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Effect of Online Science Kits on Students' Achievement Scores in Online Science Courses

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Overview



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Causal comparative study on the efficacy of online science kits to improve students' science achievement in online science courses.

A comparison of student end of course mean scores and course completion rates between kit and non-kit courses are provided.

The presentation is designed to aid instructional designers, instructors, and institutions to identify the contributing factors for the effectiveness of the kits to increase students' achievements in online science courses.



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Purpose

Workforce competency gaps in STEM

A shortage of effective hands-on activities and physical labs creates a constraint to fully engage students which can impact student retention and success.



Rationale



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Accommodating the needs of the hands-on learner (often classified as a kinesthetic/tactile learner) remains an ongoing challenge in online courses.

This constraint to fully engage students can impact student retention and success.

Retention of information is influenced by student engagement in online courses as suggested by data from 44,000 students in 120 universities.

Online science lab kits provide hands-on learning opportunities that may enhance meaningful learning and retention of information by the students enrolled in online science courses.

Home-based science kits provides the student with “mass” which is the actual physical object of the subject matter under treatment in a teaching-learning situation.

Research Questions



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- **Research question:** To what extent was there any statistically significance difference between the students' mean scores of online science courses taught with and without the science kit?
- **Null Hypothesis:** There was no statistically significance difference between the students' mean scores of online science courses taught with and without the science kit
- **Alternative Hypothesis:** There was a statistically significance differences between the students' mean scores of online science courses taught with and without the science kit.

Method



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The population included 7,667 students who completed an online science course at a U.S. higher education institution. The sample drawn from the total population consisted of 4,434 students in the control group who completed the online science course using an online science kit.

A purposive sampling technique was used for this study to include archived science scores of students from control and experimental groups.

The dependent variable in this study was student end of course mean scores and the independent variable was use of the online science kit.

Research questions were designed to be answered using an independent t-test analysis.

Control and experimental groups within each institution were compared in order to maximize the similarities of the groups and courses. Student end of course mean scores were not compared across institutions as it would bring extraneous variables that would interfere with the results.

Results



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The results of the study provided support for use of the science kit at one of the five institutions and inconsistent support for use of the kit at four institutions.

Further analysis of non-completion data (withdraw, failure for non-attendance, and incomplete grades) decreased for students enrolling in courses taught with a kit as compared with the courses taught without the kit at three of the five institutions. The results of the study provided.

Conclusions



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- The science kit developers should provide the trainings for instructors and students on how to use the science kits to improve the kits' effectiveness.
- The science kit developers should provide clear recommendations and guidelines for the amount of time of using the kits and how to use the kits.
- Students' demographics may not play a role in effectiveness of the science kits on students' achievement scores.
- Age may play a role in effectiveness of improving retention rates by the science kits. Perhaps, age should be considerate in developing science kits.