Learning Science at a Distance: National Open University of Nigeria Students’ Perception of Practical Work in Learning Sciences

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The influence of practical work in the understanding of scientific concepts has been receiving attention of many scholars all over the world. In particular, the need to address the little or no consideration of practical work in science teaching/learning process in distance education seems to have received greater attention presently. This paper focuses on students’ perception of practical work in learning science through distance education. Data were collected from 450 science students of National Open University of Nigeria using questionnaire as research instrument and descriptive survey design. The research questions raised were answered using frequency counts and percentages. The results indicate that students placed a high value on practical work in the learning of sciences in distance education. Students were also of the opinion that it is essential for science course to include practical work even though the course materials are delivered in a distance mode of education. Further, investigation on this issue may help instructional designers and science curriculum developers to design and incorporate practical activities into science courses in distance education, as it has been done in some developed countries.

Introduction

Providing quality education to millions has been one of the struggles facing developing countries such as Nigeria. However, inadequate access to education may result in many people not participating meaningfully in national development. Hence the need arises for open and distance learning to act as succour for the affected Nigerians, irrespective of tribe or ethnic background.

According to UNESCO (2002), open and distance learning represents approaches that focus on opening access to education and training provision, freeing learners from the constraints of time and place and offering flexible learning opportunities to individuals and groups of learners. The practice of ODL in Nigeria takes various forms, which include correspondence study education, distance learning (Sandwich programmes), Part-Time Teacher Training Programme (PTTP), adult literacy education programmes and Open University.

The National Open University of Nigeria (NOUN) was originally founded on 22nd July in the year 1983 as the launch pad for open and distance education in Nigeria. The government debarred the university on the 25th of April 1984. The university was launched again on 12th April 2001, due to its significant role in the education system of Nigeria (Creed, 2001). The National Open University of Nigeria is also the biggest tertiary institution of the country in terms of the number of students with about 60,000 students as at 2002 (Daniel, 2005). NOUN is the first fully fledged university that operates in an exclusively open and distance learning (ODL) mode of education. Currently, it has twenty-three study centers, which are stratified into the six geopolitical Zones of the nation.

The National Open University of Nigeria is devoted towards training professionals in a range of areas through the method of distance learning. The choices of qualifications provided by the university are Certificates, Diplomas, Post Graduate Diplomas and Degrees and the university currently offers 50 programs and 750 courses including sciences.

Considering the nature of science, students studying science courses are expected to engage in first-hand experiences such as observation, measurement, testing hypothesis, or experiment, particularly in higher education (Kirschner, 1991). This can be a serious challenge, for distance education institutions when offering science courses because of the fewer occasions for students to be on campus where laboratory facilities, relevant equipment, and teaching staff are provided (Kennepohl & Last, 2000; Jason &Namin, 2006).

Much debate has been going on, however, as to the role, value or effectiveness of practical work not only in distance teaching settings but also in education in general (Watson, 2002). According to Jason &Namin (2006), the advantages of providing distance students with practical work include; reinforcing student’s motivation
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Practical work means any teaching and learning activity which involves at some point the students in observing or manipulating real objects and materials. The term “practical work” is used in preference to ‘laboratory work’ because observation or manipulation of objects could take place in a school laboratory or in and out of school setting, such as the student’s home or in the field e.g. when studying aspects of Biology or Earth science (Irwin, 1995).

Moreover, because of the nature of the discipline, science often involves students in first-hand experiences such as observation, measurement or experiment, particularly in tertiary level education. It can present a challenge, however, for distance education institutions when offering science courses because of the fewer occasions for students to be on campus where laboratory facilities, relevant equipment and teaching staff are provided. Apart from basic academic reasons, ensuring that student engage in practical work becomes critical when it comes to the issue of credit transfer between educational institutions as it can fairly represent the credibility to science courses (Osborne, 1993). For example, while you can study a history lesson completely online, you cannot perform nursing clinical online. Thus, physical classroom attendance is mandatory for the completion of some degree programs and this is why practical exercise is necessary due to what they contribute to the learning process.

However, not much research studies have been carried out to investigate the kind of effect brought about by a specific method of practical work on distance student learning. Instead, relevant literature on science courses involving distance education method is rather illustrative. For example, Kennewohl et.al. (2000) review chemistry courses offered at Athabasca University (AU). The study aimed at providing students with integral, accessible, and transferable chemistry courses, the AU chemistry course puts a strong emphasis on laboratory work, using mixed approaches through campus-based laboratories, regional laboratories, and home-study laboratories. Applications of technologies such as video, CD-ROM, internet, and computer-mediated instruction have been also considered in the institution, but the authors make it clear that simulated experiments would not replace hands-on laboratory work. Rather, they believe that technical aids can be better in preparing students for real experience with laboratory work (p.194). Hence, the present study investigates National Open University science students’ perception of practical work in learning science.

Statement of the Problem

The important of practical work in learning sciences cannot be over emphasized; it involves development of knowledge skills attitudes for the benefits and growth of individuals and the society at large. The present study sought to investigate National Open University science students’ perception of practical work in learning science.

Research Questions

In order to be able to effectively investigate the main problem as stated above, the following research questions are drawn for investigation.

- What are the perceptions of National Open University of Nigeria Students of practical work in learning sciences?
- Does learning science via distance learning more difficult than the case of face-to-face class?
- Is it more challenging to learn science via distance education than the case of other subjects related to social sciences or humanities?
- Is it essential for a science course to include practical work even though the course materials are delivered in a distance mode of education?
- Can practical work be replaced by computer simulations or other virtual components that do not require a face-to-face class?

Method

Research Design

The research work is a descriptive study on the Students’ Perception of Practical work of learning science in Open University of Nigeria. The researcher adopted the survey design because the independent variables are not manipulated.
Sample and Sampling Techniques

The target populations consist of all science students in National Open University of Nigeria. 450 science students were randomly selected from study centers in the south-western geopolitical zone of the country to form the sample for the study.

Research Instrument

The instrument used in the study was a Likert type questionnaire adapted from Josan & Namin (2006). The questionnaire was divided into two sections: section A sought for personal information of the respondents (study center, sex and course of study). Section B was made up of 20 statements on the importance of practical work in learning science. The students were to indicate the extent of their agreement or disagreement with each statement on a 4-point Likert Scale. The instrument was validated by three experts in science education and final draft was prepared with reliability coefficient of 0.67 using Cronbach alpha.

Data Collection and Analysis

The data were collected through the administration of the questionnaire to the targeted students by the researcher and collected back immediately.

Data Analysis

Data collected were analysed using frequency counts and percentages.

Results

Research Question One: What are the perceptions of National Open University of Nigeria students of practical work in learning sciences?

<table>
<thead>
<tr>
<th>S/N</th>
<th>Items</th>
<th>YES</th>
<th>%</th>
<th>NO</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Looking at the nature of science, I think it will be more challenging to learn science without any practical work.</td>
<td>354</td>
<td>78.7</td>
<td>96</td>
<td>21.3</td>
</tr>
<tr>
<td>2</td>
<td>I think practical work will help me learn how to use experimental tools.</td>
<td>414</td>
<td>92.0</td>
<td>36</td>
<td>8.0</td>
</tr>
<tr>
<td>3</td>
<td>I think practical work will allows me to have a sort of interaction with teacher or tutor to clarify some concepts out well understood.</td>
<td>439</td>
<td>97.6</td>
<td>11</td>
<td>2.4</td>
</tr>
<tr>
<td>4</td>
<td>Practical work helps students to develop the understanding of science.</td>
<td>387</td>
<td>86.0</td>
<td>63</td>
<td>14.0</td>
</tr>
<tr>
<td>5</td>
<td>Will student gain better understanding of science topic by doing practical work.</td>
<td>369</td>
<td>82.0</td>
<td>31</td>
<td>18.0</td>
</tr>
<tr>
<td>6</td>
<td>Practical work should be given an important role in encouraging students to study (science) at higher levels.</td>
<td>385</td>
<td>85.6</td>
<td>65</td>
<td>14.0</td>
</tr>
<tr>
<td>7</td>
<td>Science is a practical subjects</td>
<td>439</td>
<td>97.6</td>
<td>11</td>
<td>2.4</td>
</tr>
<tr>
<td>8</td>
<td>School science laboratory are a vital part of students’ learning experience in science.</td>
<td>360</td>
<td>80.0</td>
<td>90</td>
<td>20.0</td>
</tr>
<tr>
<td>9</td>
<td>Laboratory work provides little of real educational values.</td>
<td>144</td>
<td>32.0</td>
<td>306</td>
<td>68.0</td>
</tr>
<tr>
<td>10</td>
<td>Practical work promotes the engagement and interest of students’.</td>
<td>342</td>
<td>76.0</td>
<td>106</td>
<td>24.0</td>
</tr>
<tr>
<td>11</td>
<td>Practical work develops an ability to co-operate among learners.</td>
<td>370</td>
<td>82.2</td>
<td>80</td>
<td>17.8</td>
</tr>
<tr>
<td>12</td>
<td>Practical work develops a critical thinking in learner.</td>
<td>337</td>
<td>74.9</td>
<td>113</td>
<td>25.1</td>
</tr>
<tr>
<td>13</td>
<td>Students’ find practical work relatively useful and enjoyable as compared with other science teaching and learning activities.</td>
<td>369</td>
<td>82.0</td>
<td>81</td>
<td>18.0</td>
</tr>
</tbody>
</table>

Table 1. The perception of NOUN students of practical work in learning sciences.
Table 1 above shows the responses on students’ perception of practical work in learning sciences in National Open University of Nigeria. The population of students who have positive of perceptions of practical work in learning science is higher than the students who thought of the negative opinion to practical work in an Open University.

Reference was made to Table 2 in answering research questions 2, 3, 4, and 5.

<table>
<thead>
<tr>
<th>Research Question</th>
<th>R</th>
<th>F</th>
<th>%</th>
<th>Cum. %</th>
</tr>
</thead>
<tbody>
<tr>
<td>2. Does learning science via distance learning is more difficult than the case of face-to-face?</td>
<td>Yes</td>
<td>354</td>
<td>78.7</td>
<td>78.7</td>
</tr>
<tr>
<td></td>
<td>No</td>
<td>96</td>
<td>21.3</td>
<td>100</td>
</tr>
<tr>
<td>3. Is it more challenging to learn science via distance education than the case of other subjects related to social sciences or humanities?</td>
<td>Yes</td>
<td>360</td>
<td>80</td>
<td>80</td>
</tr>
<tr>
<td></td>
<td>No</td>
<td>90</td>
<td>20</td>
<td>100</td>
</tr>
<tr>
<td>4. Is it essential for a science course to include practical work even though the course materials are delivered in a distance mode of education?</td>
<td>Yes</td>
<td>421</td>
<td>93.6</td>
<td>93.6</td>
</tr>
<tr>
<td></td>
<td>No</td>
<td>29</td>
<td>6.4</td>
<td>100</td>
</tr>
<tr>
<td>5. Can practical work be replaced by computer simulations or other virtual components could replace practical work?</td>
<td>Yes</td>
<td>155</td>
<td>34.4</td>
<td>34.4</td>
</tr>
<tr>
<td></td>
<td>No</td>
<td>295</td>
<td>65.6</td>
<td>100</td>
</tr>
</tbody>
</table>

R: Response and F: Frequency

Table 2. Responses on Students’ view on learning science in NOUN

Discussion of findings

Examining the students’ perception, their responses on the nature of science and roles of practical work in science learning, the study shows that 78.7% (see table 1) of the respondents were of the opinion that it will be more challenging to learn science without any practical work. In support of this finding Millar (2004, 2010), sees practical work as an essential component of science teaching and learning, both for the aim of developing student’s scientific knowledge and that of developing students’ knowledge about science. The study also reveals that 92% of the students believed that practical work will help them learn how to use experimental tools. This is corroborated by Millar (2010) who opine that learning is not discovery or construction of something new and unknown; rather it is making what others already know your own. The results presented on all other statement on this issue in table 1 indicate that students agreed to all the roles of practical work in learning science.

Furthermore, in table 2, it was revealed that 78.7% of the students thought that learning science via distance learning more difficult than the case of face-to-face class. 70.7% also agreed that it is more challenging to learn science via distance education than the case of other subjects. Almost all the students (93.6%) were of the view that it is essential for a science course to include practical work even though the course materials are delivered in a distance mode of education. However, 65.6% thought that practical work could not be replaced by computer simulations or other virtual components that did not require a face-to-face class. These findings conform to that of Jason Chan and Namin (2006) in a similar study carried out in the Open University of Hong Kong.

Conclusion

It can be concluded that the importance of practical work in science is widely accepted by students even in distance education and it is acknowledged that practical work can promotes the engagement and interest of students as well as developing a range of skills, science knowledge and conceptual understanding. Despite the fact that their learning take at distance the students still believed that it will be more challenging learning science in distance mode without making provision to engage in hands-on and minds-on activities. Research also suggests that students design better investigations when they actually carry them out than when only asked to write a plan (Apu, 1988). Based on the findings of this study, it is therefore recommended that Government
should make provision for practical work in science courses offer in distance education in Nigeria to allow
students to be exposed to practical work involve in science learning. The curriculum developers should also
incorporate laboratory activities and practical work in to the curriculum of Open and Distance Learning in
Nigeria to enable students to gain necessary experience and skills that will make them compete adequately with
their counterparts from convectional universities in the world of work.

References
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