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Exploring Instructional Designs on the Socio-Scientific Issues-Based Learning Method in Respect to STEM Education for Measuring Reasonable Ethics on Electromagnetic Wave through Science Attitudes toward Physics

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Abstract : Using the Socio-Scientific Issues-Based Learning Method is to compare of the blended instruction of STEM education with a sample consisted of 84 students in 2 classes at the 11th grade level in Sarakham Pittayakhom School. The 2-instructional models were managed of five instructional lesson plans in the context of electronic wave issue. These research procedures were designed of each instructional method through two groups, the 40-experimental student group was designed for the instructional STEM education (STEMe) and 40-controlling student group was administered with the Socio-Scientific Issues-Based Learning (SSIBL) methods. Associations between students' learning achievements of each instructional method and their science attitudes of their predictions to their exploring activities toward physics with the STEMe and SSIBL methods were compared. The Measuring Reasonable Ethics Test (MRET) was assessed students' reasonable ethics with the STEMe and SSIBL instructional design methods on two each group. Using the pretest and posttest technique to monitor and evaluate students' performances of their reasonable ethics on electromagnetic wave issue in the STEMe and SSIBL instructional classes were examined. Students were observed and gained experience with the phenomena being studied with the Socio-Scientific Issues-Based Learning method Model. To support with the STEM that it was not just teaching about Science, Technology, Engineering, and Mathematics; it is a culture that needs to be cultivated to help create a problem solving, creative, critical thinking workforce for tomorrow in physics. Students' attitudes were assessed with the Test Of Physics-Related Attitude (TOPRA) modified from the original Test Of Science-Related Attitude (TOSRA). Comparisons between students' learning achievements of their different instructional methods on the STEMe and SSIBL were analyzed. Associations between students' performances the STEMe and SSIBL instructional design methods of their reasonable ethics and their science attitudes toward physics were associated. These findings have found that the efficiency of the SSIBL and the STEMe innovations were based on criteria of the IOC value higher than evidence as 80/80 standard level. Statistically significant of students' learning achievements to their later outcomes on the controlling and experimental groups with the SSIBL and STEMe were differentiated between students' learning achievements at the .05 level. To compare between students' reasonable ethics with the SSIBL and STEMe of students' responses to their instructional activities in the STEMe is higher than the SSIBL instructional methods. Associations between students' later learning achievements with the SSIBL and STEMe, the predictive efficiency values of the R2 indicate that 67% and 75% for the SSIBL, and indicate that 74% and 81% for the STEMe of the variances were attributable to their developing reasonable ethics and science attitudes toward physics, consequently.

Keywords : socio-scientific issues-based learning method, STEM education, science attitudes, measurement, reasonable ethics, physics classes
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