P31 An instructional experience for pre-service teachers: integrating simulations and hands-on activities in physics teaching

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ABSTRACT

Research suggests that the use of simulations in science teaching enhances the motivation and performance of students (Ruttenet al., 2012; Wiemanet al. 2008). As part of a teacher training course we offered a laboratory on electricity integrating hands-on activities and simulations. While providing the pre-service teachers an opportunity to experiment and reflect upon this kind of learning environment, the laboratory allowed to study the effectiveness of the proposed educational activities in the context of teacher training. The study investigates the use of simulation and its interplay with hands-on activities for pre-service secondary physics teacher education. All 45 participants had a masters degree in physics or mathematics. A conceptual test on electricity was administered to study the participantsprior knowledge. Information about prior laboratory experiences was collected. The laboratory activities focused on DC circuits. The participants were divided into two groups: one started with hands-on exercises and subsequently performed simulations, the other one followed the reversed order. The tasks required numerical or qualitative predictionsbefore simulating or building a certain circuit to check the answers with measurements.The participants were asked to reflect on the task-related difficulties, concepts, and surprising aspects. Results from a preliminary analysis suggest that there were no differences in performance between the two groups. When using the simulations, making predictions based on prior knowledge did not present any difficulty and even though 98% of the participants had no prior experience with simulationsno oneencountered difficulties during their execution. This confirms that simulations reinforce students' understanding of relationships between variables by providing exact agreement with the predicted outcome (Sethi, 2005).On the contrary, in case of the hands-on activities including simple wires, batteries and bulbs,making predictions and measurements resulted very problematic for almost all participants. Both groups encountered an equal amount of difficulties. It seems that the simulations do not help the pre-service teachers in transferring their conceptual knowledge to the reality. A quantitative analysis of the results and a study regarding the pre-service teachers attitude towards the activities is ongoing.

(1) Rutten, N. et al. (2012). The learning effects of computer simulations in science education. Computers& Education, 58, 136-153.
(2) Wieman, C. E., Adams W. K.& Perkins K. K. (2008). PhET: Simulations that enhance learning. Science, 322, 682-683.
(3) Sethi, R. J. (2005). Using virtual laboratories and online instruction to enhance physics education. Journal of Physics Teacher Education Online, 2(3), 22-26.

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