Abstract

The purpose of this study was to explore the effects of concept cartoon argument instruction on the students’ argumentation. The one-group pretest-posttest design was adopted in this research. The subjects were 21 upper graders in a remote elementary school. Based on the strategy of concept cartoon, an experimental argument instruction was provided during six consecutive weeks. The self-designed “paper-and-pencil test on argumentation ability” were used in this study. The results indicated that applying the concept cartoon strategy to argument instruction could enhance the students’ argumentation ability. However, students in the high- and mid-score groups outperformed students outperformed than the students in the low-score group. With the increase of familiarity with the instruction, all the three groups showed decreasing difference in their posttest performance. Based on finding above, it is suggested that in the implementation of argument instructions, teachers should take into account their students’ disciplinary knowledge and experience, so as to enhance their learning effectiveness.

Keywords: argumentation, argument instruction, concept cartoon
Purpose and Background

Recently, “cultivating school children with science literacy” gradually become a common goal of science education for many nations. The science literacy is the ability to distinguish evidence-based conclusions from personal opinions (OECD, 2008). Therefore, many researchers have begun to explore how students can verify or evaluate the knowledge they have acquired through discussion and interaction (Newton, Driver & Osborne, 1999; Osborne, Erduran & Simon, 2004a).

However, many studies have indicated that classroom learning is still centered on teachers, who dominate most of the dialogues in science lessons (Duschl & Osborne, 2002; Osborne et al., 2004a). This kind of didactic instructions could hinder students from clarifying their ideas through argumentation (Newton et al., 1999).

Osborne et al. (2004a) once set up a workshop, and according to the IDEAS manual to train teachers how to use various strategies in argument instruction. Concept cartoons could provide intensive stimulations to arouse students’ existing knowledge and past experience. Therefore, concept cartoon can incite students’ discussion and induce their participation in argumentation (Keogh & Naylor, 1999).

By applying the strategy of concept cartoon argument instruction, the overall aim of this research was to explore the experimental argument instruction process with primary age children. The research also aims to explore the effects of this experimental argument instruction on the students’ argumentation ability.

Method

The one-group pretest-posttest design was adopted in this study. A total of 21 upper graders in a remote elementary school were selected. The researcher who is a doctoral student and major in science education was designed to be the instructor. He has been instructing the case classes as a science teacher for more than 2 years and has sufficient understanding about the theories and practices of argument instruction.

Based on Simon et al. (2006) proposed eight themes as essentials of an effective argument instruction, the research designed an “argument instruction evaluation scale” to verify whether each instruction session had complied with all the eight themes. Besides, a teacher with a master’s degree in science education was invited to serve as an observer of the instruction.

Aufschnaiter et al. (2008) suggested that student’s content-specific experiences should be considered. Therefore, according to the IDEAS manual, six units which
student had learned before were selected. A paper-and-pencil test on argumentation ability was developed according to these six units. Students were asked to take pre/post test before and after each unit.

The researcher and the observer would evaluate each session using “argument instruction evaluation scale”. The evaluation results agreed upon by both evaluators would be presented to explain the implementation process.

The rebuttal level of the learners’ argument was inspected to assess their argumentation ability (Erduran et al, 2004). The evaluators of the paper-and-pencil test on argumentation ability included the researcher and two doctoral students. The mean inter-rater reliability about 6 units was 0.91. The evaluation results would be analyzed by using dependent sample t-test and ANCOVA.

**Result**

**The implementation process of argument instruction**

The results indicated that except for “Knowing meaning of argument” and “Reflecting on argument process” with an achievement rate of 66.67% (4/6), all the other indicators have an achievement rate of 83.33% (5/6) or 100% (6/6). Thus, the implementation of argument instructions in this study complied with the themes proposed by Simon et al. (2006).

**The progression of the students’ argumentation ability after experimental argument instruction**

The analyzed results indicated that the mean posttest scores were higher than pretest. There was significant difference between pre and post test in all six sessions and the effect size ranged between 0.62 and 0.99. According to the definition about effect size made by Cohen(1988), the results above reveal that applying the concept cartoon strategy to argument instructions can empower students’ argumentation ability.

**The differences of the students’ argumentation ability with different science achievement**

To further explore the difference among students with different science achievement, the study classified the students by their science achievement in the last semester into three groups, high-score, mid-score, and low-score. There were 7 students in each group. Using the pretest score as a covariance in ANCOVA.

The result of ANCOVA showed that both mid-score and high-score groups
outperformed than the low-score group in all six units, and difference among the three groups reached the level of significance (p<.05) in the posttests of Unit 1, 3, and 4 and the differences in mean scores of 3 groups were on the decrease. The high-score and mid-score groups presented higher effectiveness of learning than the low-score group. However, with the procession of the activity, the difference among the three groups gradually decreased, indicating that the proposed argument instruction could enhance the students’ argumentation ability.

Conclusion

Applying the concept cartoon strategy to argument instruction enhances students’ argumentation ability

Osborne et al. (2004b) proposed nine strategies for design of argument instructions. Of the nine frameworks, concept cartoon is one that can incite learners’ discussion and induce their participation in argumentation (Koegh & Naylor, 1999). Therefore, the results of this study indicated that by applying concept cartoon strategy could effectively enhance the students’ argumentation ability.

Students’ disciplinary knowledge and experience should be considered when providing argument instructions

According to Aufschnaiter et al. (2008), students would use their prior knowledge in argumentation, and argumentation allows students to integrate their existing knowledge and refine their scientific knowledge. In this study, there was difference among students with different science achievement in the learning of argumentation. It can be concluded that personal knowledge and experience could affect student’s learning of argumentation.

The Application of the Research and Education

Personal knowledge and experience may affect student’s learning of argumentation. In the implementation of argument instructions, teachers should take into account their students’ disciplinary knowledge and experience.

This present study was focused on students’ argument writing rather than oral argumentation. It is suggested that future researchers analyze oral arguments in group discussions. Besides, future researchers may try to apply the nine strategies proposed by Osborne et al. (2004) and explore the effects of other strategies on teaching argumentation.
Reference