



Original Article (Quantified)

The relationship between cognitive dissonance, scientific reasoning and systemic thinking with the academic progress of Babol University physics students with the mediating role of critical thinking

Akram Kamel Zaherolmahni¹ , Mohammad Hassani² , Hasan Ghalavandi³ 

1- PhD student, Department of Educational Management, Urmia University, Urmia, Iran

2- Professor, Department of Educational Management, Urmia University, Urmia, Iran

3- Professor, Educational Management Department, Urmia University, Urmia, Iran

Receive:

10 January 2024

Revise:

13 April 2024

Accept:

14 June 2024

Keywords:

Cognitive dissonance,
Scientific reasoning,
Systemic thinking,
Academic progress,
Critical thinking.

Abstract

The aim of this research is to investigate the relationship between cognitive dissonance, scientific reasoning, and systemic thinking with the academic progress of Babol University physics students; with the mediating role of critical thinking. The current research is applicable in terms of purpose, and descriptive-correlative in terms of nature. The statistical population of the research includes 249 physics students; due to the limited statistical population, the statistical sample was considered equal to the statistical population, therefore, the census method was used and all the physics students of Babol University have been considered as the statistical sample of this research. As many as 249 questionnaires were distributed among students and consequently 230 questionnaires were returned. Four standard questionnaires of cognitive coordination (Harmon Jones et al., 2007), systemic thinking (Dolansky et al., 2020), scientific reasoning (Golombic et al., 2022), and critical thinking (Watson and Glaser, 2002) were used to collect research data; and, students' GPA was used in order to measure academic progress. The validity of the questionnaire was confirmed by experts in educational sciences and confirmatory factor analysis, and the reliability of the instrument was confirmed using Cronbach's alpha coefficient in a preliminary study. SPSS and Lisrel statistical software were used for data analysis. The results showed that there is a negative and significant relationship directly between cognitive dissonance and academic progress, with the mediating role of critical thinking. It was also found that there is a positive and significant relationship directly between systemic thinking and scientific reasoning with academic progress, with the mediating role of critical thinking.

Please cite this article as (APA): Kamel Zaherolmahni, A., Hassani, M., & Ghalavandi, H. (2024). The relationship between cognitive dissonance, scientific reasoning and systemic thinking with the academic progress of Babol University physics students with the mediating role of critical thinking. *Management and Educational Perspective*, 6(3), 155-175.

Publisher: research centre of resources management studies and knowledge-based business

Corresponding Author: Akram Kamel Zaherolmahni

<https://doi.org/10.22034/jmep.2024.434843.1310>



Email: a.zaherolmahni@urmia.ac.ir

Creative Commons: CC BY 4.0



Extended abstract

Introduction

One of the most important and central issues in the fields of scientific education is understanding the nature of science. This understanding plays a significant role in understanding the philosophy and goals of scientific education, the content of textbooks, teaching strategies, teacher preparation (with its characteristics), and also evaluating the results of teaching and learning; because understanding the nature of science helps teachers to design appropriate strategies for teaching. For example, the more the teacher's understanding and recognition of the nature of science increases, the more the teacher's method of using effective teaching methods increases. These methods make the student the center of the educational process. This process emphasizes understanding the spirit of science, styles, and methods. Also, if the professor is aware of the nature of science, it has positive effects on the quality of question design and its applications (Hamilton & Hamilton, 2018). Therefore, the most important task and goal of the lesson is to increase the understanding of the teacher and student about the nature of science (Stonebraker & Howard, 2018). Science is not just an accumulated collection of scientific information and facts that are categorized in various disciplines. Rather, it is a physical body of regular scientific knowledge that can be achieved by applying the scientific method. By scientific method, we mean a method that is based on discussion and research in natural phenomena. In other words, the scientific method is an inseparable part of science itself. Also, the understanding of science guides us to determine the concept of science as a process or method that leads us to a scientific knowledge that can reach the concept of the same science (Paloş et al, 2019). Academic progress is one of the most fundamental issues of any educational system; so that the level of academic progress of students is one of the basic indicators of evaluating an educational system and the level of success in its scientific activities. According to the issues raised, this research tries to examine the question of whether there is a significant relationship between cognitive dissonance, scientific reasoning, and systemic thinking with the academic progress of physics students at Babol University with the mediating role of critical thinking.

Theoretical Framework

Cognitive dissonance

Cognitive dissonance is a psychological model that refers to specific ideologies and mental processes that manifest the fundamental empirical structures of goal reliance and emphasis on balance (Li et al, 2022).

Scientific argument

A scientific argument is an attempt to prove a fact, which usually includes a claim that may be supported by data, judgments, hypotheses, or descriptors (Saberi, 2018).

Systematic thinking

Systemic thinking in the general sense includes a large and countless set of methods, tools and principles, all of which focus on the mutual relationships between forces and seeing them in the heart of a single process (Rahmatollahi, 2020).

Critical Thinking

Critical thinking enables a person to investigate the truth during the confusion of events and information and achieve his goal, which is to reach the most complete understanding possible (Razavi & Nematifar, 2018).



Academic progress

The academic progress of the learners of any educational system indicates the success and efficiency of that system in realizing its goals and plans (Watson et al, 2021).

Sabih Mahdi & Ghalavandi (2024) investigated the effect of learning and motivational strategies on the self-efficacy of physical education and sports science students with the mediating role of academic progress and enthusiasm. The results showed that the effect of learning and motivational strategies, academic achievement goals and academic enthusiasm on students' academic self-efficacy was positive and significant; it was also found that the mediating role of academic achievement goals and academic enthusiasm in the effect of learning and motivational strategies on academic self-efficacy was positive and significant.

Li & Zhang (2023) investigated the cognitive/emotional dissonance of English language learners in content-based foreign language teaching: an ecological perspective. It was found that the cognitive/emotional inconsistency of English language learners in content-based foreign language education leads to learning decline and academic failure.

Research methodology

The current research is applicable in terms of purpose, and descriptive-correlative in terms of nature. The statistical population of the research includes 249 physics students; due to the limited statistical population, the statistical sample was considered equal to the statistical population, therefore, the census method was used and all the physics students of Babol University have been considered as the statistical sample of this research. As many as 249 questionnaires were distributed among students and consequently 230 questionnaires were returned. Four standard questionnaires of cognitive coordination (Harmon Jones et al., 2007), systemic thinking (Dolansky et al., 2020), scientific reasoning (Golombic et al., 2022), and critical thinking (Watson and Glaser, 2002) were used to collect research data; and, students' GPA was used in order to measure academic progress. The validity of the questionnaire was confirmed by experts in educational sciences and confirmatory factor analysis, and the reliability of the instrument was confirmed using Cronbach's alpha coefficient in a preliminary study.

Research findings

SPSS and Lisrel statistical software were used for data analysis. The results showed that there is a negative and significant relationship directly between cognitive dissonance and academic progress, with the mediating role of critical thinking. It was also found that there is a positive and significant relationship directly between systemic thinking and scientific reasoning with academic progress, with the mediating role of critical thinking.

Conclusion

The present study was conducted with the aim of investigating the relationship between cognitive dissonance, scientific reasoning, and systemic thinking with the academic progress of Babol University physics students with the mediating role of critical thinking. The findings are in line with the results of Vashani et al., (2019), Schuessler et al., (2016), Pouratashi & Zamani (2017), Shafiei et al., (2018), Chen & Ji (2021), Vashani et al., (2019), Mohammadi et al., (2016), Schuessler et al., (2016), Zyhier (2023), Yazdanbakhsh (2017), Vashani et al., (2019), and Shafiei et al., (2018). Zyhier (2023) showed that the effect of cognitive retention on critical thinking is positive and significant.

In line with the obtained results, the following suggestions are presented:



- 1- It is suggested to provide an environment for students to plan their learning activities and have self-direction in learning, as well as to have a flexible learning environment so that students can have cognitive order and to reduce cognitive dissonance.
- 2- Strengthening inference and analysis skills in order to strengthen the spirit of criticism and questioning among students.