories and beliefs. Educators have feelings, attitudes, concerns, and career histories, which could all influence their commitment to change. Most of the principals stated that the educators in their schools are indeed attempting to use computers in their lessons.

The study examined the differences between age groups in terms of educator theories and beliefs. Significant differences were found between educators aged 50 and above when compared with younger educators (aged 40 to 49) ($p<0.05$). These differences may develop from the older educators' teaching experience, changes in the trends in education and the educators' inherent theories and beliefs regarding subject matter.

In addition, comparisons were investigated between computer expertise and educator theories and beliefs. Significant differences were found between the beginners in computer usage and more advanced users. It could be argued that the more teaching and computer experience the educator has, the stronger the educators' theories and beliefs become regarding the use of computers. Therefore, the study suggests that educators' age and computer expertise, in conjunction with educator theories and beliefs, have important roles to play in how computers are utilised in the classrooms.

RECOMMENDATIONS

Rogers (2003) argued that people will only adopt an innovation if they think it will yield some relative advantage to the idea that it is intended to supersede. In this study, the empirical evidence indicated that there are clear indications that educators can see the benefits of using computers as an additional instructional tool hence, they are more likely to change their beliefs and adopt the technology. Therefore, in order to inspire other educators with their belief that the use of computers in their teaching instruction enhances the learning process for both educators and learners, the following recommendations are made, and should be implemented with extreme caution:

(i) Educators' theories and beliefs should gradually be changed by submitting to greater pressure from the school principal requesting the increased use of computers in educators' instruction. Moreover, this process must work in conjunction with improved computer access, support and training.
(ii) Self-efficacy refers to educators' perceptions and capabilities to apply computers in their instruction. Educators' self-efficacy beliefs seem to have a positive influence on computer use. Therefore, this belief must be conveyed to educators who have negative attitudes towards the use of computers.

Conclusion

During the recent past there has been an influx of educational policies and projects with positive intentions to improve the quality of education. Furthermore, it has been observed that there is an inclination within some education departments to create new models of educational change, instead of drawing upon what has been developed in the past. It should be noted that access to good quality educational software programs is an excellent promoter that motivates the educator to use computers in his/her instruction. In addition, many principals are providing support to motivate and encourage educators to use computers in their instruction. Providing the proper computer support for the educators needs to become an increasingly vital feature of the systemic process of change. It was found that in many schools, Information, Communication and Technology (ICT) policies were in place, but often it was found that these were not being implemented. Most schools had policies indicating that educators must receive basic computer training. Educators in secondary schools must be supported and shown how the use of computers in their instruction can be of benefit to the whole educational system.

This study indicated that merely using computers would not bring about the required educator theory and belief changes in secondary schools. Although educators had received some form of computer training, many reported that this was either beyond their understanding or not very useful. There might be a danger that educators could use this as an excuse not to incorporate computers in their instruction. Educators seem to stay with the instructional methods with which they are comfortable and familiar.

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