

FACTORS INFLUENCING STUDENTS' PREFERENCES ON EMPIRICAL AND DEDUCTIVE PROOFS IN GEOMETRY

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The purpose of this study is to investigate what influences students' preferences on empirical and deductive proofs and find their relations. Although empirical and deductive proofs have been seen as a significant aspect of school mathematics, literatures have indicated that students tend to have a preference for empirical proof when they are convinced a mathematical statement (Porteous, 1991; Martin & Harel, 1989). Several studies highlighted students' views about empirical and deductive proof (for example, Chazan, 1993). However, there are few attempts to find the relations of their views about these two proofs. The study was conducted to 47 students in 7~9 grades in the transition from empirical proof to deductive proof according to their mathematics curriculum. The data was collected on the written questionnaire asking students to choose one between empirical and deductive proofs in verifying that the sum of angles in any triangle is 180° . Further, they were asked to provide explanations for their preferences. Students' responses were coded and these codes were categorized to find the relations. As a result, students' responses could be categorized by 3 factors; accuracy of measurement, representativeness of triangles, and mathematics principles. First, the preferences on empirical proof were derived from considering the measurement as an accurate method, while conceiving the possibility of errors in measurement derived the preferences on deductive proof. Second, a number of students thought that verifying the statement for three different types of triangles - acute, right, obtuse triangles - in empirical proof was enough to convince the statement, while other students regarded these different types of triangles merely as partial examples of triangles and so they preferred deductive proof. Finally, students preferring empirical proof thought that using mathematical principles such as the properties of alternate or corresponding angles made proof more difficult to understand. Students preferring deductive proof, on the other hand, explained roles of these mathematical principles as verification, explanation, and application to other problems. The results indicated that students' preferences were due to their different perceptions of these common factors.

References

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