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AN ANALYSIS OF PRE-SERVICE SCIENCE TEACHERS' ATTITUDES TOWARDS PHYSICS LEARNING POST-INTERVENTION WITH VIRTUAL LABORATORY SIMULATIONS

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This paper reports the preliminary findings of a wider study targeted at assessing the affordances of virtual and augmented reality in Physical sciences learning. In this preliminary study, we assess pre-service teachers' attitudes towards the use of virtual laboratories for learning of physics concepts. The study followed a sequential mixed-method design. In the first phase, a quantitative approach was employed in a survey design to assess pre-service teacher attitudes towards physics learning. Pre- and post- test was done using an adapted Physics Attitude Scale (PAS) questionnaire before and after an intervention with virtual laboratory simulations. In the second phase, semi-structured interviews were used to elicit elaborations on the use of virtual simulations for physics learning. Fifty third year pre-service teachers' were randomly selected to participate in the attitude survey after which Phet virtual laboratory simulations where used by the group in learning Faraday's law (magnetic fields and magnets), collisions, momentum and velocity. Findings revealed significant differences in pre-service teachers' attitude scores post intervention with virtual simulations. That is, result from paired sample t-test revealed a significant difference in preservice teachers' attitudes ($t(49) = 17.429$, $p < .01$) with the mean post-test attitude score ($M = 84.04$, $SD = 5.345$) being significantly higher than the mean pre-test attitude scores ($M = 58.42$, $SD = 14.444$). Semi-structured interviews further revealed that, the pre-service teachers found the use of simulation as a useful alternative for understanding abstract physics concepts. The pre-service teachers elaborated that, the aspect of repetition possible with the Phet simulations, made physics learning more interesting. Another aspect highlighted was the accessibility to simulations from anywhere and anytime, which facilitated learning during spare times. However, pre-service teachers noted that the simulations could not replace the experiences in an authentic situation. The implications of these findings for teaching practice are that, virtual simulations can be seen as supporting tool for learning physics concepts. The may not be able to replace hands-on authentic learning experiences, but can be used to complement the learning of abstract physics concepts. We recommend further research and larger scale studies on the epistemological positions, on the affordances of virtual laboratory simulations in science teaching and learning.

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