Suggestions to Increase the Prospects of Science Education through ODL in Bangladesh Open University: Learners' Perspective

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Abstract

Technologically developed countries reach peaks due to the enormous development in the science education all over the world. Without the help of science education sustainable national growth is not possible while this education makes huge opportunities in various sectors. As a developing country, Bangladesh has to pay more attention in science education to create more technical hands for future sustainable development. Therefore, this study aims to identify the way to increase the prospects of science education through open and distance learning (ODL) mode in Bangladesh by focusing the suggestions from learners of Bangladesh Open University. To conduct this study both qualitative and quantitative methods have been used while 240 surveys have been conducted for quantitative data as well as 12 FGDs and 12 KIIs have been conducted for qualitative data. The results of the study shows that the learners have mentioned science education is needed for career development, developing human resources, enhancing technical knowledge and reducing unemployment as the forward issues of science education through ODL. They have also added that the current prospects of science education through ODL may increase by paying attention to provide sufficient lab and instrumental facility, make easier the harder subject matter and language of the study materials, reduce the volume of the Self Learning Material (SLM) and add more practical exercise in the SLMs, monitoring the tutorial classes regularly etc. Thus, this study recommends mobile phone based ODL education for science learners of Bangladesh Open University by giving special attention to policy.

Keywords: Science education, ODL, Prospect, Suggestion, Bangladesh Open University.

Introduction

Science education is the pre-condition of technological development. Although there have various opportunities in achieving knowledge on science education but there has a serious lack of skilled human resources in Bangladesh. Science education has changed the everyday life by creating new knowledge. As a result, science education has been recognized itself as the important component for national development. So, many students enrolled in science group in secondary, higher secondary and other levels of conventional face-to-face education system. The science education is based on practical experiment, course work and other practical and theoretical works although distance education may widen the opportunity for the distant learners. Here, Bangladesh Open University (BOU) is solely delivering the education by using open and distance learning (ODL) mode in Bangladesh. This unique institute in Bangladesh mainly aims to expand the education for all level of learners irrespective of age, time and space and also provides the education in different dimensions of

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science, humanities, arts and business. BOU operates many formal and non-formal educational programs through country wide educational network with its regional centers, sub-regional centers and study centers. In this case, the university has the opportunity to provide science education for different level of learners which may produce skilled manpower. As the practical works in science education through ODL is tough than the practical works in conventional system, so the science education in ODL may faces the challenges of lack of qualified tutors, laboratory facility in the study centers and other practical related facilities in the particular institutes. But the prospect of science education through ODL depends on the development of career, skilling the human resources, enhancing technical knowledge and alleviation of unemployment. Therefore, the prospect of science education may sustain by encouraging the learners, raising awareness among the learners about science education through ODL, changing the views of the learners about the toughness of science subjects and counseling of the learners. Moreover, it is important to pay attention in some initiatives to increase the prospect of science education in ODL. These are to: make easier the harder subject matter, minimize the volume of study materials, make easier the language of the study materials, conduct sufficient practical classes, increase lab facilities, provide practical exercise in the handbook and provide videos on practical classes. Although the distance education mode becoming more popular all over world but science education in distance mode in Bangladesh is not successful as much as the country's need. The massive advancement in distance education system in Bangladesh will encourage the students of science group to engage with this particular learning system.

Objectives

The broader objective of this study was to identify the prospects of science education through ODL and to the know suggestions of learners for science education through ODL in Bangladesh Open University.

This study had some specific objectives. These were:

- to know the socio-economic background of the study population;
- to explore the prospects of science education in ODL; and
- to explain the suggestions from the learners to increase the prospects of science education through ODL.

Review of Literature

A study conducted by Khan et al. (2014) on their thinking about reforming education system in Bangladesh and discuss about the quality, effectiveness and delivering quality of contemporary education system in Bangladesh and the prospect of that education in establishing knowledge based society for the country. But they do not focus on the modus operandi of the education system of that time. On the other

hand, Knebel (2001) discusses the emerging growing of distance education and it usage in medical health care training. The success of the medical professional after getting degree through distance education has been explained in this paper. Moreover, Ebabhi & Olubiyo (2016) say that most of the biology course learners (85%) do not have the knowledge on e-learning and their facilitators do not have the knowledge to conduct practical based biology course. The authors mention that there is need for the system to encourage effective interaction and improve on the feedback mechanisms between the learners and their facilitators which may help them to encourage in their study. Furthermore, Safavi, et al. (2013) conduct the study titled "Study on the Efficiency of Mathematics Distance Education" where the authors have focused on the assessment of the success of the students in distance education system in mathematics course.

The above literature pay attention in different perspective of distance education irrespective of course, methodology, place of the study, time of the study and other perspective while it is not directly related to the present study.

Methods

The methodology indicates the way to conduct a study. This study has been conducted through using both the qualitative and quantitative method. For quantitative data, 240 survey interviews have been conducted with learners of science group of SSC and HSC programs of Bangladesh Open University through survey interview questionnaire. The learners who were the study unit have been selected purposively from 12 regional centers of this university. Furthermore, 12 FGDs (Focus Group Discussions) and 12 KIIs (Key Informant Interviews) have been conducted with tutors, teachers and other academics and administrative personnel to strengthen the quantitative data through a checklist. For collecting secondary data, related documents have been reviewed rigorously. The data has been collected from July 2018 to January 2019. The collected survey data have been analyzed in Likert scale responses from (strongly agree to strongly disagree) and the responses has been shown, like, $\underset{\text{Strongly agree}}{1}$ ... ... $\underset{\text{Agree}}{2}$ ... ... $\underset{\text{Neutral}}{3}$ ... ... $\underset{\text{Disgree}}{4}$ ... ... $\underset{\text{Strongly disagree}}{5}$ and presented in tables. The mean value and standard deviation value has been calculated to justify the findings and to make conclusion.

Results

Socio-economic and demographic information

Among the respondents 54.6% were male and 45.4% were female while their age range was 16-32 years and among them 78.3% were Muslim, 17.9% were Hindu, 2.1% were Buddhist and 1.7% were Christian. The ratio of respondents according to SSC and HSC program was 50:50. The highest 55.4% of the respondents were unmarried, 35% were married, 6.3 % were divorced and 3.3 % were widowed. As they were the learners of distance education but they had different occupation such

as, housewife (25%), non-government job holder (20%), government job holder (10%) and small businessman (5%) and 40% were fresh students.

Learners' Perception on Prospects of Science Education in ODL

The $\bar{x}$=2.0500 and **σ**=1.20564 indicates that most of the learners of the science group of SSC and HSC programs of Bangladesh Open University who enrolled in the particular program perceived that science education create more career opportunities and push better position in the career (Table 1).

The science education also develop human resources which absolutely applicable in the most popular ODL system. For example, the majority of the learners of the science group of SSC and HSC programs of Bangladesh Open University ($\bar{x}$=1.7000 & **σ**=1.14694) believed that science education helps in developing human resources (Table 1).

Technical knowledge enhanced by science education that was mentioned by the learners of the science group of SSC and HSC programs of Bangladesh Open University. The majority of the learners who enrolled in the science group in SSC and HSC programs because they believed that the role of science education in enhancing technical knowledge ($\bar{x}$=1.8792 & **σ**=1.27002, Table 1).

Moreover, $\bar{x}$=2.3625 and **σ** =1.34672 indicates that most of the learners of the science group of SSC and HSC programs of Bangladesh Open University who enrolled in the particular program because they believed that the role of science education in reducing unemployment (Table 1).

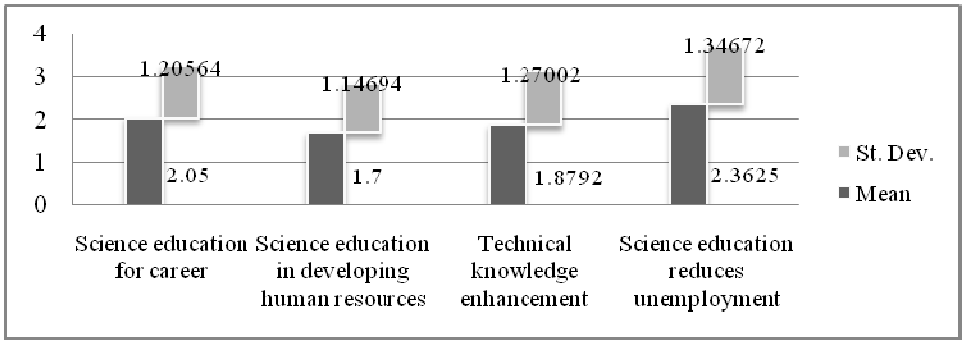
Table 1: Learners' Perceptions on the Prospects of Science Education through ODL (Figure 1)

Statement	Strongly Agree		Agree		Neutral		Disagree		Strongly Disagree		$\bar{x}$	**σ**
	f	%	f	%	f	%	f	%	f	%		
Science education for career	108	45	60	25	36	15	24	10	12	5	2.0500	1.20564
Science education in developing human resources	156	65	36	15	24	10	12	5	12	5	1.7000	1.14694
Technical knowledge enhancement	150	62.5	16	6.7	39	16.3	23	9.6	12	5	1.8792	1.27002
Science education reduces unemployment	88	36.7	55	22.9	42	17.5	32	13.3	23	9.6	2.3625	1.34672

Note: $\bar{x}$ =mean value and **σ**=Standard deviation value.

Source: Field study, 2018 & 2019

Figure 1: Mean and SD. Dev. Value of Learners' Perceptions on Prospects of Science Education through ODL



Suggestions from learners

The learning method is different in ODL from other conventional face-to-face methods. In face-to-face method learning depends on teacher's direct observation on the students where practical work is essential. The learners suggested to encourage the learners in science education through ODL ($\bar{x}$=1.9708 & **σ**=1.33319) and to raise awareness among the learners about ODL method for science education ($\bar{x}$=2.1083& **σ**=1.34628) for increasing the prospects of science education through ODL.

The existing study materials for science students should easy to increase the prospects of science education which was suggested by the learners ($\bar{x}$=2.2000 & **σ**=1.38492). Many learners mentioned that the science subjects were hard than other subjects and they were afraid of that. Therefore, the learners suggested to change the views of the learners about the hardiness of the science subject to increase the prospects of science education through ODL ($\bar{x}$=2.1042 & **σ**=1.34195). Moreover, the learners thought that the change of views can be solved through proper counseling ($\bar{x}$=2.1292 & **σ**=1.30816).

On the other hand, the $\bar{x}$=1.8375 and **σ**=1.28503 evident that to make easy the harder subject matter to increase prospects of science education through ODL. It was also important to arrange training for the ODL tutors ($\bar{x}$=2.1833 & **σ**=1.35055) and minimize the volume of the existing study materials on science subjects ($\bar{x}$=1.7917 & **σ**=1.23000) which were suggested by the learners.

To monitor the tutoring class regularly ($\bar{x}$=1.6833 & **σ**=1.17849), to conduct sufficient practical classes ($\bar{x}$=1.6833 & **σ**=1.17137), to provide sufficient lab facility in the study center ($\bar{x}$=1.7542 & **σ**=1.21789), to make practical classes easy to learners ($\bar{x}$=2.1125 & **σ**=1.30970) and to make interest of tutors in practical class ($\bar{x}$=1.8500 & **σ**=1.28167) which were suggested by the learners to increase the prospects of science education through ODL.

The success of science education depends on the practical works while the learners suggested to make sufficient video on practical work ($\bar{x}$=1.7292 & **σ**=1.23308). To make easy the language of study materials ($\bar{x}$=1.8375 & **σ**=1.28177) which was suggested by learners as a way to increase the prospects of science education through ODL.

The practical classes conduct depends on the handbook of particular subjects. The learners suggested to provide sufficient practical exercise in the study materials ($\bar{x}$=1.8042 & σ=1.27052) along with handbook for practical classes ($\bar{x}$=2.1292 & σ=1.38582) and instrumental facilities to the learners ($\bar{x}$=1.7875 & St σ=1.26782) for increasing the prospect of science education through ODL.

Table 2: Suggestions from the Learners to Increase the Prospects of Science Education through ODL

Suggestions	Strongly Agree		Agree		Neutral		Disagree		Strongly Disagree		$\bar{x}$	Σ
	f	%	f	%	f	%	f	%	f	%		
To encourage the learners in science education through ODL	139	57.9	28	11.7	32	13.3	23	9.6	18	7.5	1.9708	1.33319
To raise awareness about science education through ODL	121	50.4	37	15.4	36	15	27	11.3	19	7.9	2.1083	1.34628
To make easy study materials	118	49.2	27	11.3	45	18.8	29	12.1	21	8.8	2.2000	1.38492
To change the views of learner about the hardiness of science subjects	123	51.2	32	13.3	40	16.7	27	11.3	18	7.5	2.1042	1.34195
To arrange proper counseling	111	46.3	49	20.4	36	15	26	10.8	18	7.5	2.1292	1.30816
To make easy the harder subject	153	63.7	24	10	28	11.7	19	7.9	16	6.7	1.8375	1.28503
To arrange training for the tutors on ODL	113	47.1	39	16.3	37	15.4	33	13.8	18	7.5	2.1833	1.35055
To minimize the volume of study materials	155	64.6	24	10	29	12.1	20	8.3	12	5	1.7917	1.23000
To monitor tutorial classes	165	68.8	26	10.8	20	8.3	18	7.5	11	4.6	1.6833	1.17849
To conduct sufficient practical classes	164	68.3	26	10.8	24	10	14	5.8	12	5	1.6833	1.17137
To make easy the language of study materials	152	63.3	26	10.8	27	11.3	19	7.9	16	6.7	1.8375	1.28177
To provide sufficient lab facility in the study center	158	65.8	26	10.8	26	10.8	17	7.1	13	5.4	1.7542	1.21789
To make practical classes easy to learners	117	48.8	38	15.8	43	17.9	25	10.4	17	7.1	2.1125	1.30970
To make interest of tutors in practical class	151	62.9	25	10.4	28	11.7	21	8.8	15	6.3	1.8500	1.28167
To make sufficient video on practical work	164	68.3	22	9.2	23	9.6	17	7.1	14	5.8	1.7292	1.23308
To provide handbook for practical classes	127	52.9	26	10.8	34	14.2	35	14.6	18	7.5	2.1292	1.38582
To provide sufficient practical exercise in the study materials	157	65.4	22	9.2	27	11.3	19	7.9	15	6.3	1.8042	1.27052
To provide instrumental facilities to the learners	158	65.8	25	10.4	22	9.2	20	8.3	15	6.3	1.7875	1.26782

Note: $\bar{x}$ =mean value and σ=Standard deviation value.

Source: Field study, 2018 & 2019

Discussion

Science education through ODL

Definitely science education makes most opportunities in career. Various sectors hire the science students as they have more technical knowledge than the other students. The era of technology makes this opportunity as a vast option which the science students can prove their capability and the science education has been determined itself as the pre-requisition for technological development. As a result, the science education makes the life satisfactory with knowledge of science and has introduced a lot of chances for present and future world (Orukotan, 2007) and promotes the national development (Harsha, 2017). In this study, 70% of the learners of SSC and HSC programs of Bangladesh Open University ($\bar{x}$=2.0500 and σ=1.20564) enrolled in the science group to get job or to develop their career.

The science education develops the human resources, as it has the better opportunities to work with different sectors. Most of the learners (80%) of SSC and HSC programs enrolled in the science group because they believed that science education develops human resources ($\bar{x}$=1.7000 and σ=1.14694) as it contributes to cultural development (Mathews, 1994) and meets scientific ideas, principles (Gomes, 2007) for the learners for rational thinking through developing their attitudes where the National Curriculum and Textbook Board of Bangladesh in 2012 is followed to teach science (Babu, 2016). The science education also expands society's knowledge (Yoldere & Adamu, 2015) for developing the human resources to understand the world's working process. The technology oriented work process of the world wants different human resources which also made by science education.

The technical knowledge depends on the principles of science. Science subjects expand various types of knowledge among the learners. Therefore, the learners (78.5%) of SSC and HSC programs of Bangladesh Open University thought that science education enhances technical knowledge ($\bar{x}$=1.8792 and σ=1.27002). Science education may produces more members of the society (Fensham, 1985) that help to create a technical knowledge which based on "acquisition of knowledge", "development of learning skills" and "development of learning ideas and values" (Aikenhead, 1994).

'Creating various employment' is one of the opportunities that created by science education all over the world. Thus, the learners (59.6%) of the SSC and HSC programs of Bangladesh Open University perceived that science education reduces unemployment from the society ($\bar{x}$=2.3625 and σ=1.34672). The science education is based on the practical works which is used in the development of the students, for instance, Millar (2004) argues that developing students' scientific knowledge and students' knowledge about science are essential components for science education studying.

Way to increase the prospects of science education through ODL

The learning of science education through ODL is comparatively tough than other conventional learning system because of, for example, Kirschner (1991) argues that science education is engaged in experiment, measurement, observation and other experimental activities. Thus, the learners (69.6%) of the SSC and HSC programs of

Bangladesh Open University suggested that for increasing the prospect of science education through ODL, the learners have to encourage science education whereas 65.8% of the learners suggested to raise awareness about ODL method as this method is becoming more popular method of learning all over the world (Attri, 2012).

The teaching and learning in ODL depends on self-learning materials which indicate the path for the learners and tutors. Sometimes, the study materials of the science group of SSC and HSC programs of Bangladesh Open University remain harder to the learners who are actually benefited from these materials. Most of the learners (60.5%) suggested to make easy the study material. They (64.5%) also mentioned that by changing the views of the learners about the hardiness of the science subject through proper counseling the prospects may be increased. But this is not easy, however, Galusha (2001) argues that due to the lack of the face-to-face contact with instructor and classmate's student's motivation may reduce.

The science education is based on practical work either it is in face-to-face or through ODL. In distance education practical works depends on the study centers' infrastructural facilities, tutors' and learner's eagerness in practical works, sufficiently lab facility as the science subjects are practical oriented. Nigam & Joshi (2007) state science education is more challenging than humanities and social sciences due to the intensive practical works whereas Chan & Shin (2006) mention that in distance education institutions where the students to be on campus rarely, it may challenge to provide practical facility and teaching for the science students. As a result, most of the learners have suggested to monitor the tutoring class regularly (79.6%), to conduct sufficient practical classes (79.1%), to provide sufficient lab facility in the study center (76.6%), to make practical classes easy to learners (64.6%), to make interest of tutors in practical class (73.3%), to provide sufficient practical exercise in the study materials (74.6%), to provide handbook for practical classes (63.7%), to provide instrumental facilities to the learners (76.2%) and to make sufficient video on practical work (77.5%).

Conclusions

Science education through ODL is harder than other group due to its practical works. In conventional face-to-face education system provide more practical classes to science students as it is mentioned in curriculum. This option is absent in the ODL method where the students rarely go to their campus for practical works. But science education is important in developing career, getting job, generating human resource, increasing technical and technological knowledge, skilling the employees, inaugurating various service sectors etc. that this study reveals. This study also suggests encouraging the learners about science education through ODL. However they can involve in this education system properly and engage in the related practical works. This study finds that the study materials of science group is larger, language of the materials is harder. So making easy the study materials is the way to engage the learners in the learning process effectively. Massive lacking of infrastructural facility in the study centers may make barrier for science education through ODL. That's why; the learners suggest that provide huge laboratory and instrumental facility, making practical classes easier, making sufficient videos on practical classes

for as the ways to increase the prospects of science education through ODL. Hence, this study recommends the followings:

Recommendations

1) Although the learning in distance mode is different than conventional face-to-face learning and also difficult to conduct practical works where the learners rarely attend the classes so the alternative way may the salutation. From the perspective of Bangladesh Open University's learners, mobile learning through android phone set may the ultimate solutions. For example, android or smart mobile phone set may use in personal contacting and learners' preferred immediate feedback from the instructors (Garland, 1993; Brown, 1996; Carr, 2000 & McGivney, 2004), orientation before the course starting, counseling during the studying and disseminating information and advices from the tutors (Ashby, 2004 cited in Fozdar & Kumar, 2007). Moreover, mobile phone set helps the learners by improving literacy and numeric skills, recognizing abilities, collaborating learning experiences, identifying the need and support, overcoming digital divide, focusing longer period, raising self-confidence, moving, widely spreading and reducing complexity (Attewell, 2005, Becking et al., 2005 & Yousuf, 2007). The mobile learning for ODL learners can improve the various aspects in their learning while Andrews & Tynan (2012) mention individualness, connectedness, quality, mobility and resourcefulness are grown among the distance learners who being connected with mobile learning.

2) The android or smart phone set plays vital role in spreading education all over the world. The learners of distance education can use the device to watch the pre-recorded practical classes of the particular institute. Bangladesh Open University may create more and more practical classes on science subjects and upload its own online platform as the learner can watch that videos. This service may smooth and helpful if the internet connection remains strong, uninterruptable and accessible. So, the government of Bangladesh may take the policy to improve the quality of the internet all over the country and ensure the access of the learners with easy and flexible ways.

3) The ODL method departs education through a country wide network of regional centers, sub-regional centers and study centers in Bangladesh. In this case, Bangladesh Open University has limited access to develop infrastructural facilities in the study centers for science students as the study centers are set in the governmental and private educational institutes. So, government may take the initiatives to improve the infrastructural facilities for science students of ODL equally in the study centers irrespective of urban and rural settings.

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