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Development of Instructional Modules Using the E-modular Approach and its Effect on the Academic Achievement of Students

1. **Asma Bibi** (Corresponding Author)
PhD Scholar, Department of Teacher Education, Faculty of Education, International Islamic University Islamabad
Email: aasmamurtaza@gmail.com
2. **Dr. Shamsa Aziz** Chairperson, Department of Teacher Education, Faculty of Education, International Islamic University Islamabad
Email: shamsa.aziz@iiu.edu.pk

Abstract

Developing instructional modules and determining their effect on students' achievement were the aims of the research. There were two phases of the study. The first phase was the development of modules, and the second phase was the tryout of the modules. Instructional modules were developed using the ADDIE instructional design model. The researcher had developed 12 instructional modules on the subject of educational leadership and management. A quasi experimental design was used for the study. For tryout purposes, the researcher had taken two groups, an experimental group and a control group, randomly. Two teachers with equal qualifications and experiences were selected randomly to teach both groups. Traditional teaching methods were used with the control group, while instructional modules were used with the experiment group. A pre-test was administered at the start and a post-test at the end of the tryout. The duration of the tryout was twelve weeks. The data were analysed using SPSS 26. It was found that the students in the experiment group outscored the students in the control group.

Keywords: Instructional Modules, ADDIE, E-modules, Modular Approach, Instructional Design

Introduction

Education is the top priority in every country. Every country tries to provide the best education to its citizens. Many developed and developing countries are using the modular approach in teaching due to its various advantages.

The application of computer technology in education dates back to 1950. The IT sector has transformed as a result of the quick advancement of computer technology. Computers are now as small as something you can hold in your palm. In the past, computers were as large as room size. These days, everyone's existence revolves around computers. A typical person utilizes a computer these days for a multitude of purposes. With the use of technology, educational materials and delivery methods can be made more widely accessible through a variety of remote and distance learning platforms, where further efforts are made to reach these disadvantaged and destitute individuals. The concept of free, flexible, and adaptive learning is more conducive to achieving the objectives of extendable educational inclusion.

Modular teaching have many advantages over traditional method of teaching. In modular approach, educational material is divided into small parts according to some specific objectives. The module is than incorporated with relevant graphics, videos, links, and activities. These additional resources can be very useful in the learning the main concept of module. Students can learn and repeat the module again and again (Areaya et al., 2011).

Modern methods are being adopted by all nations to enhance their educational systems. Modular approaches are among the most popular trends. The majority of nations in the world employ modular education. Its utilization is due to the fact that it provides instruction that is tailored to each student's needs and unique differences (Farooq, 2015). For educators and learners alike, UNESCO provides a multitude of modules that comprise its courses. Many nations use the modular model for trainings, course creation, teaching, and other purposes.

Several social science areas as well as science subjects adopt a modular approach. In the classroom, traditional approaches are frequently employed as teaching strategies. Although efforts are being done to adopt latest teaching techniques and methods but there is long way to accomplish these tasks in all the institutions around the country. The Pakistan Science Foundation launched a project in 2022 to develop STEM education teacher training modules for secondary and higher secondary education, keeping in mind the benefits of modules in the classroom.

There are many advantages of modular teaching, one advantage is that the students can excel at their own pace and speed. There are different types of activities in modules that are designed keeping in view the interests of the learners. The purpose of these activities is to educate learners with the best possible ways and means (Moore et al., 2011).

Purpose of the Study

The purpose of the study was to develop instructional modules in the subject of educational leadership and management and to try out the instructional modules in order to find their effect on students' achievement. Modules are being used in different areas, including the natural sciences, social sciences, and in the teaching of different subjects.

Research Objectives

The research objectives were:

1. To develop self-contained learning material for prospective teachers in the subject of educational leadership and management.
2. To ascertain the effect of e-modules on high, average, and low achievers.
3. To assess the effect of teaching with self-contained learning material and traditional method on the academic achievement of prospective teachers.

Significance of the Study

The goal of the study was to develop instructional modules through an e-modular approach, employing the ADDIE instructional design paradigm to guide the development of the e-modules. Educators and instructional technicians can utilize these modules to create modules at various skill levels for various courses. It removes the obstacles brought on by shame and nervousness about public speaking. Both high and low achievers can benefit from the modules in the same way. Students can repeat the courses as often as they like when using the modular approach. Students can therefore study at their own speed.

Delimitations of the Study

The study was delimited to the educational leadership and management course's e-modules. The fourth semester BSEd Hons students from Federal College of Education H-9 Islamabad were taught using e-modules.

Literature Review

Modular approach is not a new concept. It has deep roots. Many countries, like USA, UK, and Canada, have used this approach for academic purposes very effectively (Shaheen & Khatoon, 2017). A module is a self-learning, independent learning package. According to Farooq (2015) modules are different from chapters in terms of contents. Modules are well organized according to instructional theory.

Modular approach is being used in many fields of life. This approach is being utilized in the teaching of social sciences, natural sciences, and science subjects as well. In the modular approach, educational material is divided into chunks. All the materials are organized in the form of modules. These modules have well defined objectives, contents, activities, graphics material, videos, and references as well (Shaheen, 2013). The students can access this material according to their ease. The best thing is that the students can access the module material anywhere, anytime. The students can repeat the material according to their satisfaction until they master the concepts. There is also an assessment at the end of each module. This assessment can help the learners in learning the key concepts within the modules (Rashid et al., 2020).

E-modules are gaining popularity these days. Educational institutions are utilizing e-modules in the teaching of different subjects. E-modules are also being utilized in trainings and workshops. E-modules consist of contents supported by web materials, audio, videos, graphics, tables, and references (Ramadhan & Linda, 2020). E-modules have many advantages over printed modules. These modules can be accessed anywhere at any time. These modules are also cost-beneficial. E-

modules do not require any paper, and students can use them many times according to their needs (Castroverde & Acala, 2021).

Modules consist of certain components, which are building blocks for modules. Modules should have clear objectives that they have to achieve. The modules should have definite objectives, clear prior knowledge. It also consisted of diagnostic tests, a list of activities, pre and post-tests, additional resources for learning, etc. components can be varied according to the nature of the modules. New components can be added if required (Simunek, 2007).

An essential component of instruction development is instructional design. It provides a sketch on which instructions are prepared. The instructional design team consists of various personnel with different professional skills. A team can be made up of one person or more than one person. There are various instructional design models that are utilized in the development of an instruction. Similarly, instructional designers can utilize instructional design models according to their need (Rothwell & Kazanas, 2015).

When it comes to instructional design, the learners and target group are the most crucial factors. It is essential to understand the students, their learning preferences, prior knowledge, cultures, learning styles, hurdles to effective communication in the classroom, etc. An instructional designer ought to be adequately educated in order to prepare any sort of instruction (Dick & Carey, 2014).

Instructional modules have been developed using the ADDIE instructional design approach. The ADDIE model consists of various phases, from analysis to evaluate. Every phase provides input for the next phase and it is a systematic development process (Branch, 2009).

Different researches in the field of module development and its effect on students shows that the use of modules has a progressive impact on the success of students. Khalid (2011) conducted a yearlong study on the university students. The researcher found that the modular approach has a positive effect on the students' achievement. In another study conducted by Malik (2021), it was found that the test scores of students instructed using conventional methods differed from those using the modular method. Compared to the students in other groups, those who received instruction through a modular approach scored higher. Kausar (2018) found in the study that social site mediated modules have played an effective role in enhancing the learning of students.

While group activities can be added to modules to take advantage of the benefits of group learning, modular training also encourages individualized instruction. In a modular setting, students can learn at their own speed. Modules can be beneficial to students both at home and in an educational setting. Teachers and students can both benefit from the module. They can both make use of their time to study through modules.

Aalam (2019) has conducted a study of using modules in the English language. The researcher has found that the modular approach was useful in enhancing of English-speaking abilities. Several research studies have confirmed the effectiveness of the modular approach in the improving students' achievement and language proficiency. Studies also confirmed that a modular approach can be useful for high, average, and low-achieving students (Nardo, 2017; Aksoy, 2019; Njoku et al., 2021; Sunarno & Supriyanto, 2021). Keeping in view the various advantages of the modular approach, the researcher intended to develop modules and their effect on the achievement of students at BSEd hons.

Methodology

The aim of the study was the development and validation of instructional modules. The study had two phases. The first phase was the development and validation of instructional modules using an e-modular approach, and the second phase was the tryout of the modules. The modules were developed using the ADDIE instructional design model. A quasi-experimental design was used in the study. These modules were first validated by a team of experts. These exports have expertise in different areas of assessment, technology, and educational leadership. All the students at BSEd hons were the population of the study. The total number of students was 70 in the BSEd hons 4^{th} semester.

After the validation of the developed modules, the next step was the tryout of the modules. Two groups of BSEd hons were taken randomly as the control group and the experimental group. The experimental group's students were taught through instructional modules, whereas the control group's students were instructed by traditional methods. A pretest was taken at the start of the experiment. The duration of the tryout was twelve weeks. A posttest was taken at the end. The data was analyzed using SPSS 26.

Results and Findings

On the pretest, the experimental group's mean score was 11.31, while the control group's mean score was 10.76. Both groups were the same on the pretest (Table 1.1). The mean scores for the two groups weren't different significantly.

Table 1.1

Mean and t-value on Pretest of Experimental Group and Control Group

Group	N	Mean	Df	t-value	p-value
Experimental	32	11.31			
			68	1.15	0.254
Control	38	10.76			

The posttest mean scores for the two groups differed. The experiment group's mean score was 21.40, while the control group's mean score was 16.02. (Table 1.2).

Table 1.2

Mean Score of Experimental Group and Control Group on Posttest

Group	N	Mean	df	t-value	p-value
Experimental	32	21.40			
			68	8.416	.000
Control	38	16.02			

There was an obvious difference between the experimental group's and control group's mean scores.

Additionally, it was found that there were differences in the two groups' high, average, and low achiever students. Therefore, to determine the difference between the high achievers in the experimental group and the control group, an independent sample t test was employed. Additionally, there was a difference in the mean score between the high achievers in the control group and the experiment group. (Table 1.3).

Table: 1.3

Mean and t-value of High Achievers of Both Groups on Posttest

Group	N	Mean	df	t-value	p-value
Experimental	12	24.00			
			19	5.458	.000
Control	9	19.00			

The experimental group's high achievers scored a mean of 24.00 on the posttest, while the control group's high achievers scored a mean of 19.00. It was found that the mean scores of the high achiever students in both groups differed significantly.

Therefore, to determine the difference between the average achievers in the experimental group and the control group, an independent sample t test was employed. It was found that the mean scores of the average achiever students in both groups differed. (Table 1.4).

Table 1.4

Mean and t-value of Average Achievers of Both Groups on Posttest

Group	N	Mean	df	t-value	p-value
Experimental	14	20.07			
			31	6.089	.000
Control	19	15.73			

The mean score of the experimental group's average achievers was 20.07, while the control group's average achievers' score was 15.73. So, the two groups' mean scores differed significantly from one another. The experimental group's mean score was noticeably higher than the rest.

In order to know the difference between the low achiever students of the experimental group and the control group, an independent sample t test was used. The experimental group's mean score differed from the control group's students mean score. (Table 1.5).

Table 1.5

Mean and t-value of Low Achievers of Both Groups on Posttest

Group	N	Mean	df	t-value	p-value
Experimental	6	19.33			
			14	9.77	.000
Control	10	13.90			

On the posttest, the experimental group's low achiever students scored a mean of 19.33, whereas the control group's mean score was 13.90. It was found that the mean score for the two groups differed.

Discussion

Teaching using modules or e-modules is an emerging strategy. Many countries in the world are using this in the teaching of social sciences, natural sciences, and science subjects as well. Due to its advantages, many countries are utilizing this approach in the teaching of many subjects. In Pakistan, there was no study available in the subject of educational leadership and management. So, the researcher aimed to develop and try out modules in order to see their effect on the achievement of students. In a modular approach, the content is divided into little chunks. The modules are enriched with graphics, pictures, audio, video, etc. In a modular approach, each student can access modules anytime, anywhere.

After the tryout, the experiment group's performance differed from that of the control group. When compared to the students in the control group, who gained instructions using the traditional method, the achievement of the experiment group's students was significantly higher because they were taught using a modular approach. The findings of the research are consistent with those of the study by Shaheen and Khatoon (2017). The researcher developed modules on the subject of biology. At the end of the experiment, it was found that teaching biology using a modular method proved to be more successful than teaching of biology with the traditional method of teaching.

Kausar (2018) has developed a social site-mediated course for the subject of instructional technology. The researcher found that the students' learning was effective using social sites. The researcher suggested that long and theoretical courses can be taught effectively using social sites. The study's conclusions likewise supported those of Azhar's (2019) study. The researcher has developed modules using attributes of Power Point. The researcher found that the students' learning increased using Power Point modules.

Rashid (2021) conducted a study on the development of modules for teaching human rights course. The researcher found that teaching the subject of human rights was effective using a modular approach. The research confirmed the results of Rashid's (2021) study. The research also confirmed the findings of the study by Utami et al. (2020). Utami developed modules using an instructional design model. These modules were based on hybrid guided inquiry. The researcher found that these modules were useful in the learning of the learners. The findings of the research are consistent with those of Haryanto and Rustana (2021). They developed modules in the subject of physics using the ADDIE instructional design model. The researcher found that at the end of modules, students' achievement was high.

Finding the effect of instructional modules on the educational outcomes of high, average, and low achiever students was one of the study's objectives. It was found that the achievement of high, average, and low achiever students in the experiment group who were taught using a modular approach was high as compared to the achievement of students in the control group. These findings confirmed the findings of the study by Ahmed (2007). Ahmed used modules on different ability groups and found that students' achievement increased using the modular approach.

Ganiron (2015) developed modules on the subject of physics. In his studies, he finds that these modules were helpful in increasing the achievement of high and low achiever students as compared to attainment of the students in other groups. Thus, Ganiron's findings supported the study's findings. The study' findings also support the findings of Javed (2016). The researcher developed modules and found that computer-supported modules were helpful in the achievement of different ability groups. The findings of the study by Javed confirmed the findings of this study.

Conclusion

On the basis of the findings of the study, it is concluded that the modular approach is a very useful teaching strategy. This approach has improved students' achievement. Students can access material and comprehend it according to their own ease. They can repeat the modules if feel difficulty. It is a useful strategy for increasing the academic achievement of students as compared to the traditional method of teaching. Moreover, this approach is also useful in increasing the academic achievement of different ability groups of high, average, and low achiever students. Students in the high, average, and low achiever of the experiment group who were taught using instructional modules performed better

as compared to the students in the control group. This approach can be used for teaching other subjects to increase the achievement and learning of students of different abilities.

Recommendations

After conclusion and discussion, the following recommendations are formulated:

1. Instructional modules are helpful in the achievement of prospective teachers of BSEd hons in the subject of educational leadership and management. This approach may be used in teaching of other subjects of BSEd hons.
2. The modular approach may be used at the school, college, university to teach other subjects, including science subjects, technical subjects, and language subjects too.
3. Instructional modules have also improved the achievement of the high, average, and low achiever students in the experiment group. So, it is recommended that these modules may be used by all students with different abilities.
4. Instructional modules may be developed for different trainings, workshops, and seminars.
5. It is recommended that, for the implementation of these modules, teachers may be given training about how to use these modules in the class.

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