Investigation of Elementary School Students’ Conceptual Change on The Phases of The Moon in A Collaborative Learning Environment

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SYNOPSIS

INTRODUCTION

Studies show that people from elementary school students to adults hold alternative conceptions or have limited understanding of astronomical events. Trundle and Troland (1996) reported that moon’s phases were the least understood among the astronomy concepts even though they can be seen from the earth. Lindell (2001) and Barnett (2002) indicated that students usually come to school with some existing knowledge, but most of this existing knowledge is wrong or incomplete. Teaching new information to students is easier than changing their existing knowledge. Therefore, students’ existing ideas should be investigated carefully at all grade levels, and the best teaching methods should be determined. Different strategies have been used to teach the causes of the moon phases. The new science curriculum suggests that collaborative learning should be promoted in science classes (MEB, 2011). Therefore, collaborative learning strategy to teach the causes of the moon phases needs to be investigated carefully.

PURPOSE OF THE STUDY

The purpose of the study is to determine the alternative conceptions that the 8th grade students possibly have and to compare traditional instruction and collaborative learning method in teaching the causes of moon phases. Specifically, following research questions were investigated.

1. What are the alternative conceptions that students hold about the causes of moon phases?
2. How does 8th grade students’ conceptual understanding of moon phases change with different teaching methods?

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METHODOLOGY

The study design was quasi-experimental (Karasar, 2007) which included one control and one experimental groups. Participants in both groups were 8th graders. However, control and experimental groups were randomly assigned. A total of 33 students from a rural area elementary school participated in the study. 16 of them were in the control and 17 of them were in the experimental group.

Participants in the control group completed an instruction developed by McDermott (1996). The instruction was based on making daily moon observations and detecting cyclic patterns. The experimental group activity also included daily moon observations in addition to a collaborative teaching.

The data was collected through structured interviews. The interview protocol was previously developed by Trundle, Atwood & Cristopher (2002) and administered before and after the interventions to collect data. Data were analyzed using the method developed by Trundle et al. (2002) too. Participant's answers were first coded and then categorized into the following categories namely scientific, scientific fragmented, scientific fragmented and alternative, alternative fragmented, alternative, and no conceptual understanding.

FINDINGS

Pre-test scores of both groups were compared using Mann-Whitney U test, and no significant difference was observed (Mann-Whitney U=120.0, p>.05) before the instruction. None of the participants held scientific conceptual understanding before the instruction in both groups. However, 3 students held scientific conception in the control group while 4 students held scientific and 5 students held scientific fragmented conceptual understanding in the experimental group after the instruction. These findings indicate that experimental group performed better.

DISCUSSION

The alternative conceptions revealed in this study were pretty similar to those previously reported in the literature. The most common alternative conception “eclipse” reported by Trundle et al. (2006) was observed in the current study too. In addition, “clouds are causing moon phases” was another common alternative conception reported both in the literature and in the current study (Bisard, Arons, Francek & Nelson, 1994). Current study found that cooperative learning method is an effective instructional method to teach the causes of moon phases. Other studies reported the effectiveness of cooperative learning method in other contents (Bilgin, 2006; Klein & Schnackenber, 2000; Souvignier & Kronenberger, 2007).

CONCLUSION

Both control and experimental group students showed the similar alternative conceptions before the instruction, however, after the instructions both groups increased their conceptual understanding of causes of the moon phases, but the experimental group showed a greater increase in 8th grade level. It is suggested that teachers should prefer the cooperative learning environment to teach causes of the moon phases or other astronomy contents to eliminate alternative conceptions and promote scientific understandings of the contents.
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