

PROSPECTIVE TEACHERS' KNOWLEDGE OF EXISTENCE THEOREMS

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A large body of research describes high-school students, prospective teachers and teachers' knowledge of universal theorems (e.g., Healy & Hoyles, 2000; Martin & Harel, 1989). This paper describes the characteristics of prospective teachers' knowledge of existence arithmetic statements. The main aims of the study were: (1) To examine prospective teachers' competence in constructing proofs of existence theorems; (2) To probe prospective teachers' views of given, written proofs of such theorems; (3) To examine the relationship between the prospective teachers' competence in constructing proofs of existence theorems and the prospective teachers' views of given, written proofs and refutations; (4) To examine the similarities and differences between elementary school and middle school prospective teachers' competence in constructing proofs of existence theorems and their views of given, written proofs of such theorems.

Ninety-three prospective teachers from several major teachers colleges in Israel participated in the study. They were given two questionnaires that were developed for this study: "The Constructing Proofs and Refutations Questionnaire" and "The Judging Proofs and Refutations Questionnaire".

About 50% of the prospective elementary teachers and 20% of the prospective, middle-school teachers incorrectly argued that the existence theorems that were included in the questionnaire are false. Furthermore, about two thirds of the prospective elementary teachers and one half of the prospective middle school teachers argued that numerical examples that fulfill the statements are just examples and could not be regarded as mathematical proofs. These responses suggest that some participants developed a general view that a mathematical statement is true only if it holds for "all cases", a view that is adequate for universal theorems but not for existence theorems.

In the presentation we shall provide typical prospective teachers' responses and draw some educational implications.

References

- Healy, L., & Hoyles, C. (2000). A study of proof conceptions in algebra. *Journal for Research in Mathematics Education*, 31, 396-428.
- Martin, G., & Harel, G. (1989). Proof frames of preservice elementary teachers. *Journal for Research in Mathematics Education*, 20, 41-51.