



## Teacher Self-efficacy Beliefs on the Use of an Aspect of ICT for Secondary School Biology Teaching

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### Abstract

The integration of ICT in biology teaching has profound effect on students' achievement since learning is enhanced through audio and visual aids among others. Because of the paucity of computers in schools, it is likely that many teachers have low self-efficacy beliefs on the use of ICT for secondary school biology teaching. The Computer Self-Efficacy instrument was used as a tool to investigate the self-efficacy belief on the use of ICT for secondary school biology teaching by teachers. This instrument was administered on 200 randomly selected secondary school biology teachers in Warri Municipality, Nigeria, and its suburbs. A benchmark of 2.50 was used to make decisions relative to the group mean values obtained for answering the research question posed in the study. The results indicated that the secondary school biology teachers have positive self-efficacy belief in seven (7) of the ten (10) items of the research instrument. Implications of the results were discussed and suggestions were put forward about the direction for future studies.

**Keyword:** Computer Self-efficacy; Self-efficacy belief; Information and Communication Technology (ICT)

### 1. Introduction

Self-efficacy belief is people's judgments of their capabilities to organize and execute courses of action required to attain a designated performance (Bandura, 1997). Bandura's theory of self-efficacy is a key concept in social cognitive theory. The theory triangulates the relationship between the individual's personality, behaviour and environment (Chao, 2003). Current theoretical approaches to the integration of technology acknowledge that learners' computer knowledge, experience and expertise do impact on their perceived self-efficacy. Increasing self-efficacy is claimed to improve learners' academic performance and the institutional environment (Abulibdeh & Hassan, 2011). It has been proved that teachers perceived self-efficacy affects teacher's professional goals and aspirations (Muijs & Reynolds, 2002), their involvement on planning instructional activities, enthusiasm in classroom and attitudes toward innovation (Smylie, 1998). Studies by Liang and Tsai (2008), and Sam, Othman and Nordin (2005) found that pre-service teachers with higher self-efficacy levels demonstrated more progress and ease in their use of ICTs, such as online learning environments or other activities, within their learning approaches. In addition, Maninger and Anderson (2007) found that pre-service teachers' self-efficacy was significantly correlated with their technological expertise while Hakverdi, Gucum and Korkmaz (2007) found that levels of computer use, whether educational or general, impact on pre-service teachers' self-efficacy. By implication, increasing their involvement with computer training and practices can influence learners' perceived self-efficacy positively and this, in turn, may increase effectiveness of the educational environment (Jungert & Rosander, 2010). Slouti and Barton (2007) findings indicated that ICT can motivate students in their learning by bringing variety into the lessons and at the same time sustaining teachers own interest in teaching. It therefore appears that teacher's self-efficacy beliefs may influence adoption of ICT in teaching and learning Biology.



Some studies have been carried out on self-efficacy beliefs of teachers in the use of ICT for secondary school biology teaching but the results are inconclusive. For instance, Becta (2004) reported that negative attitude of teachers which resulted from negative self-efficacy beliefs was a barrier towards integration of ICT in teaching and learning while Rhoda and Gerald (2000) found that positive attitude which is tangential to positive self-efficacy belief towards ICT use is widely recognized as a necessary condition for effective computer use in teaching and learning. Selewyn (1999) pinpointed that the integration of ICT in education environment depends, to a great extent, on teachers and students attitude with positive or negative self-efficacy beliefs toward their use.

To supplement it all, Myers and Halpin (2002) asserted that attitude of both students and teachers towards ICT use was a major predictor of future classroom use which is dependent on their self-efficacy beliefs. In the Nigerian experience, no study has been conceptualized to specifically determine self-efficacy beliefs of secondary school biology teachers on use of ICT, and in particular, MS Word, for teaching biology.

**1.2 Problem of the Study:** The problem of this study, put in a question form is, what are the self-efficacy beliefs of secondary school biology teachers on the use of MS Word for teaching biology?

## 2. Method

### 2.1 Sample and Sampling technique

A sample of two hundred biology teachers was selected from a population of biology teachers in Uvwie Local Government Area of Warri metropolis, Nigeria, by random sampling. To ensure fair representation of the population in the sample, gender and teaching experience were used as strata although these variables were not hypothesized.

### 2.2 Instrument for Data Collection

To investigate teacher's self-efficacy belief on ICT use for secondary school biology teaching, a Computer Self-Efficacy questionnaire validated by Compeau and Higgins (1995) was modified for this purpose and used. This consists of 10 items. For each item, a Likert scale (1 to 4) is provided as response options, where 1 is "not at all confident" and 4 is "totally confident". Computer Self-Efficacy (CSE) represents an individual perception of his or her ability to use computers in the accomplishment of a task (Compeau & Higgins, 1995). The reliability coefficient 0.891 was established using Cronbach alpha technique by the present researchers.

### 2.3 Procedure for Data Collection and Analysis

The research instrument was administered to the members of the sample personally by two of the researchers. As a result, 100% retrieval was ensured by the researchers.

Means and standard deviations were used in answering the problem of this study. A benchmark of 2.50 was used to make decisions relative to the group mean values obtained for answering the research question posed in the study. A mean score of below 2.50 was interpreted as 'lack confidence', 2.50 to 2.79 as 'moderate confidence' while above 2.80 as 'high confidence'.



### 3. Results and Discussion

**Table 1:** Mean and Standard deviation of the rating of self-efficacy belief of teachers on use of ICT for biology teaching

During classes, I can use MS Word...	$\bar{x}$	SD	DECISION
1...if there was no one around to tell me what to do as I go.	2.49	0.885	Lack confidence
2...if I had never used software like it before trying it myself.	1.99	0.882	Lack confidence
3...if I had only the software manual for reference.	2.60	0.845	Moderate confidence
4...if I had seen someone else using it before.	2.59	0.731	Moderate confidence
5...if I could call someone else for help if I got stuck.	2.88	0.641	High confidence
6...if someone else had helped me get started.	2.81	0.629	High confidence
7...if I had a lot of time to complete the job for which the software was provided.	2.91	0.636	High confidence
8...if I had just built-in help facility for assistance.	2.97	0.660	High confidence
9...if someone else showed me how to do it first.	2.87	0.524	High confidence
10...if I had used similar software before this one to do the same job.	2.08	0.561	Lack confidence

The results indicate that the teachers lacked confidence in three out of ten items. These items are: ‘... if there was no one around to tell me what to do’, ‘...if I had never used software like it before trying it myself’ and ‘...if I had used similar software before this one to do the same job’. This means that the teachers had weak self-efficacy beliefs in these areas. The results also show that the teachers had strong self-efficacy beliefs in the remaining seven items. Further examination of these seven items shows that they are conditionally premised on having someone else to help, adequate time and facility for assistance.

Underlying this research study the basic premise is that to enhance integration of MS Word, an aspect of ICT, into biology teaching, a better understanding about teacher’s self-efficacy belief is very important, particularly in terms of ways they trust their ability to integrate ICTs into their approaches underscoring the fact that positive self-efficacy belief can improve biology teachers’ performance in the educational environment. The results of the analysis of the data obtained in this study are presented in Table 1.

Evidence provided by the analysis shows support for teacher education programme to introduce biology teachers to ICT practices and explore guides to them for the integration of ICT in their teaching activities. According to Bandura (1997), self-efficacy belief is presented as people’s judgments of their capabilities to organize and execute courses of action required to attain a designated performance. The results confirm the speculation that it is most likely that in developing countries, despite the fact that ICT adoption in schools activities appear to be settled, no significant changes could be found in teaching practices (Milbrath & Kinzie, 2000). This hunch probably stems from the paucity of computers, among others, which could result in low perceptions of their self-efficacy beliefs. It was expected by the researchers that teacher’s self-efficacy belief on the use of MS Word for biology teaching will be weak, because of lack of adequate exposure by teacher education programme on the use of ICT generally. But the results indicate that biology teachers have strong self-efficacy beliefs in most of the items. The results disagree with the expectation. Speculatively, the strong self-efficacy beliefs obtained here can be explained by the fact that ICT technology is common place. This means that the teachers are conversant with some devices for ICT. By implication, teachers have a better perception of their self-efficacy on the use of ICT for biology teaching.

#### Implications

The findings of this result show that secondary school biology teachers with strong self-efficacy beliefs on the use of MS Word in seven out of ten items. But a close observation indicates that most of



these items require responses that have to do with having someone else to help, adequate time and facility assistance. These imply that the pre-service teachers need assistance, exposure and adequate time to bring about desired changes. To achieve this change in practical terms, pre-service teachers' experiences should be increased through more exposure to computers and ICT and the facilitation of their use. Furthermore, providing them with proper access to computers and ICT, as well as technical support, has the potential to enhance their levels of self-efficacy and confidence to make desired changes. Increasing their training and providing them with more computer and ICT related knowledge and skills, through available courses and open workshop sessions, are essential for enhancing their self-efficacy levels, as well as creating motivation and more positive attitudes towards ICT. How to achieve this change can indicate direction for future studies. Future studies can also increase the sample size, widen the scope and variables, like teaching experience, qualification and gender to improve further our knowledge of this phenomenon.

## Conclusion

The analysis of data from this study supports the conclusion that secondary school biology teachers have strong self-efficacy beliefs on their use of MS Word, an aspect of ICT, for biology teaching in most of the areas investigated.

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