Learning difficulties in School Science for Distance Learners at Bangladesh Open University

Runu Biswas*

Abstract

Science is the most important lesson to develop the learners' analytical skills. The study focuses on the challenges and barriers of learning in science courses with hands-on practice. The current research selected 7 Regional Centers (RCs) out of 12 Regional Centers all over the country. There are 302 learners' perceptions and attitudes are taken of six science courses to find out their difficulties. The study uses the indicators as- printed materials, tutor and tutorial services, audio-visual, shadow teaching, science practical and learners' support services. The study encounters that learners 85.8% are not getting textbooks in time. More than seventy percent of learners identify tutors are not taking scheduled 20 classes but from FGD tutors complain that learners were not attending the tutorial classes because tutorials are not compulsory for them. The study finds out that more than eighty percent of the learners and tutors were not watching the video program of BOU which are more effective to learn science courses. More than half of the tutors told that insufficient of the computer lab, apparatus, and learners also identified that. The study reveals that learners were receiving shadow teaching from tutors and outsiders. It was perceived that without laboratory experiments the objectivesof practical courses cannot be achieved in other settings. In addition to tutorial sessions, printing text and audio-visual, BOU authorities should take the step on online courses. University authorities should monitor for sending textbooks, tutorial sessions and hands-on practice. The authority of BOU should take feedback from learners of their support services, tutor, tutorials etc. Based on the suggestions, BOU should take an attempt then it would be a very powerful weapon for the theory as well as practical courses.

Keywords: Science Courses, Difficulties, Distance learners, Bangladesh Open University.

Introduction

The current research aims to investigate what types of challenges and barriers are the Open School learners encounter themselves to be successful in the theoretical and practical science courses of the Secondary School Certificate (SSC) program. Three different backgrounds are existing in the SSC program as – Science, Arts, and Commerce. Science is the most important lesson to develop the learners' analytical skills. Science has always been a challenging academic subject, particularly in schools. The study selected five courses - Physics, Chemistry, Biology, Home Science, Agriculture and Information Communication Technology (ICT). National Curriculum and Text Book (2010) (http://www.nctb.gov.bd) of Bangladesh states the purpose of science education, which covers all dimensions, including human and philosophical significance, scientific significance, and personal significance. Science education from objective fact-based knowledge to the practical activity which caters to the learners' skills, attitude, and values along with understanding Donnelly & Jenkins (2001). Yap (1996) identified program benefits and implementation barriers

* Assistant Professor (Mathematics), Open School, Bangladesh Open University, Gazipur.

in the report on the Pacific Northwest Star Schools partnership for distance education and five implementation-barrier categories were identified: lack of equipment and support; scheduling difficulties; program costs; instructional concerns (e.g., interactivity, motivation); and training and technical assistance. These frameworks are described by Dooley, Metcalf, and Martinez (1999); Galusha (1998); Hopkins (1996); Lehman (1998); Merrill et al. (1992); and Sherry (1996). A lack of feedback and teacher contact has been identified frequently in distance education studies, (Dooley, Patil, & Lineberger, 2000; Flowers, 2001; Grace, 2001; Zirkle, 2001). So, the quality and integrity of the educational process depends on two-way good communication between students and faculties and then it will be sustainable. 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 Agriculture or Chemistry or Physics or Earth science (Irwin, 1995). Distance education students cannot be physically present to access these resources, so alternatives must be in place (Cho & Berge, 2002; Galusha, 1998). (Flowers, 2001) described the need for institutions to better advertise distance courses to facilitate awareness. Related to program costs,the availability of proper equipment for offering courses at a distance can present barriers (Galusha, 1998). Instead of reducing the costs of education, the equipment involved with information technology and distance education increase it (Gladieux & Swail, 1999). The lack of equipment and infrastructure for distance education is especially pronounced in poorer, rural areas (Yap, 1996). Faculty involved in distance education environments must be aware of student characteristics and situations that can present barriers to the students' effective learning and success (Hillesheim, 1998). Learners engaged in distance education appear to be equally affected by job conflict, family time constraints, and financial issues (Grace, 2001; Hillesheim, 1998; Sherry, 1996; Zirkle, 2002). (Rezabek, 1999) stated that grouped the barriers to distance education enrollment into three categories. Situational barriers result from an individual's general situation or environment and include such issues as transportation, age, time constraints, and family responsibilities. Institutional barriers are created by an institution's programs, policies, and procedures, and include problems with admissions, registration, scheduling of courses, financial aid, examination and support services. Dispositional barriers result from an individual's personal background, attitude, motivation, learning style, and self-confidence. This study explores that the learners are facing challenges and barriers of learning science courses in the theoretical and practical parts from at the school level. It also achieves the following specific

Objectives:

- to ascertain the challenges of conducting the science education at the Open School;
- to identify the barriers of conducting practical work for the science courses at the School;
- to compare a study of the men and women learners' perception about practical.

However, not many research studies have been carried out to investigate the kind of

effect brought about by a specific method of practical work on open schooling. Bangladesh Open University (BOU) practices hands-on experiments to make learners more confident regarding their study, especially on science-based courses. The prospect of practical experiments depends on how it would be convenient and accessible to the learners. The infrastructure and facilities for laboratory experiments is not adequate in conventional and/or ODL system in developing countries. An open and distance learning system, practical works of specific courses can be conducted by using laboratory, home experiment kits, audio-visual media and computer-mediated system. BOU's practical works have been conducted by laboratory. Besides these, BOU also provides some model experimental practical work to the learners in a limited way. In the SSC program, learners take part in their practical sessions by selected tutorial sessions and at the end of their academic year, students appear at their practical examinations. For SSC program each science course has five mandatory practical classes, it is not sufficient for learning practically. In practice teaching learners play the role as a teacher as take part in activities as their teaching experience.

The indicators for investigating in this study are as follows

Variables	Barriers and challenges related indicators
▪ Gender ▪ Age ▪ Learning Year	▪ Printed materials ▪ Tutor and tutorial services ▪ Audio-visual ▪ Shadow Teaching ▪ Science Practical ▪ Student Support Services

Percentage scores, number of learners', mean and standard deviation have been calculated for each item to describe their difficulties in learning science courses.

Study Area:
There are 12 Regional Centres (RCs) in BOU for covering the entire country. Seven has been selected randomly from 12 regional centres.

The precise research Questions are as follows:

(a) What challenges do the Open School learners encounter themselves to be successful in the sciences courses of the SSC program?

(b) What types of obstacles are they encounter to complete their conducting practical works at school?

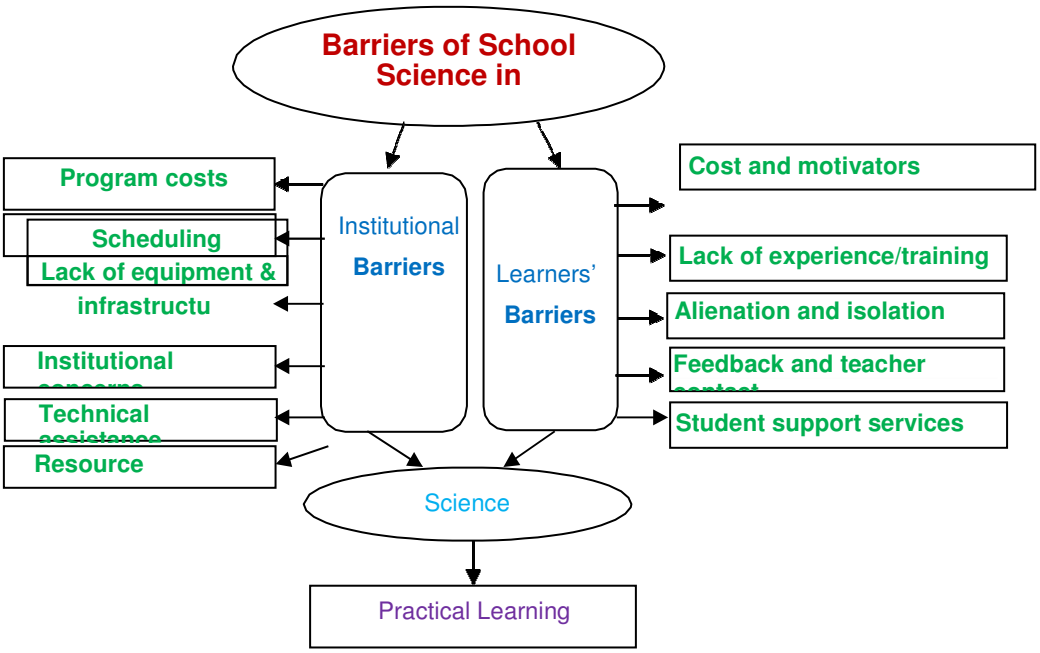
(c) What are the differences between men and women learners' opinions of the hands-on practical?

The research conducts through a mixed method one is quantitative and the other is qualitative in nature based on collecting data. For quantitative data questionnaire survey has been conducted to collect information from the field level. Researcher conduct the study centres and selected first year and second year learners of the SSC program of BOU. In this survey 302 learners' opinions have been collected through a structured questionnaire. After that, data analysis has been conducted using

Statistical Package for the Social Sciences (SPSS-22). The study uses a 5-point Likert-scale structured questionnaire to acquire the learners' views, attitudes and perceptions of the printing texts, audiovisuals, tutorials and tutors, practical science courses, private tutoring and student support services of the given courses. To find out the difficulty level in the science courses questionnaires arrange like as Strongly Agree = 5, Agree

= 4, Neutral = 3, Disagree = 2 and Strongly Disagree =1. There are 77 questions were selected to know about the barriers and challenges in the science learning and practical of those courses. Firstly, researcher did the reliability test for the questionnaire. Mean and standard deviation are calculated for each item. For comparing between men and women about their video-lectures the study uses also a t-test. Mean and standard deviation scores have been used for describing data. In mean scores, higher implies the higher effectiveness and lower implies lower effectiveness of science courses learning of the learners. Qualitative data has been collected from the tutors of the selected seven study centres by using Focus Group Discussion (FGD). FGD conducts to the tutors of the study centres who knows better the process of the tutorial, textbook, videos, hands-on practical and support services of science courses.

A conceptual framework is of the study about the barriers of learning science courses and practical



Results

Reliability Test for questionnaire

Reliability is a measure of the stability or consistency of test scores. A reliability coefficient is a measure of how well a test measures achievement. Cronbach's alpha is a measure of internal consistency, that is, how closely related a set of items are as a group. It is considered to be a measure of scale reliability. If the value of Cronbach's α is more than 0.7 then suggesting that the items have relatively high internal consistency.

Table 1: Reliability Statistics for the questionnaire

Reliability Statistics	
Number of items	77
Cronbach's, α	.67

The table 1 shows that Cronbach's α is 0.67 where the number of items is 77.

Regional Centre wise respondent distribution

There are 12 Regional Centres (RCs) in BOU for leading the entire country. Seven has been selected for the study in the research.

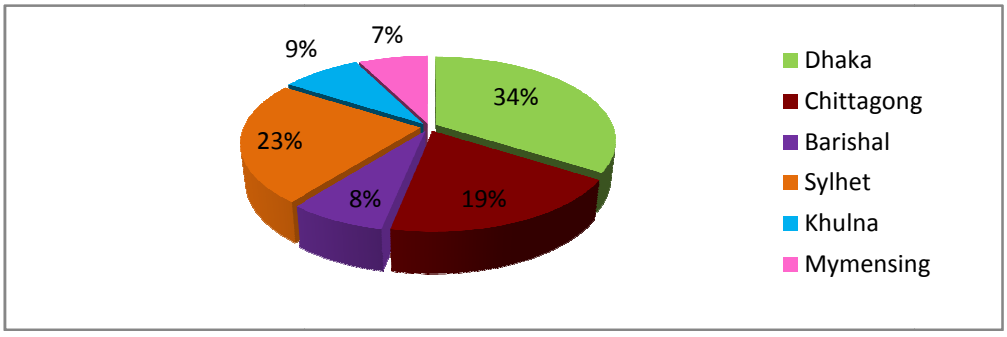


Figure 1: *Selected Regional Centres*
Source: ***Researcher's Survey***

The figure 1 shows that 32% of respondents belong to Dhaka RCs, 22% of the learners were from Sylhet RCs and 18% were from Chittagong RCs.

Gender of the Learners and their age category

The figure 2 shows that more than half of the learners (57%) are male and others 43% were female. The figure 3 depicts that majority (50.7%) learners were in the 16-25 years category and 32.5% were in the 26-35 years and 14.9% were in the 36-45 years group.

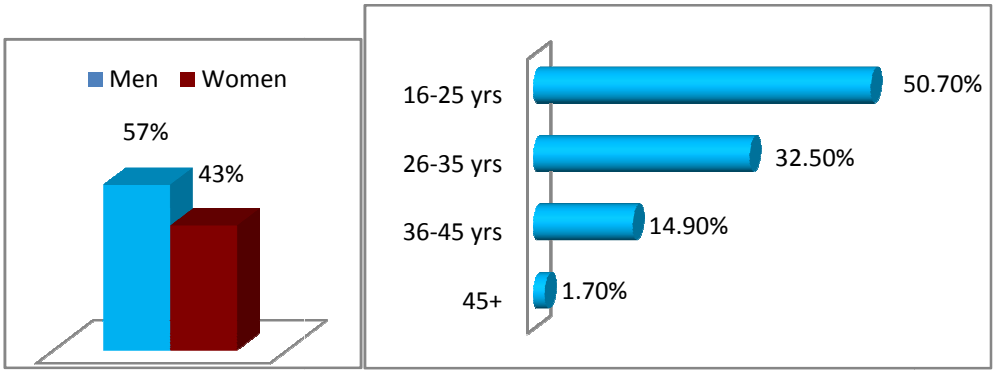


Figure 2 & 3: *Gender of the Learners and Learners age category*

Source: *Researcher's Survey*

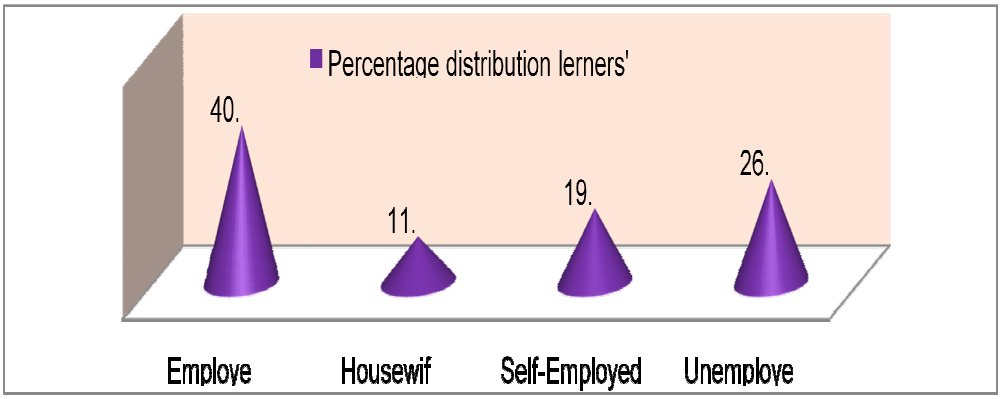


Figure 4: *Social Status of the learners* ***Source:*** *Researcher's Survey*

The figure 4 expresses that majority (40.7%) of the learners are employed and 19.2 % of learners are self-employed that means near about 60% of learners are engaged in the different services and businesses.

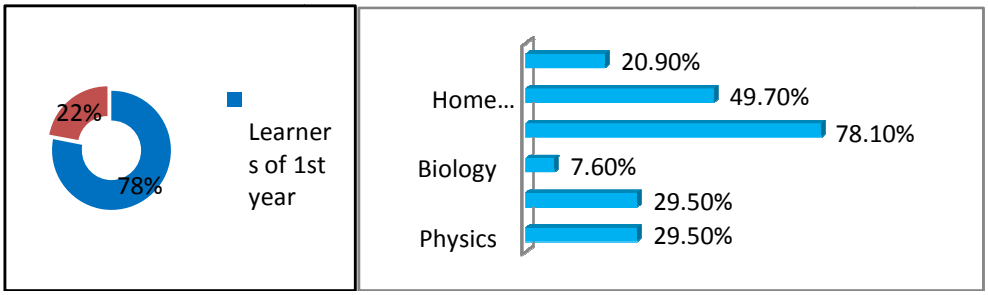


Figure 5 & 6: *Learners' learning year and selecting Courses*

Source: *Researcher's Survey*

The figure 5 shows that, the majority (78%) of learners were learning in the second year and the other 22% of learners were in the first year. The figure 6 also depicts that 78% learners were taking ICT because of compulsory for the second year.

Learners' perceptions of the tutors and tutorials

BOU provides printed all courses textbooks. The study takes attitudes and perceptions from the learners about science textbooks that are supplied from BOU.

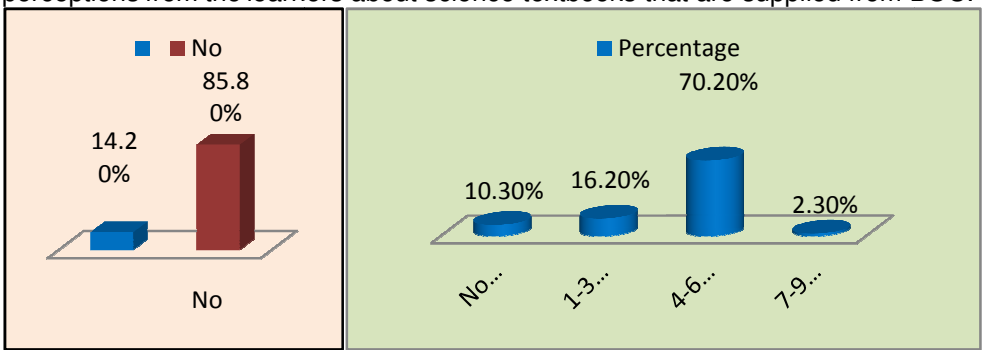


Figure 7& 8: *Percentages of learners who do not get textbooks in time and after how many months they getting are.*
Source: *Researcher's Survey*

The figure 7 shows that near about ninety percent of learners do not get science books timely and the figure 8 explains that 70% of learners get their textbooks after 4-6 months.

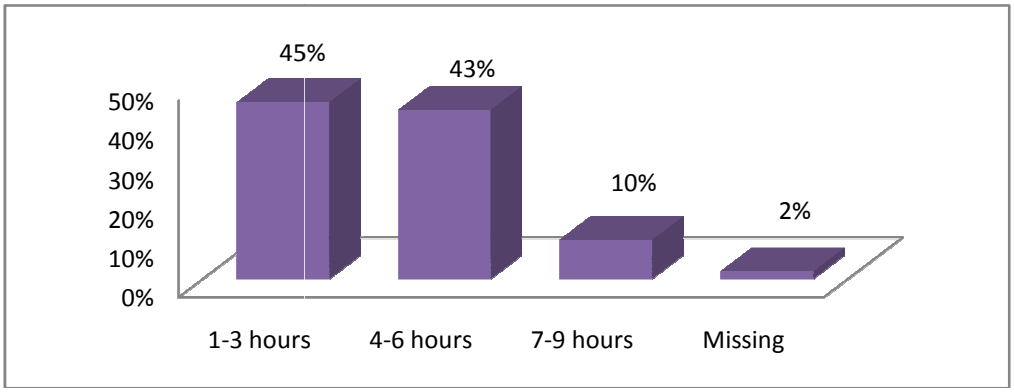


Figure 9: *Percentage of how many hours students are reading their textbook in a week.*
Source: *Researcher's Survey*

The figure 9 depicts that near about half of the learners read their textbooks 1-3 hours and 42.7% of the learners read 4-6 hours in a weak.

The table 2 explains that all **mean** values of the statements were more than 3.5 so learners' are satisfied to our textbooks.

Table 2: Mean and Std. Deviation of learners' perceptions about Text Book

Descriptive Statistics	Mean	Std. Deviation
The Content is assembled successively of the science text.	3.9868	1.07825
More difficult contents are described in detail.	3.8874	1.10597
Figures helps understand the contents.	3.5464	1.16261
Books are incorporated with real examples.	3.6424	1.28028
Books are written in lucid and simple language.	3.9106	1.16794
Contents of modules that are helpful in my daily life.	3.6821	1.25949

Source: Researcher's Survey

Learners' perceptions of the tutors and tutorials

BOU always provides 20 tutorials as face-to-face contacts for each course. Then the learners keep in touch with the teachers for their studies. It is also limited and teachers (tutors) are acted as the traditional teachers.

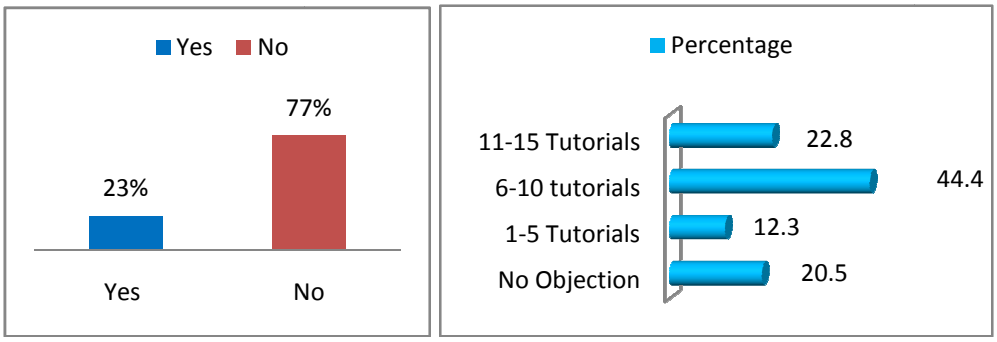


Figure 10 & 11: *Learners opinion about taking tutorials and attending tutorials of the BOU tutors out of 20 scheduled tutorial sessions*

Source: ***Researcher's Survey***

Figure 10 depicts that majority (77%) of the learners' opinion that, the tutors were not taking all 20 scheduled classes and the figure 11 shows that near half of the learners' told that tutors were taking only 6-10 out of 20 tutorials.

Learners' opinions about tutors and tutorials

The Table 3 expresses that the learners were attending regularly in the BOU scheduled tutorial session. It also shows that 20 classes are not sufficient for each course. Most of the tutors are teaching traditionally. Tutors provide suggestions for the learners of the courses. Tutors provide ideas regarding creative questions. This figure also depicts that tutors cannot help after the tutorial session. It explains that tutors encourage learners to think creatively.

Table 3: Number of the learners' opinions about tutors and tutorials

Items	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
You are attending BOU tutorial sessions on a regular basis.	128	65	49	52	8
20 tutorial sessions are sufficient, you suppose.	47	61	51	81	61
Tutors teach traditional way.	114	113	21	41	9
Tutors provide suggestions for the learners.	112	126	23	32	8
Tutors provide idea regarding creative questions.	49	99	60	42	16
Tutors are helping after the tutorial sessions.	77	70	24	77	49
Tutors are encouraging learners to think creatively.	95	119	30	49	5

Source: ***Researcher's Survey***

Learners' perception about video program of science courses

BOU provides video lectures through broadcast on the national TV and in addition, it also keeps on YouTube, BouTube for supporting learning materials. Lowe, Mestel and Williams (2016) state that video lessons are helpful to the courses of study and it has been highly structured, professionally produced notes and support from an individual tutor, specifically feedback on tutor-marked assignments and face-to-face tutorials. Table 3 shows that half of the learners believe that, the use of flash animation in science videos are improves learners' creative thinking. Near half of the learners' express that video lectures are not well arranged.

Table 4: Number of learners' perceptions of science courses on video programs

Items	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
Learners' used science video lectures on TV in addition to Text books.	55	106	31	59	49
Learners' watched BOU TV program which are available on YouTube	49	59	31	106	55
Science courses related video programs of BOU are available on YouTube.	57	45	79	48	70
Video lectures are highly motivating for my science studies.	64	104	55	44	31
Science Video lectures on BTV are matching with my tutorial class.	32	67	67	86	50
Science video lectures of BOU are arraigned as per the units.	25	50	79	71	70
Learners' search on YouTube for drawing science in addition to BOU videos.	58	89	46	89	19

The use of flash animation in the science videos improves learners' creative thinking.	97	66	46	81	12

Source: Researcher's Survey

Table 4 also depicts that more than half of the learners' think that video lectures are not matching with the tutorial classes. The majority of the learners' is thinking that the video lectures of science courses are highly motivated for their studies.

Learners perceptions about hands-on practical

Practical is an examination or lesson in which theories and procedures learned are applied to the actual making or doing of something. In the conventional system, a huge amount of time, teaching resources are accessible for practical courses of the learners. BOU learners are getting only 5 practical classes. BOU selects that study centres, which have available laboratory facilities. BOU provides five practical classes for each course though it is not sufficient.

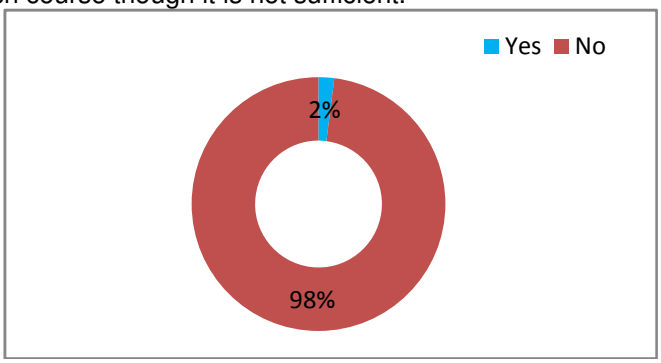


Figure 12: *Percentages of learners' opinion about practical tutorial*

Source: *Researcher's Survey*

The figure 12 shows that 98% of the learners didn't know five practical classes are obligatory for each science course.

Table 5: Learners' perceptions of the practical courses

Items	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
I think 5 practical classes are adequate for each science courses.	18	50	36	108	**87**
The fees charged practical based for pursuing courses are considerable.	59	60	48	63	68
Tutors are emphasizing theory classes more than the practical classes.	51	119	40	67	19
Tutors are well trained and experienced	89	99	42	37	32
Science practical teachers are available in the study centers.	22	81	42	111	43
Practical time duration is enough.	55	38	64	93	51

Science apparatus are adequate for learners.	25	38	75	107	55
Practical labs are sufficient for science students.	33	79	72	76	41
Science practical classes are helping in the daily life	90	106	60	34	9

Source: Researcher's Survey

The Table 5 shows that the majority of the learners were thinking of five practical classes which are not enough to do better for practice. The table also shows that most of the learners thought tutors are well trained; guiding properly to do their practical; science practical classes are helping their daily life. On the other hand, learners overview those science practical tutors are not available; apparatus is not sufficient; they are emphasizing theory classes more than practical classes; practical time duration is not adequate.

Learners' opinion of private tutoring

Open School learners receive private tutoring and believe that private tutoring is more supportive in the examination. Bray (2010) states that over half of Hong Kong's secondary students receive private

supplementary tutoring, and in the last grade of secondary schooling the proportion exceeds 70%. Such tutoring is widely called shadow education because it mimics the regular system. Trent (2015) finds that despite its rapid expansion in many countries around the world, private tutoring has attracted only limited attention from policymakers and researchers. This is especially surprising in the case of Asia, where high rates of private tuition have been reported.

Figure 13 shows that 67.2% of learners are learning science courses privately. Figure 14 depicts that the highest percentage 37% of the learners are receiving private tutoring from BOU tutors. The figure also shows that 22% of learners are learning privately other than BOU tutors and 32% of learners are not receiving private tutoring.

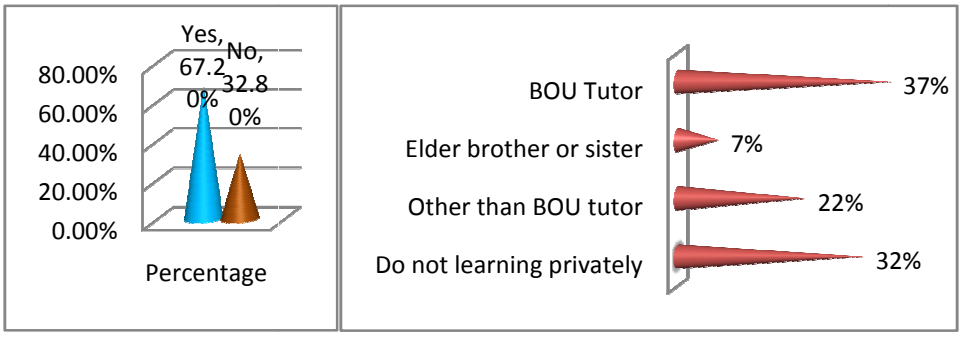


Figure 13 & 14: *Percentage of learners' opinion of the private tuition* ***Source:*** Researcher's Survey

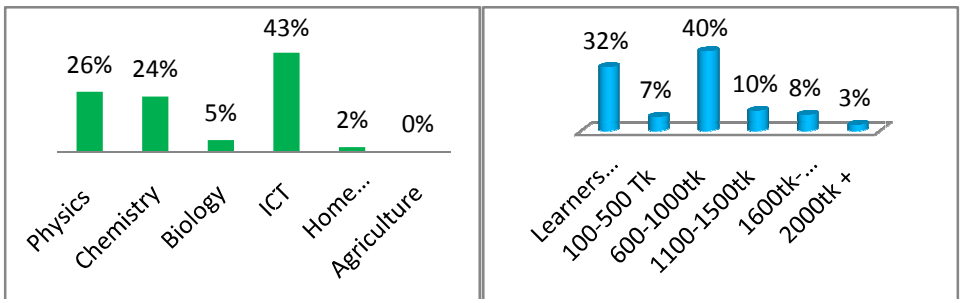


Figure 15 and 16: *Learners are learning privately to courses and spending money monthly*

The figure15 depicts that the highest percentage of 43% of learners' were learning privately in the course ICT. It also shows that 26%' and 24% of learners' are receiving private of Physics and Chemistry respectively. The figure 16 confirmations that 38.7% of the learners are spending money in the range 600Tk.-1000Tk per month because the highest percentage of the learners (43%) have taken ICT course needs to learn privately.

Learners want to get information from BOU

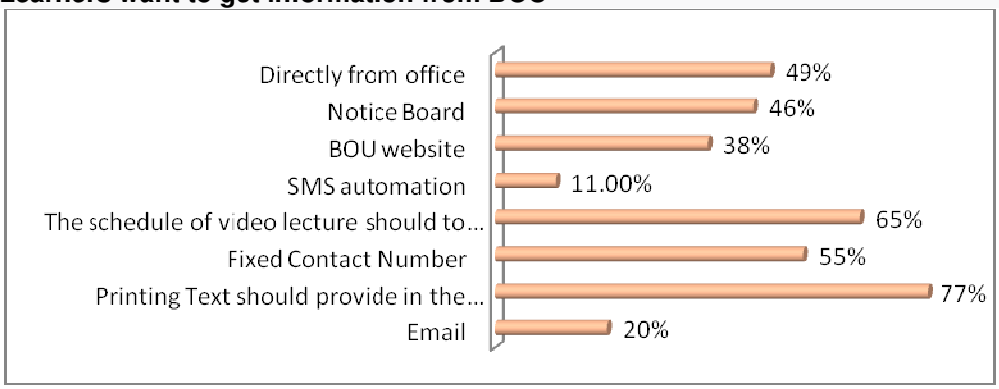


Figure 17: *Learners prefer to get information through various media.*
Source: *Researcher's Survey* ****Multiple Choice Questions***

Figure 17 depicts that 77% of the learners seek to get their printing text in the orientation classes; it also shows that 65% of the learners wish to get the schedule of a video program in the starting day. There are 55% of the learners wishing to get the admission and examination information by BOU's fixed contact number. Half of the learners 50.4% preferred to obtain information directly from the office. It also depicts that 46.7% of the learners' want to get information from the notice board. And 37.5% and 20.25 % of the learners wish to get information from the BOU website and email, respectively.

Table 6: Independent sample t-test for men and women of the practical work

Independent Samples Test	Levene's Test for Equality of Variances		t-test for Equality of Means	
	F	Si g.	t	Sig. (2-tailed)
I think 5 practical classes are adequate for each science course.	14.118	.000	2.231	.026
			1.974	.052
The fees charged practical based for pursuing courses are considerable.	1.098	.296	.394	.693
			.384	.702
Tutors are emphasizing theory classes more than practical classes.	11.471	.001	1.158	.248
			1.327	.187
Tutors are well trained and experienced	3.048	.082	-1.283	.200
			-1.220	.226
Science practical teachers is available in the study centres.	.938	.334	.644	.520
			.607	.545
Practical time duration is enough.	1.827	.177	-3.450	.001
			-3.625	.000
Tutors are guiding properly to do their practical work.	4.391	.037	-.034	.973
			-.032	.974
Tutors are using multimedia based practical classes to help the learners.	3.045	.082	2.021	.044
			2.243	.027
Science apparatus are adequate for learners.	.531	.467	-.293	.770
			-.299	.766
Practical labs are sufficient for science students.	.321	.571	-1.072	.285
			-1.090	.278
Science practical classes are helping in the daily life	6.802	.010	.707	.480
			.802	.424

Source: Researcher's Survey

The p-value was less than the alpha level: p <.05. We can reject the null hypothesis that there was no difference between means. Table 6 depicts that the significant level is Sig *p*=0.000, Sig *p*=0.001, Sig *p*=0.037 and Sig *p*=0.010 for the statement '5 practical classes were adequate for each science courses'; 'tutors were emphasizing theory classes more than the practical classes'; 'tutors were guiding properly to did their practical' and 'science practical classes were helping in the daily life' respectively. So, for those four statements, there are **equal variances not assumed**. Therefore, the study can reject the null hypothesis that there was no difference for means. For other statements, null hypothesis was accepted that was **equal variances assumed**.

Results of Focus Group Discussion (FGD)

There are 22,000 tutors are teaching in the 1100 study centres all over the country for the SSC program. For FGD, the study selected seven study centres. The study conducted the number of participants per focus group ranged from 5 to 7 with a median. Researcher arraigned seven focus groups in the seven different study centres. Focus group discussion sessions lasted for 50 minutes. Five main themes emerged from the review: understanding of learners' perspectives regarding text

(22%), about tutorial session (21%), audio-visual (17%), science practical (23%) admission and examination of challenges (15%) and their won barriers. From the survey of the learners, the study got 78% of the learners' opinion that tutors are not taking all scheduled classes but the tutors expressed learners were not coming regularly it was a contradictory result. The majority of the tutors' (63%) explained that BOU textbooks were well structured, languages are lucid and simple, difficult contents are described in detail etc. Most of the tutors (66%) disclosed that some textbooks didn't come timely, like Chemistry and ICT that was also identified by the learners. More than half of the tutors (59%) told that 20 tutorial sessions were insufficient to complete the entire syllabus. The majority (81%) of the tutors give the opinion that they are not encouraged to watch the video program of the learners and they also told that they didn't watch the video program. Tutors were advised by the researcher that they want a schedule of telecasting video programs. The majorities of the tutors (55%) expressed that they have limitations to serve the lacking of practical experience. Most of the tutors were involved in private tuition. More than half (53%) of the tutors were presented that they have inadequate of the computer lab, apparatus and demonstrators.

Discussion

There were 12 Regional Centres (RCs) in BOU for covering the entire country. Seven had been selected randomly from 12 regional centres. The majority of the data (32%) has been collected from Dhaka Regional Centre. From the table 1, the Cronbach's α was 0.686 and the number of items was 77. The result shows that the set of a questionnaire was reliable to collect the data. The study 302 learners' opinions were taken for analysis. By the nature of data, only 22% of the learners were in the first-year and others were learning in the second-year. There were six science courses were selected as Physics, Chemistry, Biology, ICT, Home Science and Agriculture. ICT was the compulsory course for the second-year learners and Out of these six courses only two were in the first year and others were in the second-year syllabus. The majority 57% of the learners were women, half of the learners (50.7%) were in the age 16-25 category. Majority 85.8% of learners do not get the text in time from BOU. The majority 70% of the learners' opinion is that they get some textbooks 4-6 months later; it is a big issue of BOU because learners are mainly dependent on printing materials. BOU provides 20 tutorial sessions for each course. The majority 77% of learners' view that the tutors were not taking all 20 scheduled classes; the study think it is a big matter for the authority. Learners' were satisfied with the textbook of BOU. BOU always provides that tutorials as face-to-face contacts so that the students get a touch with the teacher. Most of the tutors are teaching tutorials like a traditional teacher. Tutors provide suggestions for the learners of the courses. Tutors provide ideas regarding creative questions. If tutors are taking tutorials regularly then students have no objection about tutors of teaching but findings show a big number of tutors are not taking class regularly. Nearly, half of the learners' express that video lectures are not well arranged. The majority (41.5%) learners thought that video lectures are highly motivating for science studies. The finding shows that (67.2%) of learners are learning science courses privately. The highest percentage (37%) of the learners are receiving private tutoring from BOU tutors I. Moutodi & Ngirande (2014) found that most of the learners' face difficulties in solving

a scientific problem. To solve scientific problems accurately and efficiently, students confirmed that one needs to develop flexibility and to learn multiple strategies. The majority (38.7%) of the learners' was spending money between ranges 600T.-1000Tk. per month because the highest percentage of the learners (43%) was taking private tutoring only one course ICT. Dawson (2009) and Bray (2010) find that in low-income countries such as Azerbaijan and Bangladesh, it had become acceptable for teachers to demand payment for extra tutoring of pupils for whom those teachers already have a responsibility in mainstream classes. The outcome of the research shows that the lacking of the computer lab, lacking apparatus', inadequate practical teachers, insufficient practical classes and limited practice time duration are the actual scenario in the study centres. The finding also shows that science students are receiving private tuition. An open and distance learning system, practical work of specific courses can be conducted by using laboratory, audio-visual media and computer-mediated system. Science video lectures of BOU were arranged as per the units' and 'Learners' search on YouTube for drawing science in addition to BOU videos' two statements there were equal variances not assumed. Therefore, the study can reject the null hypothesis that there was no difference for means. For other statements, null hypothesis was accepted that was equal variances assumed. The majority (77%) of the learners wishes that the printing text in the orientation class, also depicts that 65% of the learners wish to get the schedule of a video program on the starting day. 55% learners wishing to get the admission and examination information by BOU's fixed contact number. Half of the learners 50.4% preferred to obtain information directly from the office. It also depicts that 46.7% of the learners' want to get information from the notice board of study centers. And 37.5% and 20.25 % of the learners desired information service from the BOU website and email respectively.

Conclusions

The study focuses on the challenges and barriers to learning in the science courses and practical. Hands-on practice is very essential for proper learning. But in distance education, has some limitations compare to mainstream education. In designing course programs and materials, science educators in distance teaching institutions often use mass media than their complements in the mainstream sector. It is clear that Open School (OS) learners receive the opportunity of shadow teaching to success in the science course. BOU provides them self-learning text materials, audio-video lectures and short tutorial services and few practical classes but learners are not enjoying all the benefits. Again, it is clear that learners have the less opportunity for collaborative learning as the open school learners get the tutorial supports for limited time and which are not mandatory. Through using the video lecture, it is possible and BOU needs to build up the capacity of the tutors to implement the collaborative learning opportunities integrating the video lectures. It is important to take feedback from learners' but there is no opportunity to take it. It is observed that laboratory and field-based time for distance education students tends to be very limited. It is perceived that without laboratory experiments the objectives of practical courses cannot be achieved in other settings.

Recommendations

To strengthen the theory and practical works of science courses for the learners of BOU and to improve the quality education then the following recommendations could be suggested:

- In addition to tutorial sessions, printing text and audio-visual, BOU authorities should take the step on online courses. There would be preserved all facilities should be provide in the online course such as - PDF Textbook, video lectures as per the unit, model questions, notices, the process of assessment then learners can take help any time from it.
- Experience has shown that support needs to be provided on a regularly until the teachers and the students become comfortable with all activities.
- University should monitor for sending textbooks, tutorial sessions.
- University should monitor the practical courses of the tutorial classes with a regular basis.
- There should be strong coordination between the faculty of BOU and the tutors of practical courses to conduct practical classes in the tutorial session.
- BOU have a strong media centre, use this centre to produce more and more interactivepractical based programs and telecast these programs frequently.
- School should be introduced computer mediated practical course works for the learners.
- School can provide Interactive Virtual Class Room (IVCR) then learners will be benefitted.
- More research should be done in this area to get valuable opinion from the students, tutors and administrative staff.
- School authority should to take feedback from the learners of their support services, tutor, tutorials etc. There are now tremendously increasing the use of multimedia-based practical courses in different distance educational institutions in developed and developing countries. If BOU adapts the above suggestions, hope it would be a very powerful weapon in elucidating learners' theory as well as practical courses at BOU.

References

Bray, M. (2010). Researching shadow education: methodological challenges and directions. *Asia Pacific Education Review. Volume 11*, Issue 1, pp 3–13.

Cho, K.G. and Berge, Z. L. (2002). Active, interactive, and reflective elearning. The Quarterly Review of Distance Education. 3(2): 181-190.

Dawson, S. (2009). Students' readiness in using mathematics online portal: a preliminary study among undergraduates, *Procedural-Social and Behavioral Sciences*, *Volume 2*(2), Pages 677-681.

Donnelly, J. F., and Jenkins, E. W. (2001). Science education: Policy, professionalism and change. London: Paul Chapman Publishing Ltd.

Dooley, K., Patil, B., and Lineberger, R.D. (2000). An evaluation of a multidisciplinary course delivered at a distance: Prescriptive principles to challenge our profession. San Diego, CA: Proceedings of the 27th Annual Agricultural Education Research Conference (ERIC Document Reproduction No. 449 351)

Dooley, L. M., T. Metcalf, and A. Martinez. 1999. A study of the adoption of computer technology by teachers. Educational Technology & Society 2 (4): 107–15.

Flowers, J. (2001). Online learning in technology education. *Journal of Technology Education 13*(1), 17-30.

Galusha, J., M. (1998). Barriers to Learning in Distance Education. The Educational Resources Information Centre (ERIC), University of Southern Mississippi.

Gladieux, L., and Swail, W.S. (1999). The virtual university and educational opportunity. Issues of equity and access for the next generation. Washington, DC: The College Board. (ERIC Document Reproduction No. 428 637).

Grace, L. (2001). Barriers to learners' successful completion of VET flexible delivery programs Adelaide, Australia: Proceedings of the Australian Vocational Education and Training Research Association (ERIC Document Reproduction Service No. ED 456 278).

Hillesheim, G. (1998). Distance learning: Barriers and strategies for students and faculty. Internet and Higher Education 1 (1), 31-44.

Hopkins, J. D. 1996. [online]. Information technology and the information society in Europe: Expectations and barriers to the implementation of new media in the higher education and research sector. Deploy Project Summary Report, prepared for the Confederation of European Union Rectors' Conference.

Irwin, A. (2006). The politics of talk: Coming to terms with the 'New' Scientific Governance. Social Studies of Science, (36), 299-320

Lehman, D. 1998. Barriers to distance education. Presentation for EDST885.

Lowe, T., Mestel, B., and Williams, G. (2016). Perceptions of online tutorials for distance learning in mathematics and computing. *Research in Learning*

Technology, *24*(1), 30630.

Merrill, P. F., K. Hammons, M. N. Tolman, L. Christensen, B. R. Vincent, and P. L. Reynolds. (1992). Computers in education 2nd ed. Neddham Heights, MA: Allyn and Bacon.

Moutodi, P., & Nagirande, H. (1014). The influence of students perceptions on mathematics performance: A case of a selected high school in South Africa. *Mediterranean Journal of Social Science 5*(3), 261-279.

Rezabek, R. 1999. Barriers to distance education enrollment. Presented at TeleLearning Conference. October. Austin, TX.

Sherry, L. 1996. Issues in distance learning. *International Journal of Educational Telecommunications 1* (4): 337–65.

Trent, J. (2015). Constructing professional identities in shadow education: perspectives of private supplementary educators in Hong Kong. *Educational Research for Policy And Practice*, *15*(2), 115-130.

Yap, K. (1996). Distance education in the Pacific Northwest: Program benefits and implementation barriers. ERIC, ED 395563.

Zirkle, C. (2001). Access barriers in distance education. *Contemporary Education 72* (2), 39-42. Zirkle, C. (2002). Identification of distan ce education barriers for trade and industrial teacher education. *Journal of Industrial Teacher Education, 40* (1), 20-44.

Acknowledgement
Project work on **"The Challenges and Barriers of Learning in Science Courses in BOU".** Funded by the BOU Research Department.

Disclaimer
This paper has not been previously submitted for publication elsewhere.