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Potency of Compatibility of Assistive Technology on Teaching and Learning of Integrated English Among The Visually Impaired Learners in Special Secondary Schools in Kenya

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Abstract
The purpose of the study was to examine the extent to which compatibility of Assistive Technology affect effective teaching and learning of integrated English among the visually impaired learners. The research design was descriptive research design. The target population was 4 principals, 48teachers and 480 students while the sample size was 4 principals, 218 students and 48 teachers. The sampling techniques were simple random sampling and purposive sampling. The data was collected using questionnaires, observation schedule and focus group interview.
The hypothesis was not rejected meaning that there was no significant relationship between compatibility of assistive technology and effective teaching and learning of integrated English among visually impaired learners. The hypothesis test indicated that there was no significant relationship between compatibility of AT and effective teaching and learning of VI. The researcher recommends though the relationship is not significant it is important to consider whether an AT device is compatible with the targeted VI users.

Key words
Compatibility, Assistive Technology, Visually Impaired

I. Introduction

Rogers (2003) stated that "compatibility is the degree to which an innovation is perceived as consistent with the existing values, past experiences, and needs of potential adopters" (p. 15).
The United Nations defines assistive technology as "technology adapted or specially designed to improve the functioning of people with disabilities" (Borg, Lindstrom, & Larsson, 2009, p. 1863). Assistive Technology (AT) is a broad concept, covering anything that might be used to compensate for lack of certain abilities (Reed & Bowser, 2005).This range from low-tech devices like special grip for a pen, to more advanced items like hearing aids and glasses, to high-tech devices such as braillers and computers with specialized software for helping persons to read (WHO, 2009; Petty, 2012). Kapperman, Sticken and Heinze(2002) demonstrated that approximately 60 percent of the academic students with visual disability in Illinois who could have benefited from the use of special technology for individuals with visual disability were not receiving that opportunity.
The increase in assistive technology use may be attributed to the federal laws passed which support funding for assistive technology devices and services. Although these laws increase the accessibility of assistive technology, many recipients are dissatisfied with devices and services. Dissatisfaction typically results in discontinuance of assistive technology devices. A national survey on technology abandonment found that 29.3% of all devices obtained were abandoned (Phillips & Zhao, 1993). Discontinuance of assistive technology represents a waste of time and money. There is however, limited research documenting factors related to assistive technology discontinuance from consumers' perspectives. It is important to gain an understanding of these factors to aid professionals in designing assistive technology service delivery techniques. Assistive technology can improve teaching and learning in inclusive classrooms in various ways (Kleiman, 2010).
This research is guided by Rogers' theory of diffusion (1995) which offers a comprehensive philosophy regarding the processes involved in accepting or discontinuing use of technology. According to this theory, discontinuance is a decision to discard an innovation after previously accepting it.
The two types of discontinuance are replacement (rejection of an innovation for an improved one) and disenchantment (rejection of an innovation due to dissatisfaction). Relative advantage, compatibility, trialability and re-invention are concepts derived from the diffusion of innovations theory. They are examined in the present study to determine if they are related to continuance/ discontinuance of assistive technology devices by individuals with disabilities. Relative advantage is identified as a significant factor associated with continuance or discontinuance of technology. This factor relates to the characteristics of the device itself (Rogers, 1995) and examines the relative advantage that continued use of a device offers a user over discontinuing its use.
Compatibility,refers to the degree an innovation is perceived as consistent with the needs of the adopter (Rogers, 1995). According to Rogers, compatibility is a factor related to continued use of an innovation. In summary, diffusion theorists claimed that innovations that are perceived by individuals as having greater relative advantage, compatibility, trialability and re-invention will be rapidly adopted and slowly discontinued (Rogers, 1995). These concepts are examined in the present study to determine if they are applicable to continuance/discontinuance of assistive technology devices by individuals with disabilities.
Bennett and Bennett (2003) showed that trialability, compatibility, relative advantage and complexity influenced faculty members' likelihood of adopting a new technology into their teaching. A study in Canada examined how one can help students with special needs use assistive technologies to smoothly transit from elementary to secondary school (Specht, Howell & Young, 2007).A Norwegian study examined how environmental factors, braille and assistive technologies affect the learning and literacy of 11 severely visually-impaired students (Vik, 2008).
The academic success of students who are blind or vision impaired, whether in special, integrated or inclusive schools setting depends on a variety of factors. Among these is their ability to access the classroom curriculum. Curriculum access for blind and visual disability students requires provision of books and resource materials. However, these need to be provided in an appropriate

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format for example Braille, large print, e-text and audio at the same time and at the same level including book edition (Kelley et al, 2001).

Gale and Cronin (1998) have argued that educational goals for students who are blind or vision impaired should be the same as for other students, with some modifications and adaptations according to individual needs. The rapid development of Information Communication Technology (ICT) has impacted on the education sector in South Africa. The focus has shifted to the increasing use of ICTs to address teaching, learning and administrative needs (Archer, 2003; Engelbrecht, Oswald and Eloff, 2003), even for visual disability learners. Similarly the Integrated Education Project (IEP) was set up by Sight Savers, Ghana, the Special Education Division (SpED) and the Ghana Society for the Blind (GSB). The programme successfully integrated a totally blind student into a mainstream school in Hohoe District, Volta region (Michaels & McDermott, 2003).

Research indicates that there have been numerous problems facing the use of AT for the blind in learning institutions. D'Andrea (2010) affirms that despite the federal regulation that AT services should be provided in learning institutions, half of high school students with visual impairment are not provided AT services. One of the problems emanates from lack of technical skills to use some of the AT devices and software.

In East Africa, according to Sight Savers Tanzania's annual review report (2010), less than 10 percent of children who are blind or visual disability (B/VD) or have low vision (LV) receive any kind of schooling. Realizing the effectiveness of assistive technologies in education for people with disabilities, Tanzania Education Authority (TEA), Tanzania League for the Blind (TLB) and Sight Savers Tanzania (SST) have been working very closely since 2009 to ensure the" Dolphin Pen" project which started in Kenya is scaled up in Tanzania so that students with visual disabilities also benefit. Tanzania Education Authority, TLB and SST jointly developed an "Assistive Technologies Programme (ATP)" which started March 2011(SST Annual Review Report, 2010).

The Kenyan government's education policies and goals are geared towards achieving Education for All (EFA) by 2015 in tandem with national and international standards. In an effort to achieve these goals, the government launched a special needs education policy framework in 2010 (Republic of Kenya, 2010).

Mugo (2013) established that the Blind and VI students in Kenyatta University used the AT for the blind to perform various tasks including writing notes using braille machines and braille papers, using computers to type their work and communicate through emails and even browsing using screen readers for academic materials.

The World Health Organization (WHO) estimated the number of persons with visual disability in Kenya was 620,000 in 2011 (WHO, 2009). In Kenya, Kenya Society for the Blind (KSB) in partnership with the Ministry of Education and Sight Savers, the Kenya Integrated Education Programme (KIEP) has made EFA a reality for learners with visual impairment. According to Kenya Institute Special Education (KISE) some special school have AT but in others they are not available or adequate due to cost. According to Ministry of Education (2012)there are 4 high schools for the blind in Kenya; Salvation army School for the Blind ,Thika , St. Lucy's High School for the visually impaired (Meru), Salvation army special secondary School Kibos (Kisumu) and St Francis Kapenguria.

The examples of assistive technology integration (or lack of it) point to the pressing need for a comprehensive response from the education in the community. Individuals with disabilities, parents, districts and states desperately need, and are aggressively seeking, guidelines for effective integration of assistive technology (Hart, 2000). This study focuses on special secondary schools rather than mainstream school because the special secondary schools are expected to have put some measures in place to facilitate effective teaching and learning of visual disability students. Most studies have been done in America and Europe but few in African context. The empirical studies mentioned in the background have not determined the effect of AT on a subject area apart from Bisi (2013) who studied impact of AT on visually impaired student performance in Kiswahili in public primary teachers college. The AT were not available or adequate in all special secondary schools in Kenya.

A. Compatibility of Assistive Technology in Teaching and Learning

According to Jwaifell and Gasaymeh (2013) the process of adopting an innovation can be accelerated if the individual feels that this new innovation is compatible with their needs and experiences. Rogers (2003) stated that "compatibility is the degree to which an innovation is perceived as consistent with the existing values, past experiences, and needs of potential adopters" (p. 15). For innovation in learning materials, the new idea may or may not be compatible with students' socio-cultural values, beliefs, or needs for the new technology.

A lack of compatibility in AT with individual needs may negatively affect the individual's AT use (McKenzie, 2001). Hoerup (2001) describes that each innovation influences student opinions, beliefs, values, and views about teaching. If an innovation is compatible with an individual's needs, then uncertainty will decrease and the rate of adoption of the innovation will increase.

B. Statement of the Problem

In 2009, the Ministry of Education (MOE) released a report which indicated that only 21 percent of visual disability children were attending school. This indicates that the majority79 percent of visually impaired children do not have access to education. It is estimated that there are approximately 15,500 visually disabled children in Kenya. The MOE report (2009) shows that 1527 children were attending special schools and 1637were attending integrated /inclusive schools in Kenya.

KISE has assistive technology such as Duxbury Braille Translator, dolphin pen and jaws for windows (Ministry of Education, 2012). These technologies are too expensive and are not available in all schools. This indicates there is a problem of teaching and learning of visual disability students due inadequacy or unavailability of AT. KISE has assisted in facilitating availability of AT devices in some schools but have not been effectively utilized to enhance teaching and learning among visually disabled students. According to Bisi (2013) assistive technologies such as talk book were available but inadequate. Therefore there was need to determine the effect of AT in effective teaching and learning of integrated English among visually impaired learners in special secondary school in Kenya.

C. Purpose of the Study

The purpose of the study was to investigate the effect compatibility of assistive technology on effectiveness of teaching and learning of integrated English amongst visually impaired learners in special

secondary schools in Kenya.

D. Objectives of the Study

The study sought to achieve the following objective:
To examine the extent to which compatibility of Assistive Technology affect effective teaching and learning of integrated English among the visually impaired learners.

E. Research hypotheses

The study sought to test the following hypothesis.
HO: There is no significant relationship between compatibility of Assistive Technology and effective teaching and learning of integrated English among the visually impaired learners

II. Methodology

This study used mixed-methods research design, quantitative and qualitative method for example the focus group discussion. Descriptive survey design is a method of collecting information concerning the current status of the phenomena to describe "what exists" with respect to variables or conditions in a situation (Orodho, 2003). According to Ministry of Education (2012) there are 4 public high schools for the blind in Kenya; Thika School for the Blind, St. Lucy's High School for the Blind (Meru), Kibos High School for the Blind (Western Region) and St Francis Kapenguria (Rift valley Region). This study target population was 4 principals, 48 teachers and 480students.Asample of 218 students was used while the principals and teachers were purposively selected.

III. Findings and Discussions

A. Compatibility and School Cross tabulation

The researcher determined the compatibility and school cross tabulation. The key used was as follows: 1) Not at all (2) to a less extent (3) To moderate extent (4) to a large extent (5) to a very large extent Table 1 shows the cross tabulation of compatibility and school

Table 1: Compatibility and School Cross tabulation

Scale		Total
Compatibility	1.50	4.5
	2.00	18.2
	2.50	22.7
	3.00	25.0
	3.50	20.5
	4.00	4.5
	4.50	2.3
	5.00	2.3
Total		100.0

Overall 25percent rated at moderate extent and minority 2.3 percent on high extent and very high extent.

B. Compatibility and Gender Cross Tabulations

The researcher determined the relationship of compatibility of AT and gender. The key used was as follows: 1) Not at all (2) to a less extent (3) To moderate extent (4) to a large extent (5) to a very large extent
Table 2 presents the compatibility and gender cross tabulation.

Table 2 :Compatibility Gender Cross tabulation

Scale		Gender		Total
		Male	Female percent	
Compatibility	1.50	4.5		4.5
	2.00	4.5	13.6	18.1
	2.50	2.3	20.5	22.7
	3.00	15.9	9.1	25.0
	3.50	9.1	11.4	20.5
	4.00	4.5		4.5
	4.50	2.3		2.3
	5.00		2.3	2.3
Total		43.2	56.8	100.0

In Table 2 15.9 percent of male teachers rated compatibility of AT 3 which is a rating of moderate extent, while 20.5 percent of female teachers rated compatibility of AT to a little extent. 25 percent both male and female rated compatibility of AT moderate extent. This implies that majority of teachers rated compatibility at moderate extent.

C. Influence of Compatibility of assistive technology on Learners Achievement

The effective teaching and learning was measured in terms of learner's achievement.
To test this objective null hypothesis HO**:** there is no significant relationship between compatibility of Assistive Technology and effective teaching and learning of literature among the visual disability learners at 0.05 significance level. This information is based on teachers' response. Table 3 indicates relationship between the compatibility and learners achievement.

Table 3: Relationship between Compatibility and learners achievement

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.023[a]	.001	-.023	1.05469

a. Predictors: (Constant), Compatibility

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	.025	1	.025	.022	.882[b]
	Residual	46.720	42	1.112		
	Total	46.744	43			

a. Dependent Variable: Learners Achievement

b. Predictors: (Constant), Compatibility

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	6.102	.628		9.711	.000
	Compatibility	-.032	.212	-.023	-.149	.882

a. Dependent Variable: Learners Achievement

The coefficient of determination was 0.001 indicating that compatibility explains 0.1 percent of variation in learners' achievement. The remaining 99.9 percent was explained by other variables not within this study.

The overall test of significance using F-value statistic was 0.022 which was not significant because p-value (0.882) was more than 0.05 significance level and the null hypothesis that there is no significant relationship between compatibility of Assistive Technology and effective teaching and learning of literature was not rejected. In order to establish individual significance t-test was carried out. From Table 3, the constant was statistically significant (0.000) but compatibility was not significant. Kapperman, Sticken and Heinze (2002) found that AT devices may not always be beneficial. Mckenzie (2001) study found that compatibility of AT has positive effect on the learners. For the principals - The coefficient of determination was 0.015 indicating that compatibility explains 1.5 percent of variation in learners' achievement. The remaining 98.5 percent was explained by other variables not within this study.

The coefficient of determination was more in principals' response data as opposed to teachers. For the teachers the overall test of significance using F-value statistic was 0.022 which was not significant because p-value (0.882) was more than 0.05 significance level and the null hypothesis that there is no significant relationship between compatibility of Assistive Technology and effective teaching and learning of integrated English was not rejected.

For the principals the overall test of significance using F-value statistic was 0.030 which was not significant because p-value (0.878) was more than 0.05 significance level and the null hypothesis that there is no significant relationship between compatibility of Assistive Technology and effective teaching and learning of integrated English was not rejected. F- Value statistic for the principal's data was greater than F-value from teachers' data. In both data of teachers and principals p-value was more than 0.05 significance level and therefore the null hypothesis was not rejected. This implies compatibility of AT has no significant influence or effect on effective teaching and learning of integrated English as measured by the mean score.

IV. Conclusion and Recommendations

Although relationship of compatibility and effective teaching and learning was not significant it is important to consider whether an AT device is compatible with the targeted VI users. This is because the coefficient of determination indicated that compatibility influence learners achievement by 0.1 percent. The school management should consider their visually impaired students' needs and to what extent an AT device would be compatible. The management should consult and bench mark with other school that are using what they intend to purchase for use by their students. It is important for school management to carefully assess their available AT on their compatibility with other more advanced AT devices. This would inform the management on whether they need to completely do away with existing and replace with new ones.

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