Problem-Based Learning Using HARP Instruction

Academic High Altitude Conference

Contributors: Dr. Steve Snyder, Danielle Green, Heidi Hilt, Jenny Nordin, and Lydia Kilmer
Taylor University

Hypothesis

Hypothesis 1 – Problem-Based Learning
The event group (control group) who did not use a problem-based teaching approach in implementing the HARP program would do significantly worse than the expert group classrooms on valuing of science, application, intrinsic motivation, cognitive skills, metacognitive skills, and content knowledge.

Hypothesis 2 – Specific Feedback Improvements
Professors that integrate a problem-based teaching approach in implementing the HARP program with guided improvement suggestions two or three times (experienced group) were able to achieve growth in their students that equaled the expert group classrooms on valuing of science, application, intrinsic motivation, cognitive skills, metacognitive skills, and content knowledge.

Hypothesis 3 – Continual Expert Improvements
Expert groups that continue to evaluate and receive constructive feedback on how to improve their problem-based teaching approach in implementing the HARP program into their curriculum will show significant improvement on valuing of science, application, intrinsic motivation, cognitive skills, metacognitive skills, and content knowledge.

Results

The experienced group and the expert group saw almost identical increases as they implemented the project in their own classrooms. Students in both groups exhibited significant increases in all main scales and all but two subscales. This means that the suggestions made for instructional improvement by Taylor University evaluators have successfully aided educators in improving their educational techniques to achieve growth.

Reliability & Validity

Reliability: The degree to which an instrument will produce the same results each time it is administered to the same person in the same setting.

Validity: the extent to which a test measures what it claims to measure.

Methods

Analysis: A One-Way Repeating Measure ANOVA was used to measure changes between students’ pre and post tests. Based on professors’ number of HARP implementations, the classes were grouped together and One-Way ANOVA tests were conducted with a Multiple comparison Test follow-up using net gain scores. Practical significance was obtained for each comparison using η² to indicate the magnitude of change associated with the independent variable.

Group 1: Event Launch Group (Control group)
The control group school did not integrate the HARP program into their curriculum and conducted the launch as a one week event under the supervision of Taylor University (1 Class; 15 students).

Group 2: Novice Launch Group
The novice group included schools that had completed their 1st event group under the guidance of Taylor University during a semester course and had received feedback for improvement within the curriculum of their classes (11 Classes; 281 Students).

Group 3: Experienced Launch Group
Schools that had completed either a 2nd or 3rd launch under the guidance of Taylor University during a semester and had received feedback for improvement within the curriculum of their classes (6 Classes, 89 Students).

Group 4: Expert Launch Group
Schools that had completed more than 3 launches under the guidance of Taylor University during a semester and had received feedback for improvement within the curriculum of their classes (3 Classes; 141 Students).

Conclusions

Problem-Based Learning: The event group (control group) experienced results that were significantly lower than those of the groups that applied a problem-based teaching approach. It appears that students in the event group did not gain perceptual growth in the areas of application knowledge, metacognitive processes, cognitive skills, and content knowledge. The novice group did achieve more perceptual growth in intrinsic motivation and valuing science than other groups.

Specific Feedback Improvements: The experienced group and the expert group saw almost identical increases as they implemented the project in their own classrooms. Students in both groups exhibited significant increases in all main scales and all but two subscales. This means that the suggestions made for instructional improvement by Taylor University evaluators have successfully aided educators in improving their educational techniques to achieve growth.

Continual Expert Groups: After four semesters of implementation and feedback on how to improve, all major educational variables measured were both statistically and practically significant when comparing students’ improvements from pretests to posttests. The quality of problem-based learning in science classes seems to be proportional to the number of times instructors go through the process of evaluating their classes on key instructional variables and seek to implement specific educational instructions.