THE EFFECT OF PRODUCTIVE FAILURE ON MATHEMATICS MORE-KNOWLEDGEABLE STUDENTS

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ABSTRACT

This teaching based research aims to describe whether there is a significant effect of the productive failure method on students who learn mathematics collaboratively and who are categorized as having advanced level knowledge in the mathematics material being studied. Productive failure is an instructional design where students are given the challenge of solving mathematical problems beyond their thinking capacity so that they experience difficulty in solving mathematical problems, then are given feedback so they can learn from these mistakes in the form of worked examples. In this lesson, worked examples function as feedback. The effects of productive failure have previously been studied in individual learning settings. In this research, aspects of high prior knowledge, collaborative learning strategies and self-efficacy variables were modified in the development of instructional design as research novelty. Productive failure is thought to have a significant influence on self-efficacy and knowledge transfer ability. Self-efficacy is a belief in students that motivates them to learn because they feel they have the ability to learn.

To investigate whether there is an effect of this method, this research uses a comparative method through experiments comparing this method with the opposite. In the productive failure method experimental class, students learn from a set of problem solving first, then a set of worked examples. In the comparison experimental class, students learn from a set of worked examples first, then a set of worked examples. This test uses an experimental method in regular classes of undergraduate students taking advanced mathematics courses at a state university in Yogyakarta, which research method consists of three main stages, namely preparation (including FGD and piloting the development of teaching materials and instruments), testing and testing modifications; as well as data analysis and reporting. Before the experiment was carried out, a diagnosis/identification of students' initial abilities was carried out, a learning scheme was prepared and a learning implementation plan was carried out, so that the level of difficulty of the material was in accordance with the cognitive level of the research participants. The learning method experiment was carried out in three learning phases, namely: introductory, acquisition, transfer tests. During the experiment, the testing classes were divided according to the factorial design used. After the experiment was carried out, an assessment of the cognitive load and self-efficacy experienced by students was carried out through a questionnaire and an assessment of transfer ability through a description test.

When students have high prior knowledge, productive failure instructional design in collaborative learning is thought to be able to direct students to develop various problem-solving strategies and encourage the growth of self-efficacy. The logical framework of cognitive load theory will be used as a basis for interpreting the results of the analysis of the experimental data obtained.

Kata Kunci: *problem solving, worked example, cognitive load theory (CLT), desain instruksional, productive failure, transfer, matematika*