

Research Paper
(Mixed)

Designing a facilitation model for experimental sciences based on the reverse approach in elementary school

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Abstract

The purpose of this research is to design a model for facilitating experimental sciences based on the reverse approach in elementary school. According to its purpose, the research method is a mixed exploratory research (qualitative-quantitative) based on thematic analysis and structural equation modeling. The statistical population of the research in the qualitative part includes 14 participants of the interview part (including experts in the field of curriculum, experts in the field of experimental sciences and teachers with high experience in elementary school) and participants in the texts content part (including documents published in reliable scientific databases in recent 5 years leading to the time of analysis and adjustment of the fourth season (2017 to 2022)). The sampling method in the interview section is purposeful snowball type; and in the text section it is purposeful based on the purpose of the research. The statistical population in the quantitative section includes all primary school teachers in Khuzestan province with a sample of 193 people and was selected by multi-stage cluster random sampling method. The tool of the qualitative part is an interview, and that of the quantitative part is a questionnaire. The analysis of the qualitative part is using the theme analysis method proposed by Atride-Sterling (2001), and the quantitative part is SPSS and Amos software. The results showed that the facilitation model includes six organizing themes: objective and visual teaching, teacher activity in the reverse method, teacher-student interaction, teaching for learning, teacher motivation and ability, and active participation of families, which has a total of 31 basic themes. In the validation of the designed model, the examination of the structural model showed that the above model has a good fit.

Keywords:

facilitation,
experimental science,
reverse approach,
teacher's motivation and
ability,
active participation of
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Extended abstract

Introduction

One of the important and practical lessons during education is experimental science, which is taught to students from the moment they enter school until the end of the academic year (Raisi Ardali, 2020). The purpose of teaching experimental sciences in the primary school curriculum is to educate people with scientific literacy, who must be equipped with knowledge, skills and scientific insight of behavior based on values and competences, and who must understand the phenomena related to experimental sciences and are familiar with science and technology (Simsek, 2020). Reviewing the results of the Tims test, which is the most important international adaptation study in the field of teaching experimental science and mathematics in the fourth grades of primary along with eighth grades of secondary school, and is held every four years under the supervision of the International Association for the Evaluation of Academic Progress (Zianejad Shirazi et al, 2022), shows Iran's poor performance in mathematics and experimental science lessons in the fourth grade of elementary school compared to other countries (Kasyani N, Zarei, 2019). The 21st century educational systems emphasize the importance of paying attention to student-centered learning in which students participate and direct their own learning. In student-centered learning environments, students must actively participate in learning. Participation should be organized through learning activities such as discussion, problem solving, and peer learning. These types of activities are known in a new method called the reverse learning method or the reverse class (Kazu, 2020). But despite the fact that in recent years, the reverse learning method has been proposed as an alternative model of education to improve students' knowledge and skills, interaction and self-efficacy in learning; mostly this method has been neglected in the field of teaching experimental sciences (Ahmed & Indurkha, 2020).

Reverse learning is a type of blended learning that reverses traditional perceptions of pre-class and in-class activities. This teaching method gives students the opportunity to have more control over their learning. However, teachers should check whether students' activities in the classroom lead to more pre-learning or not (Nuhoglu Kibar, 2020). Based on this, the current research is looking for an answer to this question: What is the pattern of facilitating experimental sciences based on the reverse approach in the elementary school?

Theoretical Framework

Reverse learning

Reverse learning is an approach that has aroused the interest of researchers and educators today. Reverse learning, as the name suggests, is exactly the reverse of the traditional teaching method. If we want, this learning style can be summed up in one sentence: doing school work at home and doing homework at school. It is an educational model in which students learn educational content at home through online or offline educational videos, and the teacher in the classroom solves the problems and answers the students' questions and talks with them (Khorshidi & Ghaidi, F, 2022).

Aybirdi & Atasoy sal (2023) investigated the effect of reverse learning on the achievements of L2 learners. They showed that reverse learning had significant effects on students' scientific achievements compared to the traditional method.

Dong (2021) in a research entitled the effectiveness of the flipped classroom in collaborative learning showed that the flipped classroom was effective in improving academic performance and promoting higher level thinking abilities, such as critical thinking and self-recognition and evaluation.

Research methodology

According to its purpose, the research method is a mixed exploratory research (qualitative-quantitative) based on thematic analysis and structural equation modeling. The statistical population of the research in the qualitative part includes 14 participants of the interview part (including experts in the field of curriculum, experts in the field of experimental sciences and teachers with high experience in elementary school) and participants in the content part of the texts (including documents published in reliable scientific databases in last 5 years lead to the time of analysis and adjustment of the fourth chapter (2017 to 2022)). The sampling method in the interview section is purposeful snowball type; and in the texts section it is purposeful based on the purpose of the research. Statistical society in the quantitative part includes all primary school teachers in Khuzestan province with a sample of 193 people, which were selected by multi-stage cluster random sampling method. The tool of qualitative part is interview, and of quantitative part is questionnaire.

Research findings

To analyze the qualitative part, the method proposed by Atride-Sterling (2001) was used through the theme analysis method; and SPSS and Amos software were used to analyze the quantitative part. The results showed that the facilitation model includes six organizing themes: objective and visual teaching, teacher activity in the reverse method, teacher-student interaction, teaching for learning, teacher motivation and ability, and active participation of families; which has a total of 31 basic themes. In the validation of the designed model, the examination of the structural model showed that the above model has a good fit.

Conclusion

The current research was conducted with the aim of designing a model for facilitating experimental sciences based on the reverse approach in elementary school. The results of this research are in agreement with the results of Aybirdi & Atasoy sal (2023), Dong (2021), Sahebyar et al, (2021), Jafarkhani et al, (2020), Tajari & Bayani (2019), Niro & Hajian (2020), Smallhorn (2017). Based on the study of Jafarkhani et al, (2020), the implementation of the reverse learning method has a positive effect on the learning and motivation of multi-grade students and helps the multi-grade teacher in the learning process and classroom management. Erkan & Duran (2023) in the context of the fourth elementary science lesson show that basic activities using reverse teaching have a positive effect on students' scientific creativity and their basic activity; and with this method, most students find the activities useful, structured and entertaining.

According to the results of the research, the following suggestions are presented:

It is necessary for educational systems in different educational levels, especially in the primary period, to use a creative reverse approach and use the opportunities and facilities of educational films and videos, internet spaces, and educational podcasts. In this regard, teachers should provide elementary students with new subjects of experimental sciences in the form of video, podcast or audio recording, and ask them to observe and take notes and bring them to class as homework.