ABSTRACT

This study aims to construct and find out the effect of the Problem Based Learning-Flipped Classroom Model, learning independence, critical thinking skills and mathematical communication on the improvement of mathematical argumentation. This current research utilized concept development and quasi-experimental methods. The concept development research design is based on the Theory-Driven Conceptual Instructional Design Models approach using the synthesis of Lee and Jang. The synthesis procedure uses a Theory-driven conceptual Instructional Design Models (F1-O1-S1-A1) approach through a literature review that functions to connect variables or activities in learning design. The experimental method applied was Inter and In-Group Mixed Factorial Design (Between Group-Within Group).

The procedure for determining the components of the PBL-FC Model, learning independence, critical thinking skills and mathematical communication to improve mathematical argumentation is as follows. First, Analyze: the activities carried out of the analysis stage were: a). analyze the synthesis procedure of Type F1-O1-S1-A1 in constructing a model; b). analyze learning activities based on the main objectives of pedagogy, learning independence, critical thinking skills and mathematical communication to improve mathematical argumentation; c). analyze basic theories related to learning theory and task framework of mathematicians. d). analyze the literature related to the research and development of the PBL-FC Model. Second, PBL Model Development by integrating Flipped Classrooms were carried out of the following stages: a). review the literature relevant to the theories, b). Identify and re-conceptualize model variables/components; c). connnect variables/components logically. The third is implementation and evaluation, the activities carried out were internal and external validation. After going through the validation with the three-round Delphi technique, the PBL-FC Model produced five components, namely: a) Reviewing and presenting problems; b) Understanding and encourage problem solving; c). Facilitating and process problem solving plans; d). Discussing the results of the settlement and provide reinforcement.; e) Evaluating and concluding learning.

The PBL-FC model was applied in the experimental class and the Conventional Model in the control class. The results showed that the mathematical argumentation skills of students who received the PBL-FC model were higher than students who used conventional learning in terms of independent learning, critical thinking skills and mathematical communication. This study also shows that there is a positive interaction between PBL-FC model and independent learning, critical thinking skills, mathematical communication in influencing mathematical arguments. Thus, it can be concluded that the PBL-FC model is compatible to be applied in universities, especially in the Department of Mathematics Education.

Keywords: Concept formulation procedure, modification of Problem Based Learning-Flipped Classroom model