

建構主義式的網路科學學習對國中生力的概念 學習之研究

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摘要

本研究的目的是在探討符合建構主義的學習模式，在融入網路化教學的特性後是否能夠協助學生建構較完整的力的概念。研究結果顯示，實驗組學生在後測及延宕測均高於前測成績且達顯著差異，顯示使用建構主義式的網路科學學習模式，確實可以讓在自然科成績不論高成就或低成就的學生都可以學得很好，而且學習保持也有不錯的效果；另外不論在後測及延宕測成績實驗組都優於對照組，代表建構主義式的網路科學學習模式不論在學習成效或學習效果的保持都優於傳統的教學方式。另外在傳統教學模式只有高分組的學生在後測成績達顯著，低分組的學生甚至後測及延宕測成績均低於前測成績，由此顯示，傳統的教學方式只對自然科成績高成就的學生的學習有效，但是對一般或低成就的學生就沒有多大的效果。

學習網站的學習路徑分析方面，在各單元除了在「力的測量」單元，高、中、低分組三組學生錯誤的概念差不多及「力的分類」單元，中分組錯誤的概念較高分組少外，其餘的都是高分組學生錯誤的概念較少，中分組次之，低分組的學生錯誤的概念較多。而在學習成效方面，在「力的測量」、「兩力平衡」、「力的合成」、「力的分類」及「摩擦力」的成就後測方面，高分組的學生成績均高於與中分組及低分組的學生且均達顯著差異。另外在延宕測驗，在高分組的學生延宕測驗成績與低、中分組的學生成績除了「力的測量」及「摩擦力」兩個單元外都達到顯著差異。

而在網路學習動機與成就測驗相關研究，顯示網路學習動機的各向度與延宕測驗成正相關。網路環境問卷方面，發現學生知覺學習網站有較高的學習彈性與學生的學習成效成負相關。而「學習知識重整」因素與學生的學習成就成正相關且具預測力。網路學習環境與學習動機相關分析方面，網路學習環境的四個向度，對於學習動機的每一個向度都有相關。觀察標準迴歸係數(standardized regression coefficient β)，顯示網路學習環境的「網路課程的結構」對學生「功課作業價值」及「對學習與成績的自我效能」此二個學習動機向度有較大的預測力。

The Effects of Constructivist-oriented Web-based Science Learning on Middle School Students' "Force" Concept Learning.

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Abstract

This research aims to investigate the use of constructivist-oriented web-based science learning would bring students more scientific view of force concepts. Results show that experimental group (use of constructivist-oriented web-based science learning) performed better on both post-test and retention-test of force concepts than control group (traditional teaching). In addition, experimental group's students made statistical significant progress on both of post-test and retention-test, regardless of high or low achieving students. In other word, the use of constructivist-oriented web-based science learning would bring students better immediate performance and retention effect than traditional instruction. On the other hand, only control group's high achieving students made statistically significant progress on their post-test, and low achieving students' did not make any progress after traditional instruction. It indicates that traditional instruction is only effective for high achieving students.

The results of the students' learning path analysis show that high achieving students had lesser misconceptions than middle or low achieving students on most sections, except the measurement of force and classification of force. It also shows that high achieving students made statistic significant greater progress than middle and low achieving students on the post-test of the section of measurement of force, balanced force, force in combination, classification of force, and friction; and retention test on the section of balanced force, force in combination and classification of force.

This study also shows that five scales of web-learning motivation questionnaire had negative correlation with students' retention test.

Students' perception of the scale of learning flexibility on web-learning environment questionnaire had negative correlation with their post-test and retention-test. However, students' perception of the scale of reorganization on web-learning environment had positive correlation with students post-test and retention-test. Moreover, each scales of web-based learning questionnaire had positive correlation with each scales of web-learning motivation questionnaire.

