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Didiş, Nilüfer; Eryılmaz, Ali; Erkoç, Şakir

Pre-service physics teachers' comprehension of quantum mechanical concepts.

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Summary: When quantum theory caused a paradigm shift in physics, it introduced difficulties in both learning and teaching of physics. Because of its abstract, counter-intuitive and mathematical structure, students have difficulty in learning this theory, and instructors have difficulty in teaching the concepts of the theory. This case study investigates students' comprehension of some fundamental concepts which are based on quantum mechanical postulates. The data of the study were collected by forty minute semistructured interviews with two pre-service physics teachers conducted separately. In this study, qualitative analysis of pre-service physics teachers' dynamics of understanding showed that (1) students have insufficient conceptions that influence their descriptions and discriminations, (2) students' comprehension is indefinite, that means, they contain correct and wrong ideas simultaneously, influencing the students' use of different concepts interchangeably and making explanations and discriminations by intuitive reasoning, and (3) some of the conceptions of students are totally unscientific. In addition, students' comprehension lets only one way translation from mathematical to verbal.

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