Study on the Efficiency of Mathematics Distance Education

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Abstract

In view of scientific and technological advancements, enthusiasm and need of the people for learning and the phenomenon of urban sprawl in many countries, especially advanced and industrial countries, distance education system has been used for many years as a method of teaching people in different locations and in different times without the student’s needing to attend a class. Since it has been only a few years that this type of education has been used in the education system of the vast country of Iran and in view of special structure of mathematics and the importance and sensitiveness of its education, the present study was made to assess the success of students in this system of mathematics education. The statistical population of this research consists of 95 boy students from high schools of Tehran who were chosen by quasi-cluster method. 35 students in distance education system were chosen as experiment group and 60 students in traditional education system were chosen as control group. Using quasi-standard harmonious mathematics test and according to the results of descriptive statistics, Levene tests and independent samples test, this method of mathematics education was not found efficient for high school students of Tehran.

Keywords: Distance education, traditional education system, mathematics education, efficiency, learning.

1 Introduction

In view of technological advancements, growth of population, high volume of information, facilitated communication, distribution of citizens in different areas (considering the ability of mankind to reside in places which he could not use before), urban sprawl, spending money and time for commutation, gradual change of living method, the increased enthusiasm of the mankind for learning and his motives for economic and occupational promotion, time constraints of participation in class, differences among students in their ability to learn a subject in a certain time, the need for various educational methods and many other issues, it is inevitable to use distance education system along with traditional education. Wedemeyer (1981) believes that face to face education is not feasible for all, as some people are unable to
attend a real class in a certain time and place. This becomes feasible only when time and space constraints of face to face education are eliminated (IFIP, 2004) [2, 6]. Distance education as a factor contributing to social and economic development has become an essential part of education system in all countries especially developing countries (UNESCO, 2005) [5]. Distance education has the capability of quantitative and qualitative development in different times and places as well as in different educational levels owing to its unique characteristics. In any country therefore, education planners may consider the expansion of public education with an approach to distance education. Nowadays almost all countries even the third world countries, use some kind of distance education to fulfill some of its educational goals. The advanced countries do the same with the difference that distance education is mainly provided to those who due to some reasons don't want or cannot use fulltime traditional education (Daniel, 1993) [5]. But the question is that what points should be considered in educational design of each discipline based on its special structure and educational goals. Do auto-mechanics and political geography have similar problems in distance education system? Can mathematics be taught with a physical distance between teacher and student? Do the age and mental capability of students allow education planners and distance education experts to provide an educational design appropriate for all levels of mathematics in distance education system? Considering that one of the duties of each educational system is to provide a good environment for teaching mathematics and to motivate students to learn mathematics so that other products of this discipline can be accessed by all, can human societies fulfill this goal without distance education? There are many questions like this which must be answered. The present essay attempts to answer some of the questions about the efficiency of distance education of mathematics compared with traditional education system in high schools of Tehran. Some of these answers can be generalized to other regions.

2 Review of Literature

Distance learning is not a new concept. It has been a long time that educational institutes have provided distance learning courses in different ways. The history of correspondence courses dates back to early 1980s. With technological advancements, different types of distance learning were developed accordingly. Universities provided distance learning courses for direct and independent study by using video materials. The advent of internet and its application in distance learning led to the increasing growth of distance learning courses in university level (Beyker, 2003) [1]. Virtual education (open education) began in 1850s based on correspondence education which was used in the Soviets and subsequently in Berlin and Sweden. With the advancement of communication technologies (press, radio, TV and particularly Internet), virtual education has been increasingly growing. From the establishment of Open University of England in 1969, this system provided education in a broad scale by using the powerful media of Radio and TV. The modern technology of electronic communication in its special sense and the feasibility of its educational application began in late 1990s in European countries and in the US. In Iran, a school was established in 1971 in Aboureyhan Birooni University for distance education by correspondence method. This school which was named correspondence school began with four fields of study and after a while expanded to seven fields. After a short time with increase in the number of students and fields of study, it was divided into two schools of "humanities and social sciences" and "sciences" (Farajollahi, 2008) [1]. Distance education institute in Iran began its activity in 2005 with the aim of helping education system, reducing educational costs and covering the regions to which education system could not provide educational services. This type of education considerably helped the creation of equal educational opportunities particularly by covering those who were unable to study in traditional education system. Rural people and those living in deprived areas could continue their studies through local distance education centers or if such local center didn't exist through satellite classes (education houses) which worked under supervision of distance education centers. Students in deprived areas can now study guidance school until pre-university program as well as work & knowledge course of study. These centers provide education by
book, audiovisual and electronic (virtual) methods (Mirzaei, 2008) [3]. Many studies have been made so far in Iran and other countries about distance education. Here we mention some of them: Majidi & Bandari (2001) made a study on open and distance education methods. Rezaei (2001) in his paper under title of "independent learning and the role and responsibility of learner in this type of learning" has made a comparison between independent and face-to-face learning and studied the characteristics of independent learning, the steps of teaching, and educational technologies in independent learning model [4]. Galosha (2000) pointed out the obstacles of distance education including reduction of student's motives due to lack of face-to-face contact with instructor and classmates, increase of initial costs and lack of support by scientific staff [2]. Beri Velice (2007) believes that distance education by using different technologies including printing, telephone, radio, television and computer has considerably eliminated education obstacles such as space and time constraints [2]. Grisown & Anderson (1999) concluded in their research that independence and collaboration of students in distance education are seemingly opposite words; with increase of one, the share of another reduces [2]. Anderson, Warnhagen & Campbell (1998) found out that the most important source of cooperation and recognition of technical and educational problems is not only technical or educational experts but also close relation with accessible colleagues and each of the teachers [2]. In view of the foregoing researches, it is necessary to study the efficiency of distance education in Iran.

3 Research Hypothesis

The following hypothesis has been investigated in this research: "mathematics distance education is more efficient than traditional education of mathematics for high school students".

4 Research Method and Samples

In terms of data collection, this research is a quasi-experimental and non-interventional study. After choosing experiment and control groups by quasi-cluster method and comparing pretests and posttests, changes in scores of the two groups were assessed. This research also used library method to observe history, views, essays, goals and definitions. The statistical population of this research consists of 95 boy students from high schools of Tehran who were selected by quasi-cluster method. 35 students in distance education system were chosen as experiment group and 60 students in traditional education system were selected as control group.

5 Research Instrumentations

To study the efficiency of high school mathematics distance education, a teacher-made quasi-standard mathematics test was used. This test had 30 questions in total, divided into two parts of pretest and posttest. Scores of final examinations in the third grade of guidance school were used in pretest and scores of final examinations in the first grade of secondary school were used in posttest. Total score of the tests was 20. Pretest was designed on the basis of full contents of mathematics book of the third grade of guidance school and posttest was designed on the basis of full contents of mathematics book of the first grade of secondary school. The validity and reliability of the test was confirmed by skilled teachers of mathematics.

6 Data Collecting Method

To carry out the research, 35 boy students were chosen from the first grade of high school in distance education system in District 2 of Tehran and 60 boy students of the same economic, cultural and social level were chosen from the first grade of state high school in the same district. First, mathematics scores
achieved by the two groups in examinations of the third grade of guidance school (with similar questions and traditional education system) in the previous year were evaluated and then, after one year of education with two systems of distance education and traditional education, their final examinations scores in the first grade of secondary school were assessed. It is noteworthy that in distance education system of Iran, students are educated by means of self-education books and problem-solving classes which students are not obligated to attend. Internet education is rare in this system but sometimes educational software is introduced to students.

7 Findings

Here the data achieved by the research is analyzed in two parts of descriptive and inferential statistics. In the first part as shown in Table 1, the mean of experiment and control groups in pretest and posttest has been compared.

Table 1: Descriptive statistics for control and experiment groups

<table>
<thead>
<tr>
<th>Groups</th>
<th>N</th>
<th>Mean</th>
<th>Std</th>
<th>Min</th>
<th>Max</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pretest of control group</td>
<td>60</td>
<td>16.78</td>
<td>0.37</td>
<td>10</td>
<td>20</td>
</tr>
<tr>
<td>Posttest of control group</td>
<td>60</td>
<td>10.98</td>
<td>0.6</td>
<td>0</td>
<td>20</td>
</tr>
<tr>
<td>Pretest of experiment group</td>
<td>35</td>
<td>16.45</td>
<td>0.46</td>
<td>20</td>
<td>20</td>
</tr>
<tr>
<td>Posttest of experiment group</td>
<td>35</td>
<td>8.14</td>
<td>0.77</td>
<td>0</td>
<td>17</td>
</tr>
</tbody>
</table>

According to Table 1, the two groups had equal mathematics knowledge at first but after a course of study with two different educational systems, though final mean of both groups considerably reduced, the mean of experiment group is not more than control group. This occurred while standard deviation of the two groups in pretest and posttest was not so different. One-sample Kolmogorov Smirnov test was used to determine normality and abnormality of students' scores. According to Table 2, the data is normal (P>0.05).

Table 2: The results of One-Sample Kolmogorov-Smirnov test

<table>
<thead>
<tr>
<th></th>
<th>Pretest control</th>
<th>Posttest control</th>
<th>Pretest Experiment</th>
<th>Posttest Experiment</th>
</tr>
</thead>
<tbody>
<tr>
<td>N</td>
<td>60</td>
<td>60</td>
<td>35</td>
<td>35</td>
</tr>
<tr>
<td>Sig</td>
<td>0.08</td>
<td>0.68</td>
<td>0.78</td>
<td>0.08</td>
</tr>
</tbody>
</table>

As shown in Table 3, the results of Levene Test reveals that data variance in pretests is equal (P>0.05). According to Independent Samples T-test, there is no meaningful difference between mean of control and experiment groups in pretests (P>0.05). Therefore control and experiment groups are obviously in an equal level.
As shown in Table 4, the results of Levene test reveals that data variance in posttests is equal (P>0.05). The results of Independent Samples T-test show that there is a meaningful difference between the mean of control and experiment groups in posttests (P<0.05). In addition the difference between the mean of control and experiment is clear in interval of difference; upper and lower values. Therefore we can say that mathematics distance education is not more efficient than traditional education of mathematics for high school students.

### 8 Conclusion

According to the findings of this study, though being one of the widely accepted education methods in Iran, distance education is not as efficient as traditional education system especially in the field of mathematic. However educational managers of Iran deem it essential and inevitable and students of this system are satisfied with studying under this system due to their need. Considering that governmental and private institutions have made great investments and students have passed their educational period, it is strange why no efficient research is conducted on this area under supervision of education organization. An education system is efficient and cost-effective only if it possesses necessary infrastructures whether in research area or in the field of production of efficient educational software and hardware. It seems that among the reasons of inefficiency of this system are the lack of good educational planning by education planners and lack of student's feeling as a member of student community. Holding regular examinations and obtaining students’ activity report may be useful actions. Also the use of educational software compact disks and internet along with educational books are among the useful methods used in advanced countries. Here it is recommended to carry out the following studies:
- Study on the reasons of inefficiency of distance education in high schools of Tehran.
- Comparison between mathematics distance education in Iranian schools and advanced countries.
- Study on solutions for enhancing the relations between groups of students in distance education system.
- Study on mathematics education method by help of question solution in distance education system.
- Study on solutions for enhancing students' feelings and emotions in distance education system.
- Study on cost-effectiveness of development of distance education system instead of construction of rural schools in Iran.
- Influence of cultural and social role of mathematics in distance education system.
- Study on the use of mathematics distance education and process of thinking.

The present research has been limited to boy students of the first year of secondary school.

References


