



THE IMPACT OF THE FLIPPED CLASSROOM ON LEARNING AND PROBLEM SOLVING SKILLS OF NINTH GRADE BIOLOGY STUDENTS

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The educational use of internet tools has the potential to prepare, engage and motivate students in a student-centered process (Shea & Sherer, 2011) This classroom research study investigated the effects of changing the traditional method of lecture and note taking during class to the “flipped” classroom concept which used the practice of assigning online video lectures, animations, and other supporting materials for homework and turned class time into an active learning experience. More time was available in class for problem solving.

BACKGROUND

This classroom project was carried out at Glenwood School in two of my ninth grade biology classes. The experience with science these students were exposed to was mostly teacher-centered instruction and memorization of facts to pass a test. They had very little active learning and problem solving practice. As a result they struggled with application of biology concepts. Within each class there was a mixture of high achievers, low achievers, apathy, motivation, and engagement among the students. The total number of students was 48, comprised of 25 girls and 23 boys.

FOCUS QUESTIONS AND DATA COLLECTION METHODS

Focus Questions	Data Source 1	Data Source 2	Data Source 3
Primary Question: What are the effects of flipping the classroom on learning and problem solving skills of ninth grade Biology students?	Pre and post unit assessments measuring prior knowledge, problem solving skills, and growth of each	Self evaluation rubrics following class activities/labs measuring the impact of online resources on learning and problem solving skills	Pre and post treatment surveys and interviews
Secondary Questions: 1. What is the impact of flipping the classroom on student engagement and attitude during class time?	Pre and post treatment student surveys and interviews measuring student attitude and engagement	Self evaluation rubric measuring the impact of flipped classroom format on attitude and engagement	Student written reflections and feedback
2. In what ways will flipping the classroom impact student preference for instructional methods?	Pre and post treatment student interviews measuring student instruction method preference	Pre and post treatment student surveys measuring student perception of most effective learning environment	Student written reflections and feedback

METHODOLOGY

- ❖ Pre-treatment survey on Google Forms
- ❖ Pre-treatment interviews
- ❖ Pre-unit summative assessment
- ❖ Unit Cells: Treatment Group 1
Non-treatment Group 2
- ❖ Unit Genetics: Treatment Group 2
Non-treatment Group 1
- ❖ Post unit summative assessment, surveys, and interviews.
- ❖ Treatment group homework consisted of watching assigned online resources and completing the corresponding written work. Class time began with Q&A following by active learning exercises. Self evaluation rubrics were given following each activity during class. Student anonymous written feedback was periodically taken.
- ❖ Non-treatment group followed the “normal” traditional classroom with lectures and labs.

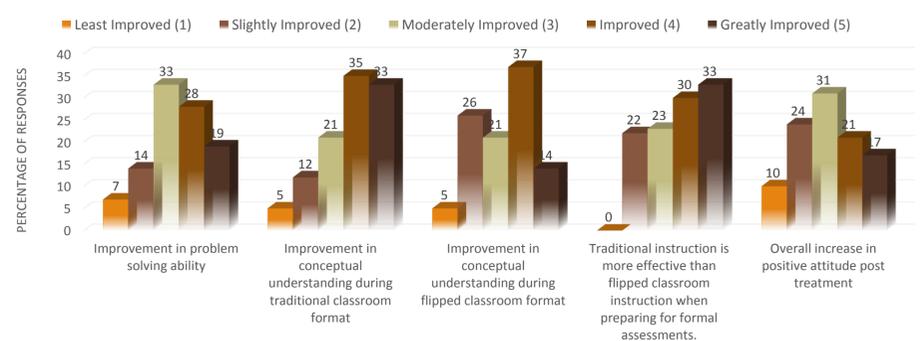


Group collaboration and problem solving .

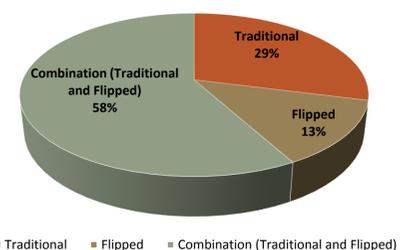
RESULTS

- ❖ All data sources indicated that learning and problem solving skills of students in both groups improved. Although the post unit summative test scores for each unit revealed significant increases compared to the pre unit tests, the non-treatment group in each unit had a greater increase in all tested areas.
- ❖ Survey responses shown in the graph below illustrate the significant improvement the students realized during the treatment in problem solving, conceptual understanding, and positive attitude. However students felt that the traditional instruction was more effective in preparing them for assessments.
- ❖ Anonymous feedback indicated an overwhelming student preference for a combination of traditional and flipped classroom instruction.

POST TREATMENT SURVEY RESPONSES



Post Treatment Student Anonymous Feedback for Instruction Preference



CONCLUSIONS

- ❖ Positively impacted learning but not necessarily test scores
- ❖ Positively impacted problem solving skills which could have resulted from more active learning during class
- ❖ Positively impacted attitude and engagement of students
- ❖ Students preferred traditional over flipped format but requested a combination of the two approaches
- ❖ Best practices must include ongoing action research and student perspectives on their learning must be considered