Design and Evaluation of Class that Incorporates Face-to-face Video Learning and Questioning Activities to Foster Critical Thinking Attitudes

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Abstract

In recent years, critical thinking has attracted the attention of Japanese primary and secondary education. Critical thinking is " reflective and reasonable thinking that is focused on deciding what to believe or do" (Ennis 1987) and can be divided into "ability" and "attitude". This study examines the critical thinking "attitude" because it has been pointed out that "attitude" is necessary to demonstrate "ability" (Michita 2001). One of the opportunities to foster a critical thinking attitude is a class subject. Although, if a teacher chose a class subject as a place to foster a critical thinking attitude, the learners who cannot deal with the subject knowledge delay learning. On the other hand, learners who can deal with subject knowledge have to wait for others and lose time. To deal with these difficulties, we suggest video learning. For example, by incorporating video learning into a class subject, the s delayed learners can pause and playback the video, while the faster learners can accelerate the video. However, there is a possibility that the learner will not be willing to engage with the video. Therefore, in this study, we decided to use peer pressure. Peer pressure is said to increase motivation for video learning. We select questioning activities for making peer pressure work. This study aims to clarify whether video learning and questioning activities after video learning are effective in fostering a critical thinking attitude.

45 first-grade High School students took six statistical mathematic classes. In this study, to add the function of improving a critical thinking attitude to the video, the three elements of the Toulmin model that Toulmin (1958) put forward are incorporated "claim", "evidence", and "reasoning". Following the Toulmin model, the composition of the video is "(1) Knowledge acquisition", "(2) Practice task", "(3) Presentation task", and "(4) Let's try task". In the class, "(a) Video learning" was performed for 35 minutes, and "(b) Questioning activities" related to "(a) Video learning" was performed for 15 minutes. For "b. Questioning activities", we first formed a group of 3 to 4 people. After that, each group was instructed to ask questions about their peers' "presentation task" and describe answers to their peers' questions.

In this study, 16 items out of the 18 items of the critical thinking attitude scale that Hirayama and Kusumi (2004) developed were used. Before the 1st class and after the 6th class, the students were asked to answer "Applicable (5)", "Somewhat applicable (4)", "Neither (3)", "Not very applicable (2)", "Applicable" No (1)". At the time of evaluation, to confirm how classes have affected learners, the mathematical test conducted before this class was used to classify the students into low and high academic ability groups. After that, we evaluated the growth from pre to post.

The number of items on the critical thinking attitude scale was changed. Therefore, factor analysis was performed (Promax rotation, maximum likelihood method) while excluding items with a factor loading of less than .35 and .35 or more. As a result, 12 items and 3 factors were finally extracted. The first factor was named "evidence emphasis and objectivity" (α = .93). The second factor was named "inquiring mind" (α = .81). The third factor was named

"awareness of logical thinking" (α = .85).

We evaluated how these classes have affected learners. First, the average of the mathematical test was 72 points, and a lower than average group was defined as a low academic ability group (19 persons). On the other hand, a higher than the average group was defined as a high academic ability group (22 persons). Next, groups (the low academic ability group and the high academic ability group) and timing (pre and post) were set as independent variables. Three factors of critical thinking attitude (evidence emphasis and objectivity, inquiring mind, and awareness of logical thinking) were set as dependent variables. Then, a two-way ANOVA was performed for the low group and high group (between participants) × pre and post (within participants) (Figures 1 to 3).

Regarding evidence emphasis and objectivity, the interaction between groups and timing was not significant ($F(1,39)=.86$, *n.s.*, $\eta^2=.02$). The main effect was significant at the time, and the effect size was large ($F(1,39)=17.50$, $p<.01$, $\eta^2=.31$). It was not significant between the groups ($F(1,39)=.08$, *n.s.*, $\eta^2=.00$). Concerning inquiring mind, the interaction between groups and timing was not significant ($F(1,39)=.25$, *n.s.*, $\eta^2=.00$). The main effect was significant at the time and the effect size was large ($F(1,39)=17.45$, $p<.01$, $\eta^2=.31$). It was not significant between the groups($F(1,39)=.09$, *n.s.*, $\eta^2=.02$). Regarding awareness of logical thinking, the interaction between groups and time was not significant ($F(1,39)=.00$, *n.s.*, $\eta^2=.00$). The main effect was significant at the time and the effect size was large($F(1,39)=10.36$, $p<.01$, $\eta^2=.20$). It was not significant between the groups ($F(1,39)=.03$, *n.s.*, $\eta^2=.00$).

From the results of the evaluation, it was clarified that the practiced classes fostered all three factors of the critical thinking attitude of all learners, regardless of their academic ability.

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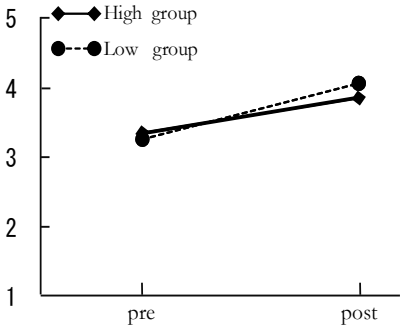

Figure 1: Evidence emphasis and objectivity

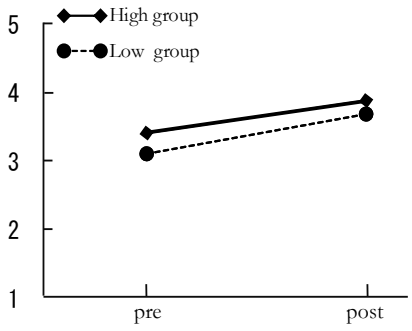

Figure 2: Inquiring mind

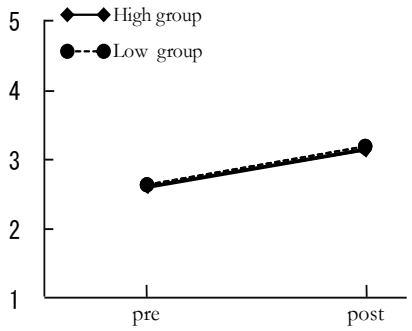

Figure 3: Awareness of logical thinking