
Assessment of Technology Integration by Senior Secondary School Teachers of Science and Mathematics

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ABSTRACT

Qualitative education is a correlate of technological development in many countries. The trend of scholastic studies in technological integration in classrooms have reported better performance from students taught using technology. Integration is mostly done by teachers with a view to improve students' performance, hence, this study investigated technology integration by senior school science and mathematics teachers in Ilorin, Nigeria. Forty-two female and seventy-three male teachers were sampled. Teachers' Technology Integration Assessment (TTIA) questionnaire elicited data to answer four research questions generated in this study. Descriptive statistics of frequency, percentage and charts were employed. Thirty one percent of teachers' use technology in their classroom against 69% who do not. Twenty-three percentage indicated weekly, 32% monthly and 45% occasionally integrated technology in their classrooms. Also, less experienced teachers integrated technology most among experienced, moderately experienced and less experienced teachers. Male teachers integrated technology more than the female teachers in this study.

Keyword: Assessment, Technology Integration, Senior School, Science Teacher

INTRODUCTION

The advent of technology, internet and its availability in developing countries in recent time have encouraged students to study at convenient places and pace, bringing about better understanding of content and context in various subject areas, with teachers as facilitators of classroom activities. Free, adequate and readily available resources on the internet minimizes the challenges faced by teachers and students in terms of availability of content knowledge which in turn makes teaching and learning easier for teachers and students unlike the past when physical libraries was the only place where

relevant and large information were gathered for both teachers and students' consumption.

The 21st century has raised legitimate concerns for developing countries in term of technological integration in the classrooms. Nigeria as one of the developing countries of the world lags behind unlike the United States and United Kingdom which introduced swift transformation to internet and web-based work in school classrooms decades ago. It is apparent that national development depends on educational advancement which are anchored on technological progress. Technology at this age has broken all national and international barriers making the world a global village where information can be

gotten anywhere and at any time. Technology improves the quality of education of a nation. The national development of a nation depends on the extent to which technology is used to facilitate its education (Onasanya, Shehu, Ogunlade & Adefuye 2011).

Technology has been reported by researchers to play an important role in students learning while large-scale studies have elicited significant increase in the achievement scores of students using technology as learning tools. The usage of technology positively influences variety of student learning outcomes, chief of which is the understanding of science concepts and the development of scientific reasoning skills. The usage of technology in science classrooms has also been reported to significantly improve students' attention, engagement and interest in science and mathematics. (Dani & Koenig, 2008; Lei & Zhao, 2007).

The integration of technology into classroom activities by the teacher has its challenges, nonetheless, the trend in the growth of internet and accessibility to educative technological materials in schools will likely improve both teachers and students in the areas of content knowledge, pedagogy and even epistemology of scientific contents. Technology has contributed significantly to the development in science, engineering, mathematics and other related fields. However, its integration to senior secondary schools in Nigeria may be short of the desired. Despite government and private sector investment in technology to equip schools with technological tools for educational purposes, an assessment of its availability and integration remain a germane question (Guzey, & Roehrig, 2011; National Education Association [NEA], 2008).

Prior reports in the United States have concluded that most high schools and its equivalent only allow students make use of computer in both computer and business classes, and most teachers use computers to perform administrative tasks such as taking attendance and for other elementary use. Unfortunately, not all teachers permit their students to use educational technology tools in solving problems, analyze data, do internet based research, present graphical information, or participate in distance learning via Internet in the past decade until recently, affirming the availability and integration in the developed world (Becker, 2000; U.S. Department of Education, 2003; U. S. Department of Education, 2016).

Researches have demonstrated the efficacy of technology as a tool in enhancing learning of science subjects especially at the senior secondary level when properly integrated. Science teachers alike have been encouraged to apply technology in demystifying grey areas in science to enhance students understanding and ultimately improve their performance. Since the world has become a global village, all human activities are seemingly driven by technology. Hence, the need for students and teachers to be well-grounded in science and mathematical content knowledge, as well as the knowledge and ability to use, manage, and understand technology as it relates to science teaching and learning becomes a new order. However, effective integration of technology in the classroom remains a challenge for physics teachers (Akindolu, 2002; Songer, 2007).

Technology can be said to have tremendously changed many aspect of human daily lives, it is undoubtedly having the same influence on our education.

Technological advancement avails a leeway to facilitate, access and assess information. However, technology does not change the message received by students, or the students' ability to grasp and retain such information. Sizable number of teachers have been reported to either ignore the call to use technology in science teaching or obsoletely employ technology in ways that replicate traditional instructional strategies, such as the use of PowerPoint for lecture presentations. Teachers who attempt to use technology become frustrated by difficulties related to its implementation in the classroom. Various hindrances can however be attributed to the usage of technology for classroom purposes (National Research Council [NRC], 2000; Thurlow, Lengel, & Tomic, 2004).

Effective technology integration in the classroom is accustomed with variety of issues, ranging from purchase of cheapest available technology without proper consideration on usability, lack of trained teachers, incompatibility with the existing system, little or no involvement of the teacher at the purchase stage, lack of adequate technology plan, lack of planning time for usage, and inadequate instructional time for implementation (Kelly, 2017). Furthermore, extrinsic factors, such as access to technological resources, software availability and quality, planning time for technology rich lessons and technical support hinders usage. Intrinsic factors which include teachers' beliefs about teaching and technology, school context and culture, instructional models, and openness to integrate technology are also important factors. Intrinsic barriers are difficult to define and overcome because teachers need to restructure their belief systems about technology and also develop

their knowledge base for technology integration (Brickner, 1995).

Teachers are regarded as central to the creation of a technology integrated classroom that is learner-centered and interesting. As far as a classroom is concerned, teachers remain an integral part to students' exposure to limited, consistent and equitable technology for effective learning, more so that technology integration is not about the availability of technology, but rather about the teachers' effective use of technology that makes a difference in reforming the classroom. The teacher is the most important ingredient for success when using and integrating technology (Beckett, Wetzel, Chishlom, Zambo, Buss, Padgett, Williams and Odom (2003); Mandell, Sorge, & Russell, 2002).

Age and gender differences in the overlooked context of individuals' adoption and sustained usage of technology in the workplace using the Theory of Planned Behavior (TPB) reveals that user reactions and technology usage behavior over a 5-month period among 355 workers introduced to a new software technology application showed that men and younger workers were more strongly influenced by their attitude toward using the new technology. In contrast, women and older workers were more strongly influenced by subjective norm and perceived behavioral control. Then, these groups of people adopted very different decision processes in evaluating new technologies (Venkatesh & Morris, 2000).

Teacher's educational experience, experience with technology for educational purposes can influence integration (Schiller, 2003). Teachers with fewer years of experience are more likely to use computers in their classes than teachers with more years

of experience. Specifically, teachers with three years or less teaching experience uses technology 48% of the time; teachers with 4-9 years, 45% of the time; those with 10-19 years, 47% of the time, while teachers with 20 years or more reportedly used technology only 33% of the time (National Center for Education Statistics, 2000). Roberts, Hutchinson and Little in 2003 reported from their study that the probability of teachers to use ICT in the classroom was limited by the reality that teachers who were educated 20 years ago were trained by people who themselves were trained before the arrival of computers in schools.

The purpose of this study was to assess the technology integration by senior school teachers of science and mathematics in Ilorin, Nigeria. Specifically, this study investigated:

1. whether science and mathematics teachers in Ilorin had integrated technology in their classroom teaching,
2. the consistency of their usage of technology in the classroom,
3. if teachers experience influenced their technology integration.
4. If gender of the teachers influences their integration.

The research questions in the study were:

1. To what extent do Science and Mathematics teachers integrate

technology in their classroom teaching?

2. Is there consistency in the usage of technology in the classroom by science teachers?
3. To what extent do teachers experience influence their technology integration to teaching?
4. To what extent is gender an influential factor for teachers' integration of technology in their teaching?

METHODOLOGY

The sample for this study consisted of 17 physics teachers, 20 chemistry teachers, 30 biology teachers, 25 mathematics teachers and 23 agricultural science teachers from public senior secondary schools in Ilorin, Nigeria. Thus, a total number of 115 teachers participated in this study. Teachers' Technology Integration Assessment (TTIA) questionnaire was administered to the corresponding teachers to elicit responses as stated in the research questions.

RESULTS

Research question one: To what extent do Science and Mathematics teachers integrate technology in their classroom teaching?

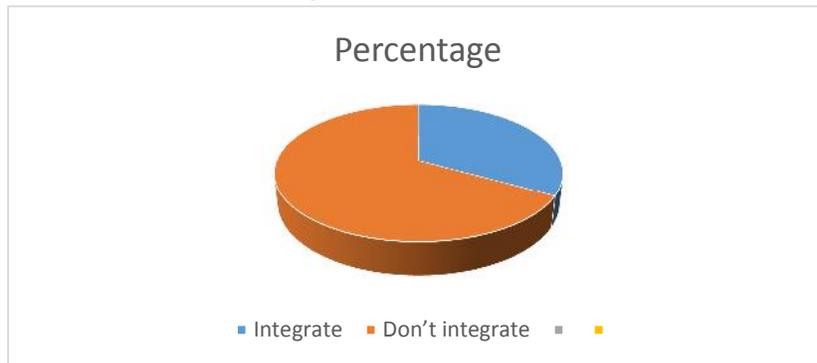


Figure 1: Pie chart of the percentage of teachers' technology integration

From the raw data, only 38 teachers (33.1%) of the population admitted to integrating technology in their classroom activities while 77 teachers (66.9%) admitted to non-integration.

Research question two: Is there consistency in the usage of technology in the classroom by science teachers?

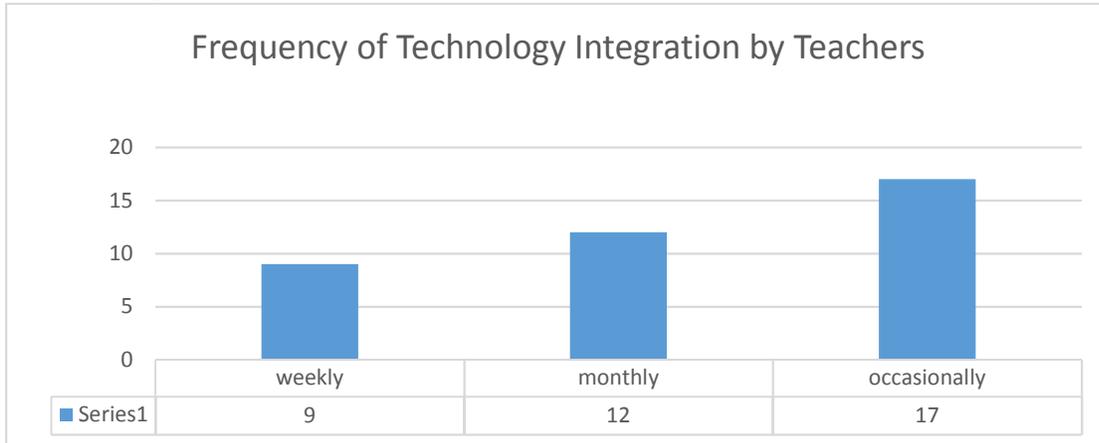


Figure 2: Bar chart showing frequency of technology usage by respondents.

Figure two indicate that 9 (23%) out of 115 teachers made use of technology in their classrooms on weekly basis, 12 (32%) of 115 used technology on monthly basis while 17

(45%) teachers occasion/rarely used technology in their classroom activities.

Research question three: To what extent do teachers experience influence their technology integration to teaching?



Key: 1= experienced, 2= moderately experienced, 3= less experienced.

Figure 3: Waterfall illustration of teacher’s experience and technology integration

Figure 3 shows that, the recently trained teacher’s integrated technology in their classrooms. Therefore, this is an indication of the trend in technological awareness of the incoming teachers which is

a reflection of what is obtainable in the society.

Research question four: To what extent is gender an influential factor for teachers’ integration of technology in their teaching?

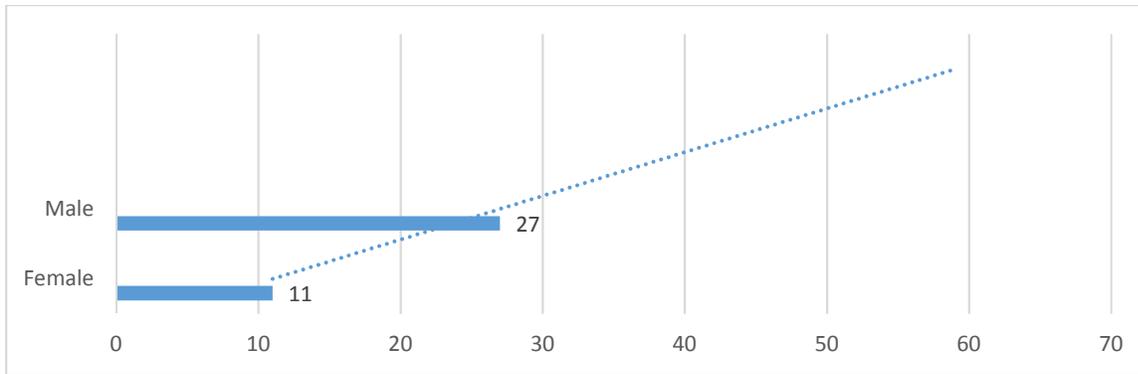


Figure 4: Bar illustrating gender integration of technology by teachers.

Figure 4 shows that only 29% of the female teachers made use of technology in their classroom while 71% of the male teachers made use of technology in their classroom activities. Although, 42 female teachers were sampled in this study but only 11 integrated technology in the class while the sampled 73 male teachers had only 27 teachers integrating technology in their classroom.

Summary of Major Findings

Below is the summary of major findings in this study:

- i. The percentage of science and mathematics teachers integrating technology in the classroom is below average (33.1%) as reported in this study. This study found 33.1% of science and mathematics teachers integrating technology in Ilorin, Kwarar State.
- ii. From the 115 teachers sampled, only 38 teachers admitted to using technology in their classrooms. The frequency/consistency in usage indicated that only 23% of those integrating adopted weekly usage, 32% used technology in their classes monthly while 45% occasionally

adopted technology in their classroom activities.

- iii. Less experienced teachers integrated technology in their classrooms than moderately experienced and experienced science and mathematics teachers.
- iv. Technology integration among science and mathematics teachers was gender biased in favor of the male teachers.

DISCUSSION

The level of technology integration in the classroom by science and mathematics teachers in Ilorin is not satisfactory considering the enormous advantages therewith as reported by Akindolu, 2002, Songer, 2007. Experience teachers use technology more than moderately and experienced teacher as observed in this study and supported by National Center for Education Statistics (2000) and Roberts, Hutchinson and Little (2003). This is expected because the recently trained teachers must have been taught while at the university. More male teachers integrated technology in this study. The finding is supported by the submission of Venkatesh and Morris (2000). The female teachers must have developed phobia for using technology.

RECOMMENDATIONS

In line with the findings of this study, the following recommendations were made accordingly:

- i. Science and mathematics should be well trained, equipped and encouraged with the technological tools that are most appropriate for classroom usage so as to stimulate and motivate more students to perform better in science and mathematics subjects especially the experienced teachers.
- ii. Consistent integration of technology in classroom activities should be encouraged among teachers of science and mathematics.
- iii. Seminars and workshops should be frequently organized by stakeholders to improve teachers' technological awareness and how best to integrate it in the classrooms
- iv. Male and female teachers should be given equal task and similar opportunity to express their technological prowess. Technology utilization should not be gender bias, as such, female teachers need to embrace technology and integrate it in their classroom activities.
- v. Efforts should be made by stakeholders to remove the phobia that female teachers may experience.

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