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Research Paper

The effect of integrated education on learning math lessons in students in multigrade classes

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Abstract

Aim: The purpose of this research was to investigate the effect of integrated education on learning math lessons in students in multigrade classes. The statistical population of this research included the students of multigrade classes in Boyer Ahmad city in the academic year of 2020-2021, of whom 18 students in two classes were selected as the sample, and were randomly divided into an experimental and a control group. The data collection tool was a researcher-made test, whose validity was confirmed by experts, and whose reliability was confirmed by examiner's reliability index. The research design was a quantitative approach of a quasi-experimental type with a pre-test, post-test and follow-up plan with a control group, during which the effect of the independent variable (integrated education) on the dependent variable of the research in students of multigrade classes was investigated. The results showed that integrated education increased math learning in students of multigrade classes. In addition, the effect of integrated education in increasing math learning in students of multigrade classes remained stable over time.

Keywords*: integrated education, math learning, multigrade classes, elementary school*

Introduction

Math lessons are a basic skill which requires student's understanding of mathematical concepts and their ability to solve problems according to what they understand. This problem is solved by using integrated learning (Karma, Dharma and Sentiana, 2019). Integrated education is one of the measures that can transform the traditional educational model and help improve the quality and relevance of teaching and learning (Jiondshez et al., 2021). Integration means an effort to create relevance, connection and finally integration in students' learning experiences, and the use of this model in multigrade classes allows the teacher to advance teaching-learning process with greater speed and better quality. Some of the research in the field of integrated education in regular classes are mentioned here.

The results of Hashemzadeh's research (2017) showed that the implementation of an integrated curriculum increases the academic progress score of math, science, social studies, Persian literature and art courses in the three cognitive, emotional, and psychomotor dimensions in students in the experimental group. Furthermore, Aftab-Savar and Momeni (2013) reported the effect of an integrated approach in the curriculum on motivation, self-efficacy and academic progress of students. Jafari Thani and Ghorbani (2008) also state that integration and organization of the content of the seventh grade science book on the subject of heat significantly affected students' level of knowledge, ability to understand, application of the course material and social development. Chellani (2014) concluded that an integrated approach is an effective model for improving students' performance throughout the learning process. Integrated education increases deep learning and facilitates students' achievement of educational goals (Walsh et al., 2016).

This research seeks to answer this question: Does integrated education have an effect on learning math lessons in students in multigrade classes?

Methodology

This research is an applied quasi-experimental quantitative study with a pre-test, post-test and follow-up design with a control group, during which the effect of the independent variable on the dependent variable was studied students in multigrade classes. There are 273 multigrade schools in Boyer Ahmad city, 143 of which include students from the second to the fifth grades. Of these 143 schools, 18 schools had the target population. Therefore, a sample of 36 students was selected from two schools. A researcher-made test of the ability to solve math problems was administered with 32 descriptive questions in three stages: pre-test, post-test and follow-up—forty days after completion of the intervention. From among the

questions, 32 with a high distinguishing power and medium difficulty level were selected. Experts confirmed the validity of this test. To this end, two subject experts, two curriculum planning specialists and two expert teachers confirmed the face and content validity of the test after the modifications.
To determine the reliability of the researcher-made test, examiner's reliability index was used. The intra-examiner coefficient for the subject of graphs was 0.92, 0.88, 0.86 and 0.89 and 0.94, 0.81, 0.89 and 0.90 for the subject of fractions in the second to the fifth grades respectively. In the intervention phase, integrated education was delivered by compiling an educational package based on the second to the fifth elementary math textbooks, and pre-tests and post-tests were designed accordingly. One of the expert teachers of multigrade classes was used to implement the educational package. The intervention included 10 sessions of 60 minutes held once a week.

Results

In order to answer the main research question of whether integrated teaching is effective on learning math lessons in students in multigrade classes, repeated measures ANOVA was used. Repeated measures ANOVA was used in the research because we had general dependent variable (including two sub-variables) and three stages (pre-test, post-test and follow-up).

Table 1. Descriptive indicators of integrated teaching in learning math lessons in multigrade classes

Group	Number (person)	Variable types	Pre-test		Post-test		Follow-up	
			Average	The standard deviation	Average	The standard deviation	Average	The standard deviation
Experimental group	18	Integrated teaching of diagrams	1.27	1.07	18.22	1.47	18.61	0.97
Control group	18		200	1.57	8.88	3.22	8.61	2.37
Experimental group	18	Integrated teaching of deductions	1.88	0.96	17.88	0.83	18.27	1.07

The scores for all the integrated training showed an increase from pre-test to post-test and from pre-test to follow-up in the experimental group. However, the control group did not show a significant change. The second question:

Do different integrated training methods have different effects on facilitating solving math problems?

Table 2. Changes in the integrated training of each test in the stages of pre-test, post-test and follow-up of the experimental group

Tests	Levels			Standard error	Significance level	Confidence interval	
	level A	level B	A-B=D difference			Lower limit	Upper limit
Integrated teaching of deductions	Pre-test	Post-test	*---16.00-	0.229	0.000	16.60-	-015.39
		Follow up	*16.38-	0.257	0.000	17.07-	-015.70
	Post-test	Follow up	0.389-	0.183	0.01	0.785	0.098
Integrated teaching of diagrams	Pre-test	Post-test	*16.94-	0.318	0.000	17.78-	-16.10
	Pre-test	Follow up	*17.33-	0.323	0.000	17.19-	16.47-
	Post-test	Follow up	0.388-	0.216	0.104	0.185-	0.962

It can be concluded that integrated education effectively improved the scores of students' math problems in multigrade classes.

Discussion and conclusion

The purpose of the present study was to investigate the effect of integrated education on learning math lessons in students in multigrade classes. The results showed that integrated education was effective on students' math learning, which is in line with the research results of Smith and Lord (2010), Jafari Thani and Ghorbani (2018), Chellani (2014), Aftab Sovar and Mehmoi Momeni (2013), Rivdin, Johnson and Walsh (2016), Zarei Zawarki and Tofani Nejad (2011), Hashemzadeh (2017), Noor and Poonamasori (2019), Wash et al. (2019).

Implications and suggestions:

1. Teaching two grades with similar subjects should be the basis of teacher's education and after teaching, they should discuss the effects of integrated education with their students, and identify its strengths and weaknesses.
2. Theoretical foundations and practical points of integrated education should be taught in in-service courses for teachers and at Farhangian University.

Limitations: One of the limitations of the present research is that it focused on math lessons, therefore, its results should be generalized to other subjects with caution.

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