Doctoral Dissertation

**Enhancement of Cultural Mathematics Understanding Using a Bridging
Framework between Informal and Formal Mathematics
at Secondary Education in Aceh
(Summary)**

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The discussion about informal and formal mathematics should focus on creating a bridge between them to improve the quality of mathematics education. Informal mathematics emphasizes using trial and error to solve mathematical problems, while formal mathematics focuses on strict rules to solve mathematical problems, which is usually called an algorithm. Another example of their difference is language. Mathematical language also divides into informal and formal mathematics. Formal means the use of standard mathematical terms such as circle, triangle, slope, and coefficient, whereas informal mathematics uses the language of daily lives to show mathematical concepts, such as saying *round things* to describe circles (Mcginn & Booth, 2018). Therefore, informal mathematics and formal mathematics may seem to contradict each other, which creates a gap in mathematics.

This research has three objectives. The first is to develop a bridging framework between informal and formal mathematics. Second, is to define cultural mathematics understanding and to ultimately enhance *cultural mathematics understanding* through developed lesson plan. The development procedure uses Tessmer's (1993) methodology. Although there are other development methods, the main reason for using the Tessmer methodology is the trustworthiness of the data interpretation. Some audiences may think that interpreted data may have been 'corrupted' by the researchers' interpretation since peer-review evaluation is conducted among research members. Formative evaluation (Tessmer,1993), will provide expert reviews and user evaluations before the preliminary test. This formative evaluation phase will

control the subjective influence of the researcher's interpretation, thereby increasing the trustworthiness of the methods.

The first objective outcome is a framework to provide a smooth transition from informal to formal mathematics or vice versa. To smooth the transition, the bridging requires finding similarities between informal and formal mathematics as the starting point. The definition of *cultural mathematics understanding* refers to the followed five activities: (1) Seeing the mathematical parts within the cultural artefact; (2) Performing calculations, predictions, and measurements using those mathematical components within the artefact; (3) Paying attention to how informal mathematics solves mathematical problems; (4) Finding the similarities and the differences in solving mathematical problems; and (5) Developing tentative classroom knowledge

The teaching material is constructed based on the bridging framework, which considers five characteristics of cultural appreciation, as stated in the definition of cultural mathematics understanding. One manifestation of teaching material is a lesson plan. The lesson plan uses the Aceh artefact as the context for learning mathematics. The result shows that the final product of this research is effective in enhancing *cultural mathematics understanding*. The results of the post-test are significantly better than the pre-test. It can be seen from the field test that 71% of 45 students (two classes) demonstrated a good result after the implementation of the learning process.