# THE IMPACT OF PROBLEM-SOLVING PROGRAMS IN DEVELOPING CRITICAL THINKING SKILLS

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**ABSTRACT**

*This study intends to demonstrate how well a problem-solving curriculum develops critical thinking abilities. After randomly splitting the participants into two equal groups (control and experimental), the study was conducted on a sample of learners of the Optimal Investment Program in the Department of Curricula and Teaching Methods. The primary research instrument was a test of critical thinking. The findings demonstrated that the problem-solving program had an impact on the experimental group's growth in critical thinking abilities in a favorable and statistically significant manner. This effect was mediated by the underlying factors of identifying and controlling variables, testing hypotheses, and reasoning.*

*Keywords: Problem; critical thinking skills; learning; Problem solving program*

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## INTRODUCTION

Learners and teachers alike often face many problems in the educational process [1, 2]. A problem-solving program is a structured method of instructing and learning that includes students in challenging, real-world tasks that lead to presentations to an audience or the creation of a finished product that can be duplicated. This method aids pupils in acquiring knowledge and abilities that will improve their quality of life [3-5]. In addition to imparting knowledge, problem-solving programs aid in the growth of students' critical and creative thinking, teamwork, lifelong learning, self-evaluation, and capacity for change. [6, 7]. A novel method to lifelong learning that places an emphasis on education for sustainable development is the problem solving program [8, 9]; the development and transmission of new information is one of the main constructivism-related tasks in problem solving programs. [3, 10]. The move from learner centered to teacher and curriculum-centered learning is supported by problem solving programs. [11-13]. The use of a topic-related problem in a real-world setting as part of a problem-solving program experience has a positive impact on learning motivation and academic accomplishment for students, according to the findings of previous studies [14-16]. Additionally, studies show that problem solving programs should be utilized for a particular number of hours each week and are frequently used in a range of courses [3, 17].

In other words, a problem-solving program is an inquiry-based educational strategy that encourages students to contribute to the creation of knowledge by addressing significant issues and producing meaningful products [14, 18]. This method of training also helps pupils build their practical skills. and reasoning, strengthening their ability to conduct research, conduct analysis, and make decisions [15, 19]. Students can participate in activities that are equivalent to those carried out by specialists in the real world thanks to problem-solving programs [20, 21]. Students are divided into groups of varied sizes as part of a problem-solving program method, and each group is given equal responsibilities and roles in the solution of the problem [20, 22]. Additionally, problem-solving program activities and procedures require the use of the mind or brain to link information, expression, and understanding to distinguish between opposing points of view [8, 23]. As a result, the cornerstone of a problem-solving program is made up of research-based theoretical concepts, active learning, social interaction, and cognitive tools [24]. Students can gain knowledge through asking questions, looking for answers, working with others, exchanging ideas, and making plans through the use of problem solving [25, 26]. The main objective of a problem-solving program is to increase students' ability to undertake thorough study on a particular topic. Encouragement of self-learning is the second objective, while material acquisition is the third [27]. The improvement of students' abilities to undertake methodical study on a particular topic is the main objective of problem-solving programs. The second objective is to promote self-learning, and the third objective is to acquire material [28-30].

It should be stressed that earlier research has demonstrated that problem solving programs can create a variety of learning outcomes, for example, they have a significant positive impact on students' academic development when compared to regular schooling [3, 31]. Additionally, it greatly improves students' capacity for original thought [6, 17]. Implementing a problem-solving program is another way to raise self-efficacy [15, 25]. However, a study of

pertinent literature did not reveal a complete attempt to apply problem-solving programs to enhance the critical thinking skills of students in the College of Education at Najran University.

Scientific thought processes including issue identification and description, information gathering to better comprehend the issue, scenario analysis, offering workable solutions to the issue at hand, and solution evaluation are also included in the category of critical thinking [32, 33]. It encourages the production of new information while enabling the learner to assess their existing knowledge [34]. Critical thinking includes participation, accepting accountability for our deeds, and making reasoned decisions [35]. The ability to collaborate with other learners to solve problems that develop during the learning process is at the heart of critical thinking skills [33]. Additionally, one of the main objectives of all educational systems is the development and improvement of critical thinking abilities [35, 36]. Debates can aid students in acquiring critical thinking abilities. The ability to think critically is also regarded as a requirement for moving on to the most complicated real-life situations and actively engaging in social situations [34]. The goal of learning is to develop critical thinking. Teaching strategies that encourage students to actively participate in the learning process, such as problem-solving programs, boost their willingness to participate [35, 37]. The goal of education should be to foster critical thinking among students [38], Additionally, a teacher-centered approach to teaching cannot help students develop their critical thinking abilities [39-41]. Based on the aforementioned, the current study makes an effort to close this gap by looking at how problem-solving programs affect students studying optimum investments' critical thinking abilities.

The core issue of this research, which prevents the attainment of the course objectives, is the large decline in the degree of critical thinking abilities for students who are receiving the best returns on investment with regard to the "Research Methods" course. The development of critical thinking abilities is another important objective of this course, which should be promoted generally in institutions of higher learning. As was stated in the research's opening, the teacher-centered teaching approach cannot help students develop their critical thinking skills. [39, 42]. Additionally, problem-solving programs result in a change from teacher- or subject-centered learning to learner-centered learning [11, 12]. In contrast to direct instruction, several earlier research emphasized the significance of problem-solving programs in developing students' thinking [14, 15, 43-45]. However, little is known about the effectiveness of problem-solving programs in developing students' critical thinking abilities for investment optimization. This leads to the question, "What is the impact of problem solving programs in developing critical thinking skills?" as the problem of this study.

## METHODOLOGY

The following design was employed because of the semi-experimental methodology that was used in this study to determine the impact of a dependent variable (critical thinking skills) and an independent variable (problem solving program).

**Table (1):** Design for a quasi-experimental study

| | **Treatment** | **Post-test** |
|---|---|---|
| Control Group | Traditional way | Critical thinking scale |
| Experimental Group | Problem solving program | |

### Research Tool (Critical Thinking Scale)

The Critical Thinking Scale was created using the results of numerous earlier investigations [46-51]. The three sections of the scale were inference (five items), definition and control of variables (five items), and hypothesis testing (six items). Each item was rated on a Likert scale of 1 to 5, with 5 representing extreme disagreement. It is determined whether the critical thinking scale is accurate and whether it has to be removed, added, or modified by presenting it to a group of arbitrators and experts in the domains of psychology, kindergarten, educational strategies, and teaching methods. Additionally, the scale's internal consistency is assessed using a survey group of ten participants from the same department's eighth level who were not included in the study's main sample. The stability of the scale is determined using the Cronbach's Alpha equation, which results in a value of (0.89). To ensure the validity of the results produced when using the scale.

## RESEARCH SAMPLE

Seventy-two workers of the Optimum Investment Diploma at the first level of the Department of Curricula and Teaching Methods in the College of Education at Najran University made up the research's final sample. After evenly dividing them into two groups (control and experimental), the control group will study "Research Methods" during the first semester of 2023. Through the conventional technique and a problem-solving program for the experimental group.

## EXPERIMENTAL PROCESSING MATERIAL

This study, which was conducted through the Blackboard platform and was based on the "Research Methods" course, went on throughout the first semester of 2022. Five students made up each of the many subgroups formed from the experimental group's participation, as suggested by Chen and Yang [3] and Olatoye and Adekoya [52] based on the number of participants in the problem-solving program, in order to achieve the best possible participant

interactions. So As a result, the process involves several parts, including 1- Teacher advancement, for the course through a virtual classroom integrated with the learning management system used at the institution, through discussions that stimulate the participants' prior experience. 2 - Encouraging the subgroup members to create a motivational question with the intention of giving the members the drive to keep concentrating on the project's issue. 3. After establishing the roles and responsibilities of the sub-group members, collect information regarding the leadership question from each member individually. 4- Each subgroup's members should present the findings to their fellow members for debate and evaluation. The instructor also shares some crucial findings with the smaller groups. 5. Each subgroup then collectively shows the other subgroups the finished result.

Eight lectures are given to the control group in the typical classroom. It should be mentioned that collaboration between the participants in the control group does occur in the typical classroom with the goal of improving their participation and facilitating debate and the exchange of ideas. Each student is required to present a research plan at the end of the course that exhibits his critical thinking abilities. This plan is then scored on the critical thinking scale.

**RESULTS**

In order to respond to the second study question, it was necessary to determine whether using problem-solving programs had an impact on students' ability to acquire critical thinking skills. Additionally, the three fundamental components of critical thinking—identifying and controlling variables, testing hypotheses, and reasoning—were calculated using multiple-group confirmatory factor analysis (CFA) within the Structural Equation Model (SEM) using the AMOS program, as shown in Figure 1.

According to the previous graph, using a problem-solving tool appears to benefit the control group's ability to detect and control variables (ß=.39, $p > 0.05$). Additionally, it seems that using a problem-solving tool has a favorable impact on the experimental group's choice of hypotheses (ß =.87, p 0.05). However, using a program for problem-solving has a smaller impact. In favor of selecting hypotheses in the control group (ß =.36, $p > 0.05$). Additionally, the experimental group's use of problem-solving programs had a favorable impact on the reasoning side (ß =.91, p 0.05), whereas the control group's use of project-based learning had a less significant impact on the inference side (ß =.32, $p > 0.05$).

Additionally, the experimental group's critical thinking was positively impacted by the aspect of detecting and regulating factors (ß =.85, p 0.05), whereas the control group's critical thinking was negatively impacted (ß =.35, $p > 0.05$). Additionally, in the experimental group, the side of picking hypotheses had a greater impact on critical thinking (ß=.82, p0.05) than in the control group, where it had a smaller impact (ß=.33, p>0.05). Finally, in the experimental group, the reasoning side has a beneficial influence on critical thinking (ß =.89, p 0.05), but in the control group, the effect is less significant (ß =.28, $p > 0.05$).

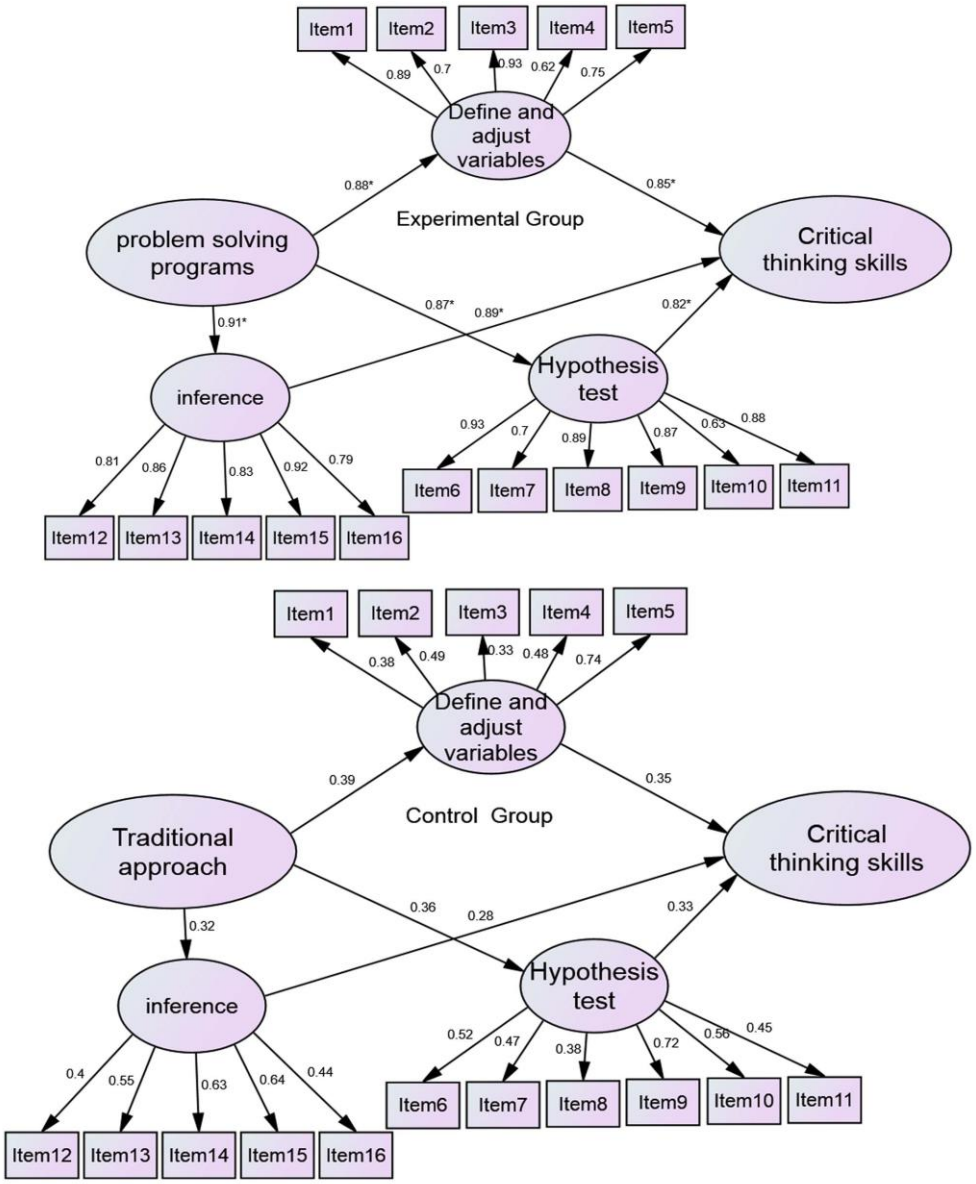


**Figure (1):** Multi-group confirmatory factor analysis (CFA) for latent critical thinking skills (variable identification and control, hypothesis testing, and reasoning)

Note: *$p \leq 0.05$

**DISCUSSION**

This study sought to determine the impact of a problem-solving curriculum on students' development of critical thinking abilities at the College of Education at Najran University's Department of Curriculum and Teaching Methods. The outcomes demonstrated that the group's growth of critical thinking abilities was positively and statistically significantly impacted by the problem-solving program. Empiricism is mediated by latent elements such variable identification and control, hypothesis testing, and inference. These findings are in line with those of other earlier studies, including [14, 15, 53, 54]. Additionally, this study's findings clearly point to a large and statistically significant impact of problem-solving programs. the development of the "identifying and controlling the variables" component, which entails "asking a main research question," "identifying the independent and dependent variables," "identifying theories, laws, and concepts related to the subject," and "describe the proposed experimental design". Additionally, the results show that problem solving programs have a significant and statistically significant impact on the growth of the "hypothesis testing" side, which includes "investigating the effect of the independent variable on the dependent variable," "explaining the relationship between variables," and "formulating zero and alternative hypotheses for research". The findings also show that problem-solving training has a significant and statistically significant effect on the growth of the "reasoning" side, which includes "identifying tools and methods for data collection," "analyzing data to ensure its validity," and "making decisions and evaluating solutions to problems".

**RECOMMENDATIONS**

The researchers advise the following actions based on the study's findings:

- The succeeding faculty members should receive training in problem-solving techniques within their respective fields.
- Improving critical thinking abilities through several additional techniques and procedures.
- Focusing on improving critical thinking abilities at other educational levels.

**SUGGESTED RESEARCH**

With respect to the research problem, the researchers come to numerous conclusions:

- Confirming, through more undergraduate study, the efficacy of problem-solving programs in other contexts.
- Improving critical thinking abilities by conducting more study to show how well augmented reality is used.
- Investigating the impact of collaborative online learning on improving critical thinking abilities in samples of female students.

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