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The Effect of Integrating Technology into Physics Teaching on Students' Achievements and Self Efficacy

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Abstract

Using various technologies (softwares, applications, simulations, etc.) in the learning process may help students understand physical phenomena and promote student achievement in physics studies. Various studies show that incorporating technologies in teaching enhances the learning experience and leads to improved achievement (Liu, 2016). The present study focuses on the integration of digital technologies and tools in teaching physics and their impact on learner achievement. It also focuses the learners' sense of self-efficacy. The sense of self-efficacy is defined as the person's belief in his ability to organize and successfully perform a series of actions necessary to achieve a desired result. Studies show that there is a positive and significant relationship between self-efficacy and student achievement (Martinez-Pons & (Zimmerman, 1992).

The study involved 84 students in three groups, each group in a different teaching method: 34 students studied in a 'technological' teaching method that relies mainly on technological tools, 28 students studied in a teaching method that combines technology alongside traditional teaching, and 30 students studied in the traditional method. The physical subject on which the study focuses is a rhythmic circular motion, a central theme in high school physics studies. The study examines whether the way of teaching in general, and particularly ways of teaching that incorporate technology, has an impact on learners' achievements and their sense of self-efficacy.

The findings of the study regarding students' knowledge did not show a significant advantage for one of the teaching methods. However, it was found that students who learned by integrating technologies achieved better than students in the traditional group, particularly in questions requiring physical understanding or visual representation of forces or movement: the achievements of the groups incorporating technology was significantly higher than the traditional group. In questions that required the use of mathematics (more than physical knowledge) -

mathematical expressions or calculation - no significant differences were found between the groups. Regarding students' errors it was found that the students of the groups in which the technology was used erred less in typical errors than the students of the traditional group.

Regarding the sense of self-efficacy, a clear advantage was found for the technology groups: there was an increase in the sense of competence and confidence of the technology group students compared to the group students who studied in the traditional way. A correlation was also found between the variables: students with higher achievement were found to have a higher sense of ability that increased even after using the technology, compared to students with lower achievement who had a lower sense of ability that even decreased after intervention in a group that did not incorporate technology.