SCIENCE TEACHERS’ PERCEPTION AND READINESS FOR E-LEARNING INSTRUCTIONAL DELIVERY IN SECONDARY SCHOOLS IN SOUTH WEST, NIGERIA

Johnson Ayodele Opateye
Institute of Education, University of Ibadan, Ibadan

Abstract
The study investigated science teachers’ perception and readiness for e-learning instructional delivery in secondary schools in South Western Nigeria. The study employed a survey research design. The sample for the study comprised 250 science teachers and 2,500 SSSIII science students. Two instruments were used namely e-Learning Science Teachers’ Perception and Readiness Questionnaire (r=.82) and Science–based Achievement Test (r=.73) to collect data. Five hypotheses were generated and tested. t-test, analysis of variance and Pearson moment correlation statistics were used to analyse the data. The results showed that there was a significant difference in male and female science teachers’ perception of e-learning and also of their readiness for e-learning instructions. There existed no significant difference between private and public science teachers’ perception and also their readiness for e-learning instruction. There was a significant difference in teachers’ perception of e-learning among science subject affiliations with no significant difference in teachers’ readiness for e-learning instruction. Positive relationship existed between teachers’ perception and science students’ achievement and also between perception and readiness for e-learning instruction. Female science teachers’ perception and readiness for e-learning instructions and public schools science teachers’ should be encouraged to develop themselves in e-learning. E-learning instructions should be incorporated into science teaching in secondary schools to enhance students’ understanding of scientific concepts.

Introduction
The use of electronic learning (e-learning) is on the increase and it is gaining appreciable grounds in the educational systems all over the world. Involvement of e-learning is given prominent attention especially in the higher institutions and for distance learning situations. Ayoade and Raji (2006) when emphasizing on the importance of ICT asserted that ICT can be used in many ways and how it is integrated into educational settings depend largely
on teachers’ instructional goals and strategies. They further enumerated technologies that enable ICT activities in the classroom as Interactive White Board (IWB), Web-based Instructions (WBI) and Virtual Classroom (VC). Development of e-learning is therefore based on these ICT technologies. An interactive white board is a sensitive display that functions as a white board, a projector screen, an electronic copy of the board, a computer, projector and in which computer image is controlled by touching the surface of the panel instead of using a mouse or keyboard. IWB is used as presentation devices and classroom motivation of students (Glover & Miller, 2002). Distributed learning activities include e-learning, Web-based learning (WBL), Web-based Instruction (WBI), Web-based Training (WBT), Internet-based Training (IBT), Distributed Learning (DL), Advanced Distributed Learning (ADL), Online Learning (OL), Mobile Learning (ML) and a-Learning (anytime, anywhere, anyplace learning). The pivot of e-learning is the Web-based Instruction in which individuals have freedom to choose their learning path in order to have greater control over their learning. E-learning is applied to systems for distance learning in which software support students to take a campus based course or online documentation for teaching and learning (Rdhagen & Trojer, 2008). The main mover of e-learning is internet.

Carr (2000) noted that since early this century, various “new” educational technologies have been touted as the revolutionary pedagogical wave of the future. Classroom films, language laboratories, educational television, computer-assisted instruction, interactive video disc, and more recently, electronic learning, which is any type of online learning that is relevant and realistic to the user, are now adopted and integrated into the curriculum with varying degrees of success most especially in the developed countries. Cattagni and Farris (2000) claimed that, e-learning, which is also known as Internet-based hybrid learning, is now one of the most significant new learning technologies to emerge in the last 10 years. It is further revealed that, the evolution of Internet in K-12 schools is having a profound impact on the evolution of computer use and the curricular integration of new learning technologies in America. E-learning is therefore an Internet-enabled learning that encompasses training, education, just-in-time information and communication. It is also a delivery of learning, training, or education programme by electronic means. It is any virtual act or process used to acquire data, skills, information or knowledge in a virtual world where technology
emerge with human activities to accelerate rapid development (Brill & Galloway, 2007).

In order to make e-learning work in Tanzania, a research project developed a more complex understanding of the participatory aspect of e-learning. First, secondary school teachers are potential participants, when materials are developed. Second, the e-learning materials can allow for more or less participation among the students in the schools. Thirdly, the actual participation in the schools will depend on the preparedness (readiness) among teachers and students to change the education context towards a more interactive mood when the e-learning material is introduced (Rhdhagen & Trojer, 2008). Government agencies and Ministries of education in Nigeria that are initiating e-learning are National Open University of Nigeria (NOUN), The School Net Project, The Teachers Network (TeachNet) Project, The National Virtual Library Project among others. The moves are made to improve the efficiency and quantity of the educational delivery system in Nigeria. There is a need to employ alternative means to ensure that the large number of students are taught effectively with or without the shortage of the professionally qualified teachers. Ajelabi (2005) therefore wrote in his book that face to face teaching is predominantly in Nigerian secondary schools which calls for innovations and reforms of mode of curriculum implementation. Most science teachers still resort to using old technology of books, chalkboard, overhead projector, video projector and computer. Carr (2000) observed that various new educational technologies have been touted as the revolutionary pedagogical wave of the future.

It is possible to use various pedagogical approaches for effective implementation of e-learning in secondary schools. Such approaches include instructional design, social constructivist, Laurillard’s Conversational model, Cognitive perspective, emotional perspective, behavioural perspective, contextual perspective and model neutral (Reeds & Jones, 2008). Bates and Poole (2003) suggested that different types or forms of e-learning can be considered as a continuum, from no e-learning, i.e. no use of computers and/or the Internet for teaching and learning, through classroom aids, such as making classroom lecture Powerpoint slides available to students through a course web site or learning management system, to laptop programs, where students are required to bring laptops to class and use them as part of face-to-face class, to hybrid learning where classroom time is reduced but not eliminated, with more time devoted to online leaning, through to fully online learning, which is a form of distance education. Also e-learning
framework by scholars and practitioners from various fields focused on nine dimensions which are applicable to science teaching in secondary schools as shown in figure 1.

![Figure 1: The e-learning framework](image)

From Figure 1, pedagogical dimension addresses the issue of teaching and learning while the technology dimension examines issues of technology infrastructure. Interface design encompasses page and site design and the evaluation looks at both the assessment of learners with evaluation of instructional environment. Management of e-learning refers to maintenance of learning environment and distribution of information. Resource support examines the online support and resource required to foster meaningful learning environment. The ethical dimension of e-learning relate to social, political, cultural, geographical, learner diversities and information accessibility with the legal issues. The institutional dimension is focused on the issues of administrative affairs, academic affairs and students services related to learning. The considerations of
these issues are very essential for integrating e-learning instructional delivery to Nigerian secondary schools especially in teaching science related subjects. Science teachers’ gender often has an influence on their classroom instructional delivery especially when using electronic media in teaching science related subjects (Quek, Wong & Fraser, 2002). Tatro (1995) investigated the influence of teachers’ gender on their perception of pupils’ learning behaviours. He reached the conclusion that gender of teachers predicted their readiness and involvement in information technology in assessing and changing pupils’ behaviours. The perception and readiness of e-learning by these teachers therefore might likely be affected by their gender. Also, secondary school ownership like private and public could determine the way science teachers perceive and ready for e-learning instructional delivery in a classroom setting. Disparities in provision of information technology gadgets that aid effective e-learning process among public and private secondary schools might cause differences in science teachers’ readiness and perception of e-learning. The type of science subjects a teacher teaches whether physical or biological based could also be a pointer to the mode of teachers’ use of e-learning to teach students in schools. Therefore, the need to investigate science teachers’ perception and readiness for e-learning instructional delivery focusing on their gender, school ownership (private or public) and their teaching subjects.

Statement of the Problem
Science teaching in most of the Nigerian classrooms still adheres strictly to the methods of chalk and talk with little practical activities as the final external examinations are approaching. Science teachers resort to making students to be slaves to available textbooks and try and error usage of obsolete scientific equipment and materials in our laboratories. Information and Communication Technologies are rapidly influencing education and it is thought that in this millennium virtual classrooms will replace conventional classrooms. The e-learning is now widely used in the delivery of lectures in the tertiary institutions but its usability at secondary school levels is yet to be noticed. E-learning cannot take place without the teachers that will guide and order the instructions. The questions therefore to be asked are these: What are the perception of Nigerian secondary school science teachers of e-learning and are they really ready for its utilisation in their day to day instructional delivery considering their gender, school type and teaching science subjects?
Research Hypotheses

1. There is no significant difference between male and female science teachers’
   (i) perception of e-learning
   (ii) readiness for e-learning instruction

2. There is no significant difference between private and public science teachers’
   (i) perception of e-learning
   (ii) readiness for e-learning instructions

3. There is no significant difference in science teachers’
   (i) perception of e-learning
   (ii) readiness for e-learning instructions based on their science subject affiliations

4. There is no significant relationship between science teachers’ perception of e-
   learning and students’ achievement in science based subjects.

5. There is no significant relationship between science teachers’ perception and
   their readiness for e-learning instructions.

Methodology

Research Design

The study employed a survey research design because none of the variables used in the study was
manipulated but were used as they have existed.

Population

The population used for the study comprised all the science teachers and students in South West
Nigeria.

Sampling Procedure and Sample

Three out of six states were randomly selected in the South West, Nigeria. The states are Ekiti, Lagos
and Oyo. Table 1 below shows the number of randomly selected science teachers and corresponding SSSIII
science students used for the study from the three states.

Table 1
Randomly Selected Science Teachers and Students

<table>
<thead>
<tr>
<th>State</th>
<th>Number of Schools</th>
<th>Number of Teachers</th>
<th>Number of Students</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ekiti</td>
<td>8</td>
<td>80</td>
<td>800</td>
</tr>
<tr>
<td>Lagos</td>
<td>9</td>
<td>90</td>
<td>900</td>
</tr>
<tr>
<td>Oyo</td>
<td>8</td>
<td>80</td>
<td>800</td>
</tr>
<tr>
<td>Total</td>
<td>25</td>
<td>250</td>
<td>2,500</td>
</tr>
</tbody>
</table>
Randomly selected two hundred and fifty science teachers and two thousand five hundred SSSIII science students were used for the study from twenty five randomly selected senior secondary schools from Ekiti, Lagos and Oyo states.

**Instrumentation**

Two instruments were used to collect the data for the study and they were constructed by the researcher. They were e-Learning Science Teachers’ Perception and Readiness Questionnaire (ELESTPRQ) and Science–based Achievement Test (SBAT). ELESTPRQ was divided to three sections. Section A requested for the background information of the science teachers, section B was the perception scale which contained 12-items and section C contained the science teachers’ readiness scale with 13 items. Four-point Likert scale responses of Strongly agree (4), Agree (3), Disagree (2) and Strongly disagree (1) were used. The scores were reversed for negatively worded items. It was given to colleagues for content and construct validity. The internal consistency of the instrument was established using Cronbach Alpha which yielded a reliability index of 0.82. SBAT was 60-item multiple choice test of science students’ achievement in seven related senior secondary schools science subjects. The subjects were Mathematics (10 items), Biology (10 items), Chemistry (8 items), Physics (8 items), Agricultural science (8 items), Technical drawing (8 items) and Foods and Nutrition (8 items). Questions were set from two SSS3 topics for each of the subjects. The instrument was pilot tested and the Kuder-Richardson 20 reliability index was 0.73.

**Data Collection Procedure**

The researcher and other two research assistants collected the data for the study. The sampled schools were visited to administer the research instruments to the targeted science teachers and students after due permission was granted by the school administrators. ELESTPRQ was administered to SSS3 Mathematics, Biology, Agricultural science, Chemistry, Physics, Technical drawing and Foods and nutrition teachers in the sampled schools. SBAT was administered to sample ten science students of the corresponding subject teachers from each of the sampled schools. Completed instruments were collected from the science teachers and students that took part in the study. Data collection took one week.

**Data Analysis**

The data were analysed using descriptive, t-test, ANOVA and Pearson Moment correlation statistics.
Results

Table 2

t-test of Teachers’ Perception and Readiness for e-Learning by Gender

<table>
<thead>
<tr>
<th>Gender</th>
<th>N</th>
<th>Mean</th>
<th>Std. Dev’n</th>
<th>Std. Error</th>
<th>t</th>
<th>Df</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Perception</td>
<td>Male</td>
<td>120</td>
<td>103.52</td>
<td>8.731</td>
<td>.797</td>
<td>2.52</td>
<td>248</td>
</tr>
<tr>
<td></td>
<td>Female</td>
<td>130</td>
<td>100.41</td>
<td>10.582</td>
<td>.928</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Readiness</td>
<td>Male</td>
<td>120</td>
<td>35.36</td>
<td>8.121</td>
<td>.741</td>
<td>2.51</td>
<td>248</td>
</tr>
<tr>
<td></td>
<td>Female</td>
<td>130</td>
<td>32.66</td>
<td>8.808</td>
<td>.772</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* = Significant at P<.05

Table 2 showed the male and female teachers’ e-learning perception and readiness scores. It is revealed from the table that male science teachers’ mean perception score was 103.52 while that of their female counterparts was 100.41. It implies that male science teachers had better perception of e-learning than the female science teachers. Also, there was significant difference \( t(248) = 2.522, \ P<0.05 \) between male and female science teachers’ perception of e-learning. Therefore, hypothesis 1(i) was rejected. It is also deduced from the table that male teachers had higher readiness (35.36) for e-learning than the female teachers (32.66). The difference in their mean score are also significantly different \( t(248)=2.511, \ P<0.05 \). Hypothesis 1 (ii) is also rejected.

Table 3

t-test of Teachers’ Perception and Readiness for e-Learning by School Type

<table>
<thead>
<tr>
<th>Gender</th>
<th>N</th>
<th>Mean</th>
<th>Std. Dev’n</th>
<th>Std. Error</th>
<th>t</th>
<th>Df</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Perception</td>
<td>Private</td>
<td>100</td>
<td>102.11</td>
<td>9.016</td>
<td>.902</td>
<td>.28</td>
<td>248</td>
</tr>
<tr>
<td></td>
<td>Public</td>
<td>150</td>
<td>101.76</td>
<td>10.384</td>
<td>.848</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Readiness</td>
<td>Private</td>
<td>100</td>
<td>34.98</td>
<td>8.251</td>
<td>.825</td>
<td>1.55</td>
<td>248</td>
</tr>
<tr>
<td></td>
<td>Public</td>
<td>150</td>
<td>33.27</td>
<td>8.745</td>
<td>.714</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

ns = Not significant at P<.05

Table 3 revealed that private school science teachers slightly had better perception of e-learning (102.11) than their public counterparts (101.76) but the difference was not significant \( t(248)=.275, \ P>0.05 \) therefore hypothesis 2(i) was not rejected. Also, it is deduced that though private school science teachers had slight higher readiness score (34.98) than that of public school science
teachers (33.27), yet the difference in their readiness for e-learning was not significant \[t(248)=1.546, \ P<0.05\]. Therefore, hypothesis 2(ii) was not rejected.

**Table 4**
Mean Perception Scores, ANOVA and Scheffe Post Hoc Analyses on Teachers’ Perception of e-learning by Subject Affiliations

<table>
<thead>
<tr>
<th>Subject Affiliations</th>
<th>N</th>
<th>Mean</th>
<th>Sum of squares</th>
<th>df</th>
<th>Mean square</th>
<th>F</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Physical Sciences</td>
<td>60</td>
<td>104.08</td>
<td>1791.283</td>
<td>3</td>
<td>597.094</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Biological Sciences</td>
<td>80</td>
<td>98.03</td>
<td>22329.217</td>
<td>246</td>
<td>90.769</td>
<td>6.578</td>
<td>.000*</td>
</tr>
<tr>
<td>Vocation/Technology</td>
<td>50</td>
<td>103.90</td>
<td>24120.500</td>
<td>249</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mathematics</td>
<td>60</td>
<td>103.22</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Sheffe Post Hoc**

<table>
<thead>
<tr>
<th>Mean Difference</th>
<th>Std. Error</th>
</tr>
</thead>
<tbody>
<tr>
<td>Biological Sciences</td>
<td>Physical Sciences</td>
</tr>
<tr>
<td></td>
<td>Mathematics</td>
</tr>
<tr>
<td></td>
<td>Vocational/Technology</td>
</tr>
</tbody>
</table>

* = Significant at P<.05

Table 4 elicits the mean perception scores and ANOVA analysis of teachers’ perception according to their science subject affiliations. Physical science teachers had the mean highest perception score (104.08) of e-learning, followed by vocation/technology teachers score (103.90) and mathematics teacher score (103.22) in that order. The biological science teachers mean score (98.03) was the least. When the perception mean scores were subjected to ANOVA analysis, it is shown in Table 4 that there is a significant difference in science teachers’ perception of e-learning by their subject affiliations [F(3,246) = 6.578, P<0.05]. Scheffe Post hoc result showed that the perception of biological science teachers of e-learning was significantly different from that of physical science, mathematics and vocational/technology subject teachers.
Table 5
Mean Readiness Scores and ANOVA Analysis on Teachers’ Readiness for e-learning by Subject Affiliations

<table>
<thead>
<tr>
<th>Subject Affiliations</th>
<th>N</th>
<th>Mean</th>
<th>Sum of squares</th>
<th>Df</th>
<th>Mean square</th>
<th>F</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Physical Sciences</td>
<td>60</td>
<td>33.20</td>
<td>173.296</td>
<td>3</td>
<td>57.765</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Biological Sciences</td>
<td>80</td>
<td>33.07</td>
<td>18135.200</td>
<td>246</td>
<td>73.720</td>
<td>.784</td>
<td>.504ns</td>
</tr>
<tr>
<td>Vocation/Technology</td>
<td>50</td>
<td>33.54</td>
<td>18308.516</td>
<td>249</td>
<td>73.720</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mathematics</td>
<td>60</td>
<td>35.40</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 5 shows mean readiness scores and ANOVA analysis of Science teachers’ readiness for e-learning instructional delivery in secondary schools. The table reveals that mathematics teachers had highest readiness mean score of 35.40, followed by vocation/technology, physical science and biological science teachers with mean scores of 33.54, 33.20 and 33.07 respectively. It is also shown from the table that there is no significant difference [$F(3,246)=.784, P>0.05$] in science teachers readiness based on their subject affiliations. Therefore the hypothesis 3(ii) is not rejected.

Table 6
Test of Relationship between Teachers’ Perception of E-learning and Science Students’ Achievement

<table>
<thead>
<tr>
<th>Variables</th>
<th>N</th>
<th>Mean</th>
<th>Std. Devn.</th>
<th>Df</th>
<th>r</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Perception of e-learning</td>
<td>250</td>
<td>101.90</td>
<td>9.842</td>
<td>248</td>
<td>.504</td>
<td>.000*</td>
</tr>
<tr>
<td>Students’ Achievement</td>
<td>36.70</td>
<td>14.151</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*= Not significant at P<.05

Table 6 shows a correlation index (r) of .540 which is positive and significant at 0.05 level. This implies that teachers’ perception of e-learning and science students’ achievement are related as teachers with high perception of e-learning also have high students’ achievement.
Table 7
Test of Relationship between Teachers’ Perception and their Readiness for E-learning

<table>
<thead>
<tr>
<th>Variables</th>
<th>N</th>
<th>Mean</th>
<th>Std. Devn.</th>
<th>Df</th>
<th>r</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Perception of e-learning</td>
<td>250</td>
<td>101.90</td>
<td>9.842</td>
<td>248</td>
<td>.181</td>
<td>.004*</td>
</tr>
<tr>
<td>Readiness for e-learning</td>
<td></td>
<td>33.96</td>
<td>8.575</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* = Significant at P<.05

From Table 7, the there is positive low correlation between teachers’ perception of e-learning and their readiness for e-learning usage in the classroom and the relationship is significant \([r(248)=.181, \ P<0.05]\). This means that science teachers that have high perception of e-learning also have greater readiness for e-learning instructional delivery.

Discussion of findings
The study has revealed a significant difference between male and female science teachers’ perception of e-learning. This finding is at variance with the report of Ajelabi and Agbatogun (2010) that there is no significant gender difference of teachers’ perception on the introduction of e-learning for instruction. Also, male science teachers have higher e-learning perception than the male science teachers. This may due to greater interest that the male science teachers develop in information technology and the ever domestic commitment that occupy most of time of the female science teachers. Difference between male and female science teacher readiness for e-learning instructional delivery could be warranted because male science teachers are more inquisitive for new innovations in developing themselves more in the use internet. There is no significant difference observed between private and public schools science teachers perception of e-learning is due to the fact that most private or public schools lack ICT/Internet facilities on which platform e-learning instruction could take place. This result corroborates Ajelabi and Agbatogun (2010) finding that there is no significant difference in the perception of teachers in private and public schools on the introduction of e-learning instruction. Also, there is no significant difference between private and public school science teachers’ readiness for e-learning instruction delivery. Lack of readiness is as a result of the insufficient knowledge of internet facilities, lack of personal laptops and science teachers’ inability to program their subjects’ instruction into the internet.
It was also deduced from the study that there is a significant difference in science teachers’ perception of e-learning based on the subject affiliations. The significant difference was noticed between biological science teachers and other science subject affiliations such as physical sciences, mathematics and vocational/technology. Physics, chemistry, mathematics, technical drawing teachers are more technically inclined with greater interests in developing new skills than biological teachers. No significant difference was found in science teachers’ readiness for e-learning among the biological, physical, mathematics and vocational/technology science teachers even though the biological teachers seemed to be more ready than other categories of teachers. The finding of the study also revealed that the relationship between science teachers’ perception of e-learning and their students’ science achievement is positive and significant. Perception of science teachers of e-learning will enable them to encourage their students to browse on internet to do assignments, undertake scientific projects and seek information to solve tutorial questions on the net which will definitely affect their performance positively. This also support the assertion of Ogunleye (2006) that computer-based instruction facilitates individual learning, thinking, provides opportunity to go beyond the confines of one learning package and provide immediate feedback that make to understand in order to improve their achievement. The low positive but significant relationship between science teachers’ perception of e-learning and their readiness for e-learning instructional delivery is brought about because a well informed teacher and who know the advantage of e-learning in facilitating teaching and learning will also be ready to utilize such facilities to enhance his/her teaching process.

**Conclusion and Recommendations**

E-learning provides a promising alternative to on site education since it reduces costs of buildings, travelling and accommodation. Teachers can be located in one place while students can stay in their home environment and attend to lessons from their teachers. Science teachers’ perception and readiness to employ e-learning and facilitating learning among their students are major issues to be considered before this teaching innovation can be effectively applied in Nigerian secondary schools. If teachers consider e-learning as replacing them, they would not be ready for its application to support their classroom teaching. E-learning and digital learning materials are therefore supposed to complement irregular and low quality and a lack of up-to-date school books for the
students and thus make secondary school science teaching nationally more equal and of higher quality. Appropriate perception and readiness of science teachers for e-learning will help them to use it to support weak students to find new motivation and to be able to learn in their own pace.

In view of the findings of this study the following recommendations are enumerated for educational stakeholders to consider for effective utilization of e-learning in secondary schools:

- Government should sponsor secondary science teachers to develop science subject content materials and lesson notes for delivery through the internet, making and delivering CD-ROMs to the schools.

- Female science teachers should be encouraged to develop themselves not only in the use of ICT facilities but also be internet browsing literate to make ready for the use e-learning.

- Educational policy makers should provide internet facilities in the schools for the use of teachers and also of students in order to undertake their e-learning activities.

- Private and public secondary schools science teachers should be mandated for Internet ICT training and all facilities are to be made available for them.

- Biology teachers need to realign their teaching professionalism with the new challenges of e-learning by creating interest and developing themselves for better perception of e-learning.

- Science teachers should be sent for in-service training, seminars and workshops on how to incorporate e-learning mode of instruction to their teaching-learning processes.

References


