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Open Book Examination: Struggling Learners' Motivation and Academic Achievement in Physics at Secondary level

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Abstract

The learning disabilities of the struggling learners is considered as their weakness; however, it can be converted into their strength through motivation and the mechanism of open book examination. This research paper is about the struggling learner's motivation and academic achievement. It is an experimental study where struggling learners were given the exposure of open book examination. The objective of the study was to focus the effect of open book examination on the academic achievement and motivation level of struggling learners. The participants of the study were 54 students of class IX which were divided into two groups (open book exam group and closed book exam group) based on their previous examination scores. A surprise test was conducted at the end of fourth week of the study. The test was consisted of comprehension level of cognitive domain. It was found that motivation level and performance of open book examination group was better than closed group examination group. Based on findings, it is recommended to use open book exams for the motivation and academic achievement of struggling learners.

Keywords: open-book, closed-book, motivation, assessment, formative assessment

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Introduction

The cognitive performance and the academic achievement of learners is directly or indirectly linked with motivation and emotions of the learners (Javed & Asghar, 2017) through which learners want to learn and to achieve successful outcomes in order to survive. Intrinsic and extrinsic motivation provides multiple dimensions like performance, achievement of learning objectives and effective relationship with positive behavior to learners and at the same time learners also need specific strategies or techniques towards the accomplishment of learning objectives specially for struggling learners (Low achievers in the academic performance).

Open book examination (OBE) system is universally accepted strategy to reduce anxiety of struggling learners during the teaching learning process (Ambala, 2020; Block, 2012) which is considered as less time consuming, less memorization and more effective towards logical thinking for struggling learners (Khan, 2015) and it facilitates the learners towards deep learning (Block, 2012) and struggling learners can take benefit to prepare themselves for examination.

Students like to prefer open book examination as compared to close book examination system (Khan, 2015). Students feel enjoyment during the learning process through open book examination and also intrinsic motivation can created among the learners towards deep learning (Block, 2012). OBE provides the opportunities to diminish anxiety level in a variety of psychological courses and is accepted as superior style of exams (Francis, 2006).

Real-life decision-making ability of the students can be created with the help of open-book examination approach (Green, Ferrante & Heppard, 2016). The learning attitudes of learners (passive to active) can be changed through open book examination system (Khan, 2015).

Students in the experimental group by using open-book quizzes performed better in the final examination as compared to students who used closed-book quizzes (Green, Ferrante & Heppard, 2016). Students like the innovative open-book quiz approach instead of traditional closed-book testing method, which is the best tool to

enhance the classroom learning experiences (Green, Ferrante & Heppard, 2016). The coalescence towards examination approach (open and closed book) enhances the competencies of students (Durning, Dong, Ratcliffe, Schuwirth, Artino, Boulet & Eva, 2016). The performance of open-book tests is better as compared to closed-book tests (Phiri, 2006).

The focus of teaching learning process is to equip learners with content knowledge and enhance their critical thinking skills. The traditional assessment system is not enough to assess learner's creativity and critical thinking with the stereo type mechanism of assessment. However, the prospect to assess higher order skills of learners exists in open book exams, therefore, OBE permits students to use either notes, memory aid, textbooks, or other stuff while answering questions, which is the best preparation approach for tests (Broyles, Cyr & Korsen, 2005).

The use of notecards in OBE is considered as a realistic and optimistic way to prepare and assess learners (Settlage & Wollscheid, 2019). In the same context, Vyas & Vyas (2009) has stated that an open-book exam (OBE) as the type of exams in which learners have autonomy to state answers of the questions during formative phase through notebooks, textbooks, or any other helping aid. It means that learners are provided questions in order to create curiosity among the learners, which creates intrinsic motivation among learners, therefore, open-book examination approach can be classified into two categories: (a) restricted, and (b) unrestricted. In restricted category, learners are permitted to seek help from dictionaries, logarithmic tables, notes, and other learning stuff under the guidance and supervision of instructor, but any hand written stuff is not permitted, while on the other hand, learners are authorized to consult any helping materials in unrestricted approach, which needs certain presuppositions, specific pedagogical skills and command on formative questions. Particularly, the focus of unrestricted approach is based on critical questions. Struggling learners can be motivated towards learning and uplift the academic achievement level through open-book examination strategy.

Objective

1. To find out effect of open book examination on the academic achievement and motivation of struggling learners

Review of the related literature

As mentioned earlier, open book assessment permits the students to consult their textbook. OBE helps to encourage learners' involvement and motivation (Elerstsen & Veldermo, 2000). OBE also enhance students' satisfaction level (Green, Ferrante, & Heppard, 2016). According to Phillips (2006) that struggling learners prefer OBE due to less stress and anxiety.

According to Mathew (2012) closed book exam needs more efforts as compared to other exam types. Mathew examined the students' rendition about closed book exam, open book exam, and cheat sheets. It was found that students like to prefer OBE. Elerstsen & Veldermo (2000) have considered that OBE promotes critical thinking along with understanding about the content. Williams & Wong (2009) have argued that learners feel enjoyment in OBE like to have open-book examinations as compared to traditional way of exam.

OBE do not merely test simple recall of information, which creates intrinsic motivation to develop higher order skills like analysis, synthesis and evaluation on the basis of difficulty level in questions mentioned in Bloom's taxonomy (Settlage & Wollscheid, 2019). Although retention and recall of factual information have its importance of its own place, but higher order thinking skills have much more significance such as skills required for the application of knowledge in new and real-life situations, critical thinking and analytical thinking. In this era there is a paradigm shift in learning. Now a day, learning is not merely confined to the assimilation of content, but it must be focused from passive to active learning approach. Besides recalling OBE requires enthusiastic notes along with organization of helping materials in order to understand and recapture the content, therefore, OBE reduces efforts to memorize of information.

Pros and cons of open-book exams

The OBE is a distinguished form of assessment. The literature suggested many ways of effectiveness of OBE. Generally, the advantages of open book included following dimensions:

- Students rely less on rote learning.
- Students' level of anxiety regarding examination will be reduced.
- Gain of factual knowledge will be continued.
- Learning will also occur during exams.
- Questions can be sought out through multiple resources
- Encouragement of students towards new learning strategies.

However, there are a few drawbacks of the OBE which include the following points:

- Examinees lost their time in an exam using the materials.
- The workload of students may be increased by finding/creating reference materials before exams.
- Learning of the material will negatively affect.
- Sometimes irrelevant answers will be observed.

The majority of educational institutions of Pakistan are using the traditional model of assessment that only check remembering. In order to inculcate deep learning, OBE can be a good option that provides assessment for learning, which is the biggest challenge of the assessment process in Paksitan.

OBE can be made successful assessment approach if learners are motivated towards higher order thinking skills (Brightwell, Daniel, & Stewart, 2004) which is used in many countries of the globe (Prasad & Aluvalu, 2017).

The focus of OBE is an application of theory through formative assessment, in the same time it does not hub of knowledge. Formative questions, provide central idea and theme of the formative assessment which facilitates meaningful learning approach, and at the same time OBE provides a self directed approach towards better achievement (Kruger, 2011) . The basic function of formative assessment is a wiring of student learning.

Magid & Schindler (2011) have argued that OBE format is used to encourage learners to mastery over content under stress

free learning environment which is evident that open-book exams for formative assessment predicts beneficial learning outcomes. There were many research materials that provide evident proof in favor of open-book exams in formative assessment. Krasne, Wimmers, Relan, & Drake (2006) have also presented that formative assessment in OBE promotes higher order thinking among learners.

Significance of open book exams

In traditional assessment methods, students are usually tested on the basis of memorization, which is not a very effective measure to assess student's learning. Such kind of assessment methods are entirely based on memorization. Therefore, such traditional methods of evaluation of students are not very effective in the 21st century. However, alternative evaluation approaches are more appropriate for the learners of the digital era. Similarly, the traditional examination formats are not helpful to assess learners, which needs to transform as a requirement of the 21st century. In this regard, relevance of the question papers must be linked with structure of learning outcomes, it has been observed that although students clear traditional examinations with good marks, but failed to achieve success in competitive examinations for recruitment, which indicates an alarming situation for traditional examination. For questions of traditional examinations are not very challenging and needs to modify. This problem can be overcome by changing the assessment pattern by providing them challenging students. The open-book exam is somewhat innovative in the context of Pakistan and it may be hypothesized that practicing OBE may help to enhance student's learning and achieve learning outcomes of the course.

Critical thinking approach among struggling learners can be promoted through OBE, because learners move towards higher academic achievement due to intrinsic motivation. In this way, students will be encouraged, motivated, and self-directed towards depth of knowledge and skills as compared to the traditional examination approach which leads to promote rote learning. OBE are increasingly offered nowadays to minimize examination

anxiety and maximize the confidence level among learners' knowledge, skills and abilities, and in the same time OBE promotes a positive attitude towards the level of the academic achievement and better understanding about the content (Preez, 2015).

Method

Single-factorial design (Single-factor experiment) was used during the study experiment with the independent formative assessment procedure for four weeks on daily basis consisted of content related to gravitation, work and energy, and properties of matter (mentioned in table 1). Fifty four students of class IX were participating in the study, 27 students were distributed in two groups, i.e. OBE and closed book examination. All the struggling learners were included in open-book exam group on the basis of their motivation level and previous academic achievement. Before the OBE, most of the struggling learners were found to have exam anxiety and demotivation towards assessment as they were afraid of failure and low assessment scores. After experimenting, the struggling learners were again asked for their motivation and found that they had less exam anxiety and less demotivation. Both the groups were analyzed through 50 multiple choice questions MCQs

Exclusion criteria

In this experimental study, 27 students (more than 40% marks) were allotted for closed book examination in the same class.

Inclusion criteria

Struggling learners (n=27) were selected on the basis of poor or low academic achievement in the previous annual result and classroom test record and facilitated during the formative assessment.

Struggling learners were allowed to consult notes and other helping materials during the formative assessment phase in order to answer the questions. The experiment took place for three weeks at Federal Government Public School No 2 (Boys) Tariqabad Rawalpindi. The following topics of Physics of grade- IX were taught during the experimental duration. Detail of the experiment is given in table 1.

Table 1

Timeline for experiment

S. No.	Chapters from SSC-I Physics Book	Content	Duration
01	Gravitation	Force of Gravitation	40 min (Monday)
02	Gravitation	Law of Gravitation	40 min (Tuesday)
03	Gravitation	Mass of Earth	40 min (Wednesday)
04	Gravitation	Variation of G with altitude	40 min (Thursday)
05	Gravitation	Artificial Satellites	40 min (Friday)
06	Work and Energy	Work	40 min (Monday)
07	Work and Energy	Energy	40 min (Tuesday)
08	Work and Energy	Kinetic Energy	40 min Wednesday)
09	Work and Energy	Potential Energy	40 min (Thursday)
10	Work and Energy	Fossil Fuels	40 min (Friday)
11	Properties of Matter	Matter	40 min (Monday)
12	Properties of Matter	States of matter	40 min (Tuesday)
13	Properties of Matter	Pressure	40min (Wednesday)
14	Properties of Matter	Atmospheric pressure	40 min (Thursday)
15	Properties of Matter	Pascal's Law	40 min (Friday)
16	Surprise test	MCQs	50 min (Monday)

Table 1 indicates the selected content from a physics textbook IX class for the experiment along with the duration. The mentioned topics in table 1 were covered during the experiment.

Procedure

The academic achievement record of IX Class learners was obtained from an examination branch of the institution along with weekly test achievement record, all the learners of class IX were taken as a sample for the research. Sample was divided into two groups i.e. low achievers and high achievers which means that the sample was stratified, so stratified sampling technique was applied in the present research, two groups (open book group and closed book group) were constructed on the basis of previous academic achievement for research purpose, 27 low achievers (less than 40% marks) were named as struggling learners for open book examination, while remaining 27 (more than 40% marks) were allotted for closed book examination in the same class. The motivation of struggling learners was sought out by interviewing them before and after OBE. Ten open ended questions were asked to struggling learners regarding their motivation for the examinations. During formative evaluation phases in the experiment, (n=27) struggling learners of the open book examination group were facilitated to answer the questions with

the help of notes, keys, and books, while closed book group (n=27) was not allowed to consult helping materials for formative questions/answers. A healthy, motivating environment was created between groups in the classroom during the experiment. After completion of the experiment, a surprise test of MCQs consisted of fifty (50) test items were administered to both groups. The items were on the comprehension level of cognitive domains. It was ensured that during the experimental phase, the struggling learners would not take any extra coaching classes.

Validity of the Tool

Initially, a pool of 75 items was generated. The test was validated by four Physics teachers. Only those items were retained which were recommended by at least three Physics teachers. The item difficulty was finding out by pilot testing of the tool (test).Only those items were retained which were of moderate difficulty level. The items fell in the range of 0.41-0.60 were included in the final test. In this way the final test consisted of 50 items only.

Statistical Analysis

The collected data for open and closed book exam were scrutinized by using SPSS. Descriptive statistics, frequency and t-test were applied to interpret data, the results are shown in the following tables:

Table 2

Mean scores of academic achievement level

Academic Achievement Level	N Statistic	Minimum Level	Maximum Level	Mean Score Value
Open Book Exam	27.00	16.00	45.00	32.5556
Closed Book Exam	27.00	19.00	41.00	30.1852

Table 2 shows that the mean score of open book examination was 32.556, while the closed book examination group was 30.1852, which indicates the value of central tendency of the data for open and closed book academic achievement of the learners.

Table 3

Descriptive statistics of academic achievement level

Academic Achievement Level	SD (s)	Var. (s^2)	Skewness Statistic	Std. Error
Open Book Exam	6.93005	48.026	- .509	.448
Closed Book Exam	7.21663	52.080	.044	.448

Table 3 indicates the standard deviation, variance and Skewness along with standard error of open and closed book examination. Std. Deviation of open book exam was 6.93005, while in case of closed book examination, it was found 7.21663, which reflects the low level of dispersion from the mean score value for OBE.

Table 4

Academic achievement open book exam frequency

OBE Score	f	%	Valid %	Cumulative %
16.00	1	3.7	3.7	3.7
20.00	1	3.7	3.7	7.4
23.00	1	3.7	3.7	11.1
25.00	2	7.4	7.4	18.5
27.00	2	7.4	7.4	25.9
28.00	1	3.7	3.7	29.6
30.00	1	3.7	3.7	33.3
32.00	2	7.4	7.4	40.7
33.00	2	7.4	7.4	48.1
34.00	2	7.4	7.4	55.6
35.00	2	7.4	7.4	63.0
36.00	3	11.1	11.1	74.1
37.00	2	7.4	7.4	81.5
39.00	1	3.7	3.7	85.2
40.00	1	3.7	3.7	88.9
42.00	2	7.4	7.4	96.3
45.00	1	3.7	3.7	100.0
Σ	27	100	100	

Table 4 explains the frequency, percentage, valid percentage, and cumulative percentage about the academic achievement of the struggling learners (open-book exam group), the minimum level in percent of the learners was 3.7, while maximum percentage was 11.1.

Table 5

Academic achievement closed book exam frequency

CBE Score	f	%	Valid %	Cumulative %
19.00	1	3.7	3.7	3.7
20.00	2	7.4	7.4	11.1
23.00	3	11.1	11.1	22.2
24.00	2	7.4	7.4	29.6
25.00	3	11.1	11.1	40.7
27.00	1	3.7	3.7	44.4
28.00	2	7.4	7.4	51.9
34.00	2	7.4	7.4	59.3
35.00	4	14.8	14.8	74.1
36.00	1	3.7	3.7	77.8
37.00	1	3.7	3.7	81.5
38.00	1	3.7	3.7	85.2
40.00	2	7.4	7.4	92.6
41.00	2	7.4	7.4	100.0
Σ	27	100	100	

Table 5 explains the frequency, percentage, valid and cumulative percentage of the academic achievement of the learners (closed-book exam group), the minimum level in percent of the learners is 3.7, while the maximum is 14.8.

Table 6

Standard error mean between open and closed book exam

Pair	**Coupled Diff Mean**	**SD (s)**	**SD Error Mean**
Open & Closed Book Exam	2.37037	11.93620	2.29712

Table 6 shows the mean score 2.37 and SD 11.93 of the pair in the academic achievement of open and closed book exam, and Std. Error mean is 2.29712.

Table 7

Comparison between open and closed book exam

Pair	**Paired Differences**		
	Lower	**Upper**	**T Value**
Open & Closed Book Exam	-2.35143	7.09217	1.032

df = 26 95% confidence interval of the difference

Table 7 explains that the value of "*t"* for open and closed book exam was 1.032 which is in acceptance state, shows that OBE is effective for struggling learners as compared to closed book exam.

Discussion

The mean score of struggling learners in open-book exam group (Mean = 32.55, SD = 6.930) was higher as compared to closed-book exam group (Mean = 30.18, SD = 7.21), which shows the academic achievement of struggling learners as a result of OBE and increase in motivation level.

The present study manifests the benefits of open book examination practices in relation to formative assessment specially for struggling learners. Since struggling learners have a wide range of abilities, therefore, teachers try to find out the ways or different pedagogical skills in order to eliminate learning disabilities of such learners (Khan, 2015; Block, 2012). Although the results of this study were analyzed in limited content including three chapters, but the reflection of this study shows significant effect on struggling learners in relation to motivational skills (open-book exam) in order to enhance the academic achievement. The results of this study are consistent with Elerstsen & Velemo, 2000; Mathew, 2012; Williams & Wang 2009; Magid & Schindler, 2011 but the place of closed book examination has its own value

towards assessment of learners. The results of the study were not homogeneous with the study of Agarwal, Karpicke, Kang, Roediger, & McDermott, 2008.

Conclusions

The performance of struggling learners in the open book exam was progressive towards the academic achievement. The effect of open book exam on struggling learners' achievement was better due to less level of difficulty or OBE facilitates second chance to obtain knowledge, therefore, OBE strategy may be an effective technique to motivate struggling learners to learn with curiosity. Open book exams promote self-directed learning as it facilitates learners' engagement in the learning process. It can be concluded that OBE approach diminishes exam anxiety among struggling learners and motivate them towards success in the learning process.

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