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Developing and Validating a Teaching Metacognitive Skills Model based on Quantum Thinking to Student Teachers

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Research Paper

Abstract

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purpose: The aim of this research was developing and validating a teaching metacognitive skills model based on quantum thinking in student teachers.

Methodology: The present study in terms of purpose was applied and in terms of implementation method was mixed (qualitative-quantitative). The research population in the qualitative section was the books and articles related to metacognitive skills and quantum thinking in the last thirty years, which after reviewing them number of 50 cases (12 books and 38 articles) were selected as a sample by purposive sampling method. The research population in the quantitative section was student teachers of Farhangian University of Shiraz province in the academic years of 2020-1, which based on Cochran formula number of 100 people of them were selected as a sample by simple random sampling method. The research tool in the qualitative section was take noting of books and articles and in the quantitative section was a researcher-made questionnaire (33 items) whose psychometric properties were confirmed. Data were analyzed in the quantitative section by coding method in MAXQDA software and in the quantitative section by exploratory factor analysis and structural equation modeling in SPSS-23 and Smart PLS-3 software.

Findings: The findings of the qualitative section showed that the teaching metacognitive skills model based on quantum thinking in student teachers had 129 indicators, 33 components and 8 categories, which categories were including macro policy area, content of metacognitive curriculum and quantum thinking, teaching and learning processes, use of information technology, interaction with scientific research centers, psychological foundations, evaluation methods and characteristics of learners. Also, the findings in the quantitative section showed that 33 items in the 8 mentioned categories were placed; So that the factor load of all items and categories was higher than 0.70, the average variance extracted of all categories was higher than 0.60 and the cronbach and combined reliability of all categories was higher than 0.90. Other findings showed that the teaching metacognitive skills model based on quantum thinking in student teachers had a good fit and the effect of mentioned model on all eight categories of macro policy area, content of metacognitive curriculum and quantum thinking, teaching and learning processes, use of information technology, interaction with scientific research centers, psychological foundations, evaluation methods and characteristics of learners were significant ($P < 0.05$).

Conclusion: Based on the results of present research, officials and planners of Farhangian University can use the identified and validated model of teaching metacognitive skills based on quantum thinking in student teachers to improve teaching, training and learning, which for this purpose use the components and categories extracted from the present study is necessary.



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Detailed abstract

Purpose: Today, the advancements that have happened in the science of physics have led to the increase of human understanding and more accurate knowledge of the phenomena of the world, and one of the topics of physics that by entering the field of science has changed the attitude and created a new paradigm in the explanation of phenomena is quantum physics. The 21st century coincides with Einstein's theory of relativity and after him the quantum theory of his student, Heisenberg. The quantum message is that all parts of the world, including humans, are dynamic, conscious and interconnected beings. Quantum means a moving particle with possible tendencies, and that order comes from disorder, and simple one-because relationships have given way to complex, intertwined and multi-cause relationships. Quantum theory is one of the behavioral metaphors of management from a postmodern point of view, the use of which can play an effective role in improving and promoting the performance and success of the organization.), quantum feeling (the ability to feel alive and life-giving), quantum cognition (the ability to know in a creative and intuitive way), quantum action (the ability to act and behave responsibly), quantum trust (the ability to trust the life process) and quantum existence (the ability to communicate) continuous) that motivates managers and employees to use them for planning, making decisions and improving the performance of the organization. The goal of the quantum paradigm is to liberate and flourish people's potential abilities and capabilities and help them grow by creating and maintaining energy fields and establishing stable relationships with others that become increasingly purposeful, dynamic and effective. In the quantum perspective, the universe is complex, constantly changing, turbulent, chaotic, uncertain, and uncertain. It means a place where nothing is static, events are unpredictable and it is impossible to control them. Quantum thinking is the ability to think in a contradictory way, and based on this thinking, the world often acts in an illogical and paradoxical way with sudden and unpredictable jumps. This type of thinking is a mental flow of abundant creativity that often produces illogical thoughts that allow people to go beyond the circle of limited thinking. Quantum thinking can keep managers and employees in sync with complex environmental changes. Organizations that manage future employees with the thoughts, feelings and actions of the present have a linear vision of the past, present and future, which will limit the organization. While quantum thinking exposes managers and employees to new events and experiences, combining and modifying simple ideas and mechanisms of quantum thinking and learning plays an important role in the success of the organization. The purpose of this research was to formulate and validate the model of teaching metacognitive skills based on quantum thinking in student teachers.

Methodology: The present study in terms of purpose was applied and in terms of implementation method was mixed (qualitative-quantitative). The research population in the qualitative section was the books and articles related to metacognitive skills and quantum thinking in the last thirty years, which after reviewing them number of 50 cases (12 books and 38 articles) were selected as a sample by purposive sampling method. The research population in the quantitative section was student teachers of Farhangian University of Shiraz province in the academic years of 2020-1, which based on Cochran formula number of 100 people of them were selected as a sample by simple random sampling method. The research tool in the qualitative section was take noting of books and articles and in the quantitative section was a researcher-made questionnaire (33 items) whose psychometric properties were confirmed. Data were analyzed in the quantitative section by coding method in MAXQDA software and in the quantitative section by exploratory factor analysis and structural equation modeling in SPSS-23 and Smart PLS-3 software.

Findings: The findings of the qualitative section showed that the teaching metacognitive skills model based on quantum thinking in student teachers had 129 indicators, 33 components and 8 categories, which categories were including macro policy area, content of metacognitive curriculum and quantum thinking, teaching and learning processes, use of information technology, interaction with scientific research centers, psychological foundations, evaluation methods and characteristics of learners. Also, the findings in the quantitative section showed that 33 items in the 8 mentioned categories were placed; So that the factor load of all items and categories was higher than 0.70,

the average variance extracted of all categories was higher than 0.60 and the Cronbach and combined reliability of all categories was higher than 0.90. Other findings showed that the teaching metacognitive skills model based on quantum thinking in student teachers had a good fit and the effect of mentioned model on all eight categories of macro policy area, content of metacognitive curriculum and quantum thinking, teaching and learning processes, use of information technology, interaction with scientific research centers, psychological foundations, evaluation methods and characteristics of learners were significant ($P < 0.05$).

Conclusion: Based on the results of present research, officials and planners of Farhangian University can use the identified and validated model of teaching metacognitive skills based on quantum thinking in student teachers to improve teaching, training and learning, which for this purpose use the components and categories extracted from the present study is necessary. In the quantitative part of the present study, there were only a limited number of student teachers in Shiraz province, so it is suggested that the questionnaire of this research should be implemented on a relatively larger sample size, for example, 400-500 people, and its psychometric indicators should be checked. Another proposal is to design and develop a model for teaching metacognitive skills based on quantum thinking in the faculty members of different universities, including cultural, government, free, Payam Noor, etc. Another limitation was related to the existence of few research backgrounds about quantum thinking in education or the lack of background about teaching metacognitive skills based on quantum thinking, which made it impossible to compare and interpret the results of the present study with the results of other studies. Of course, considering the novelty of the current research title, this issue can be one of the strengths of this research and a model for researchers to conduct other researches. The results of the present research about the identification of indicators, components and categories and their appropriate validity can have implications for the officials and planners of the educational system of Farhangian University and even other universities. As a result, managers, officials, designers and planners of higher education systems, especially Farhangian University, can use the identified and accredited model of teaching metacognitive skills based on quantum thinking in student teachers to improve teaching, training and learning, and to realize the said model, the identified components and categories to promote them through the indicators related to them.