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Research Article

The Effect of Virtual Classrooms on Improving the Solving Complex Problems Skills

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ABSTRACT

The aim of this study is to explore the effect of virtual classrooms on improving the solving complex problems skills. The participants were 60 participants from the College of Education at Najran University. They were randomly divided into two groups (control and experimental), each group included 30 participants. So that the control group studies the course in the traditional way, and the experimental group studies the course through a program based on augmented reality. Moreover, 7 tasks of the Micro-DYN test battery were used as a tool to achieve the objective of the study. The study found the effectiveness of the virtual classrooms in enhancing the skills of solving complex problems, mainly the acquisition and application of knowledge.

Keywords: virtual classes; complex problems; skills.

INTRODUCTION

Virtual classrooms are a common technology in the current global context [1-3]. The virtual classroom is a technology product [4-6]. This is because it is an electronic learning environment, that is easily accessible via the Internet at a reasonable price, and this environment is flexible [7-9]. The virtual classroom can also be defined as an electronic classroom that offers an educational course that can be expanded in content, space, and time [10-12]. It features an interactive learning environment that features audio and video broadcasts and discussion boards [13-15]. A class enables students to attend from different locations overcoming space restrictions. In addition, by recording the lecture, students can view it from different times, overcoming the restrictions of time, and that is why it was called an assumption [16-18].

Many previous studies dealt with virtual classrooms by research and experimentation. Including the study of Elbyaly and Elfeky [19], which compared a virtual classroom with a traditional classroom according to undergraduate English language students. The results showed that the students who engaged in the virtual class were better than their colleagues who studied in the traditional class, and the virtual class allowed more interaction between the faculty member and the students. In addition, the study of Elfeky [20], which investigated the perceptions of both faculty members and students in the English Department towards virtual classes. The results revealed that most of the faculty members and students have positive perceptions towards the virtual classroom, and the results revealed the enhancement of communication skills because of the use of the virtual classroom. As well as the study of Elfeky [21], which examined the effectiveness of virtual classes on the English language proficiency of students of Community College in Tabuk compared to the traditional method. The results revealed the effectiveness of the virtual classes compared to the traditional method in terms of developing English language proficiency, which was shown through the result of the achievement test of the English language. In addition, the Collaborate Ultra Experience LTI virtual classroom is a unique addition for students who benefit from the use of virtual environments. Which is used by integrating it into the Blackboard system. This application aims to facilitate

smooth, real-time interaction between students and faculty members with the support of IT infrastructure and new technologies [22-24].

In addition, complex problem solving involves successfully interacting with problems that change dynamically over time. Accordingly, solving complex problems includes a set of abilities such as the ability to gain knowledge about a complex system by exploring it (knowledge acquisition), and the ability to correctly apply the acquired knowledge to reach the goal state (knowledge application) [25-27]. In other words, it can be said that solving complex problems is an individual skill that has gained importance in educational and psychological research. Because it requires skills that go beyond routine thinking [28-30]. Moreover, complex problem-solving tasks require the performance of more complex mental processes than intelligence tests do, such as actively interacting with a problem to gain knowledge about the problem environment [31]. In general, complex problems of reducing the barrier between a given starting state and the intended goal state are solved with the help of cognitive activities and behavior [32].

RESEARCH PROBLEM

Problem solving is the foundation of many higher education processes and is therefore seen as a primary educational goal. It can be said that solving complex problems is a self-directed mental process and requires users to constantly acquire knowledge [33]. Solving complex problems is of great value in the skills of the "Issues and Problems in Teaching Digital Skills" course, which provides many opportunities to make significant progress in solving many issues and problems that we encounter in teaching digital skills. Hence, complex problem solving is seen as a critical factor in making a difference in achieving the objectives of this course [34-36]. However, little is known about whether virtual classrooms are effective in enhancing complex problem-solving skills for students. Based on the foregoing, the problem of this study can be formulated in an attempt to identify the effect of virtual classrooms on improving the solving complex problems skills.

METHODOLOGY

The methodology of the current study was to use the semi-experimental approach, in order to find out the effect of the independent variable (virtual classrooms) on the dependent variable (complex problem-solving skills), and as a result, the design shown in Table (1) was used using two groups (control and experimental).

Table (1): Design of the study

	Treatment	Post-test
Control Group	Traditional way	Micro-DYN test battery
Experimental Group	Virtual classrooms	

RESEARCH TOOL

Complex problem solving was fully assessed using the computer-based Micro-DYN test [37]. In order to familiarize the participants (study sample) with the program for the Micro-DYN test and its tasks. Detailed instructions, including a trial task, were provided to participants before the start of the assessment. Afterwards, the participants dealt with (7) Micro-DYN tasks to assess their complex problem-solving abilities. In general, learners had to find relationships between a variety of variables, where at least three input variables were associated with two/three output variables. Initially, the participants were not aware of the relationships between the variables. The output variables also changed gradually and dynamically in some tasks without addressing the input variables, as this is a feature of complex problems.

RESULTS

To answer the main study question; To prove whether the use of virtual classrooms has an impact on the development of complex problem-solving skills among learners, Confirmatory Factor Analysis (CFA) within the Structural Equation Model (SEM) was used as a measurement model for latent variables. Two dimensions of complex problem solving (i.e. knowledge acquisition and application) were considered as latent factors/variables, with six scores attached to each dimension. All the statistics for the measurement model were fit as RMSEA = .043,

PRATIO = .993, CFI = .979. Thus, the model adequately fits the extracted data (Alanzi & Alhalafawy, 2022b; Alshammary & Alhalafawy, 2023; Alzahrani, Alshammary, & Alhalafawy, 2022; Greiff et al., 2016). Figure (1) presents these statistics:

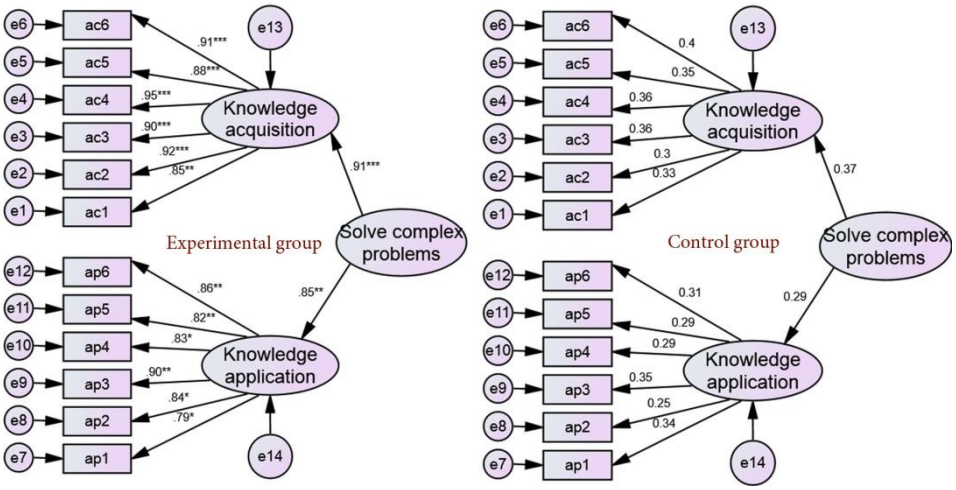

Figure (1): Confirmatory Factor Analysis (CFA) for solve complex problems

Figure two shows that the first task of the Micro-DYN test battery for the experimental group, knowledge acquisition was positively related to virtual classrooms (ß = .85, p < 0.01). In addition, knowledge application was positively related to virtual classrooms (ß = .79, p < 0.05). While knowledge acquisition and application were less correlated in the control group (ß = 0.33, p = 0.17; ß = 0.34, p = 0.26), respectively. In the second task, both knowledge acquisition and knowledge application were also positively associated with virtual classrooms in the experimental group (ß = 0.92, p < 0.001; ß = 0.84, p < 0.05), respectively; While knowledge acquisition and application was less correlated in the control group (ß = 0.30, p = 0.09; ß = 0.25, p = 0.11), respectively. Moreover, in the third task, both knowledge acquisition and knowledge application were positively associated with virtual classrooms in the experimental group (ß = 0.90, p < 0.001; ß = 0.90, p < 0.001), respectively; While knowledge acquisition and application was less correlated in the control group (ß = 0.36, p = 0.15; ß = 0.35, p = 0.19), respectively.

Figure two also shows that for the fourth task, the acquisition and application of knowledge were positively related to virtual classrooms in the experimental group (ß = 0.95, p < 0.001; ß = 0.83, p < 0.05), respectively; While knowledge acquisition and application was less correlated in the control group (ß = 0.36, p = 0.21; ß = 0.29, p = 0.16), respectively. Besides, in the fifth task, both the acquisition and application of knowledge were positively associated with virtual classrooms in the experimental group (ß = 0.88, p < 0.001; ß = 0.82, p < 0.05) respectively; While knowledge acquisition and application was less correlated in the control group (ß = 0.35, p = 0.25; ß = 0.29, p = 0.22), respectively. Finally, in the sixth task, both the acquisition and application of knowledge were positively related to virtual classrooms in the experimental group (ß = 0.91, p < 0.001; ß = 0.88, p < 0.001), respectively; While knowledge acquisition and application was less correlated in the control group (ß = 0.40, p = 0.32; ß = 0.31, p = 0.26), respectively.

By comparing the results of the students in the experimental and control groups, it can be seen that the complex problem-solving skills (acquiring and applying knowledge) of the students who learned with virtual classrooms were better than the skills of their colleagues in the control group.

DISCUSSION

The average scores of the participants in the experimental group who learned through virtual classrooms was higher than the average scores Control group participants who were taught in a classroom with instructional video support. That is, this study highlights the added value of programs based on virtual classrooms in enhancing complex problem-solving skills of learners in the experimental group. This is largely because well-designed virtual classrooms can help students relate the task to the real world and create new meanings for them [38-40]. This result also confirms that virtual classrooms are a very flexible tool that can be used to achieve different goals in different educational environments if applied well and integrated [41]. In other words, the use of virtual classrooms

had a significant impact because it provided students with high levels of independent thinking, creativity, and critical analysis [42]. Virtual classrooms stimulated and excited the participants in the experimental group by creating a distinct learning environment in which they did not feel bored. When virtual classrooms are properly designed for educational purposes, this can stimulate the authentic practice of skills [34].

RECOMMENDATIONS

- Interest in learning how to solve complex problems in various courses and at different educational levels.
- Preparing instructors to use virtual classrooms.
- Use a variety of other technology products to improve the solving of complex issues.

SUGGESTED RESEARCH

- To confirm the success of using virtual classrooms in other environments, we recommend conducting similar research and studies in other educational stages.
- Conducting more research and studies to develop complex problem-solving skills using augmented reality.
- Using the virtual reality to conduct studies to develop complex problem-solving skills for detection.

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