Enhancing computational estimation abilities with computer-supported collaborative learning activity

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Abstract: This research is informed by the theory of collaborative learning as a foundation of the mathematics design for the mathematical operations estimation ability and strategies. The results demonstrated that the design can effectively promote the mathematics estimate examination of students. This also enhances the students' interest in mathematics and promotes a group collaboration discussion and the interaction amongst classmates.

Key word: CSCL, computational estimation, number sense.

Introduction

At present, most elementary students in Taiwan rely on the standard solving procedure. If they do not use paper-and-pencil to write down the process of calculation, they fail to get answers. Enhancing number sense with a computational estimation strategy is useful to students to solve mathematics questions. (Howden, 1989; Reys & Barger, 1991).

Collaboration supported by networked computing device is known as CSCL (Computer-supported Collaborative Learning). It would allow teachers to adjust the teaching, to encourage students and to reconsider and monitor their self-ponder process, as well as to promote discussion between students (Roschelle et al., 2007).The goal of this research is to implement CSCL activity to enhance the sixth- graders' computational estimation ability.

1. Research method

The research designed two modes CSCL activities and used pre-test, post-test and delayed post-test to investigate the students' computational estimation ability. In addition, questionnaire survey and classroom observation were used to inquire the effect of CSCL activities in the multi-dimension point of view. The tools are explained as follows:

1.1 Computational estimation examination and questionnaire survey

There are 20 questions in the examination, including pre-test, post-test and delayed post-test. Teacher used the Educlick interactive response system technique (Huang, Liang, & Wang, 2001) to test students' mathematics intuition ability. The students used the remote control devices without papers and pencils to answer immediately within 60 seconds.

The main purpose of the 18 questions is to measure the perception of the learners towards these three dimensions: the software operation (5 questions), the collaborative learning (7 questions), and mathematics learning (6 questions) with Likert-Scale. The options are divided into "Strongly disagree", "disagree", "agree" and "Strongly agree", ranging from 1 to 4.

1. 2 Learning activity

The CSCL activity has two different modes. In Group Scribbles mode, the students may use the scribbles sheets to paste on the personal board. Moreover, the public discussion board and the group discussion board are used to support instant idea sharing.

In Paragraph Recombination mode, the students have individual working areas and group discussion boards. There are four mathematical formulas in each question group. Each formula is divided into three scribbles sheets. Members are able to move scribbles sheets to match the suitable one on the personal board and then move it to the group discussion board.

2. Data analysis

2.1 Computational Estimation Examination

The average results of pre-test and post-test are 14.18 and 15.67. The t-test t (32) is - 2.593, p=.014<.05, which shows that 33 students results of pre-tests and post-tests are significantly different.

In terms of the delayed post-tests, the average result is 15.88 and the average result of post-test is 15.67. T-test t (32) is -.43 and the significance is .67. The test result has not reached the significance, which demonstrated that the students have good effects of learning retention after accepting the learning activity.

2.2 Questionnaire

1. Perceptions of using GS (1~5 questions): The average score from 2.70 to 3.27 expressed positive impression in sixth grade students to software operation feeling.
2. Perceptions of collaborative learning (6~12 questions): In this dimension, the average score from 3.03 to 3.48, indicated that students have good academic motivation in the collaboration learning activity.
3. Perceptions of mathematics learning (13~18 questions): The average score from 3.12 to 3.48 expressed the positive impression of students in the activity.

3. Conclusion

This study demonstrated that the computational estimation activity in the computer-supported collaboration environment is able to promote the sixth grade students' computational estimation ability, learning interest, and the interaction among group collaboration.

However, according to the researchers' observation, the group's skills of collaboration and operating system may cause the dual low achievements of minor students.

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