The Effect of Online Remedial Tutorials on Student Experience and Grades in an Undergraduate Biology Course

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ABSTRACT

This mixed method study with quasi-experimental design explored the use of active learning-based remedial online tutorials. Three 200 student sections of a first year biology course were offered additional online tutorials (Tutorial Class in 2017), and they were compared to traditional lectures a year before without tutorials (Control Class in 2016). A pre-test that contained conceptual questions from all course units was given during the first week , and as a post-test during the final exam. Two midterms, lab exam, and final exam grades were collected, in addition an online student survey (n=225) and focus group (n=3) provided qualitative feedback.

Students enrolled in Biology 1001 in Fall 2017 were granted access to five piloted modules on Brightspace (D2L) that addressed the structure of eukaryotic cells, the plasma membrane, diffusion and osmosis, meiosis and inheritance and DNA to RNA to Protein. Each module provided students with the opportunity to watch videos, and complete interactive activities, reflection questions and quizzes.

Tutorial Classes 2017 VS Lecture Classes 2016

Self-based online tutorials
Animated videos
Quizzes
Gamification

Lecture classes with identical curriculum

Online Participation VS No Participation

What was compared?	How was it compared?
Participation in online tutorials	Quiz participation in at least 1/5 modules
Learning Outcomes	Grades and conceptual pre/post tests
Engagement Experienced	Online CLASSE student survey, online feedback survey and student focus groups

RESULTS

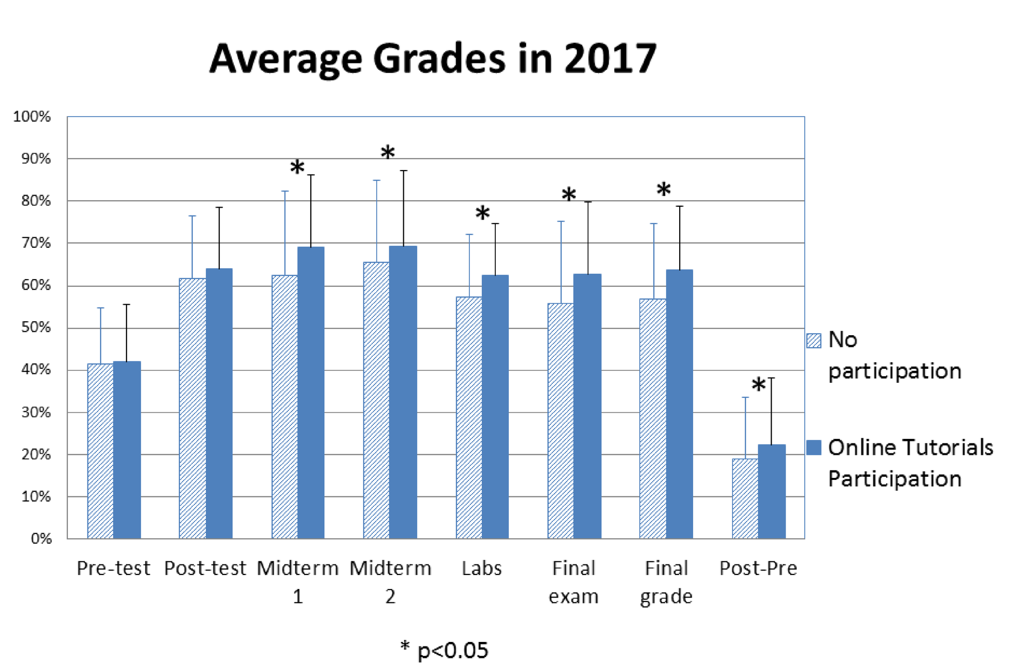

Figure 1. Students that participated in the online tutorial (n=410) by answering quiz questions at least in one module had higher grades, and improved in the conceptual test compared to students who didn't engage with tutorials (n=160).

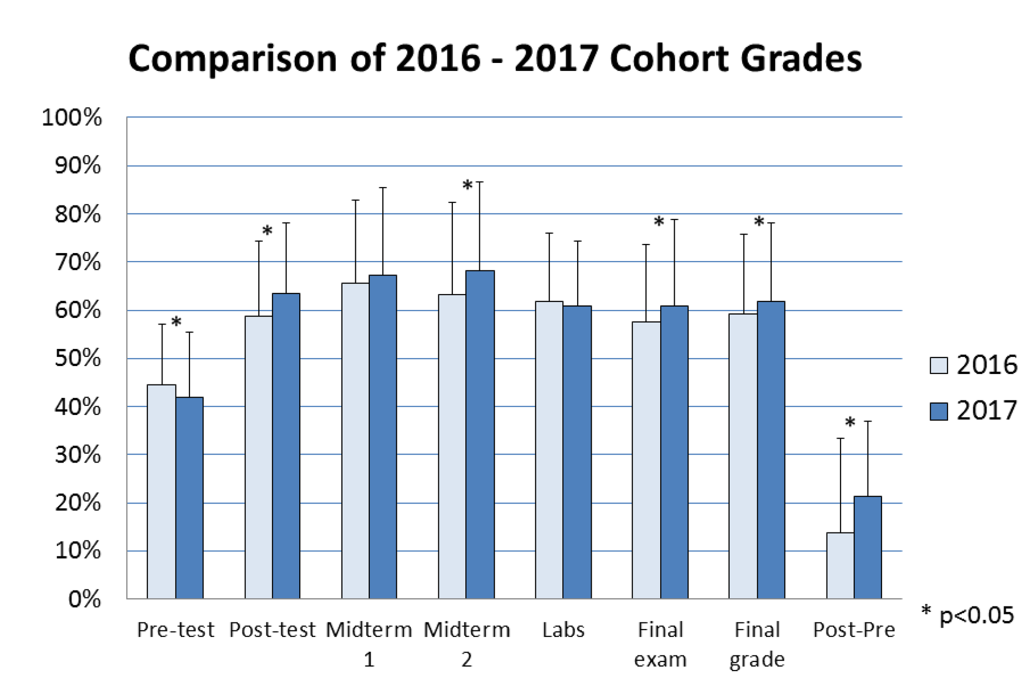

Figure 2. Student in the previous control cohort in 2016 (n= 491) started on a higher level in the pre-test but reached overall lower grades than 2017 cohort (n=586) who had access to the online tutorials.

Student feedback in Tutorial Classes

Features Accessed	%
Quizzes	77%
Videos	70%
Drag and Drop Activities	60%
Reflection Questions	46%
Awards	36%
I did not access any module features.	12%

Modules Visited	%
Diffusion & Osmosis	79%
Exploring the Structure of Eukaryotic Cells	78%
The Plasma Membrane	76%
The Basics of Meiosis and Inheritance	72%
DNA to RNA to Proteins	53%
I did not visited any of the modules	10%

Frequency of visits	0-3 times	4-7 times	8-11 times	12-15 times	16+ times
%	35%	42%	15%	4%	4%

Responses of favourite feature	%
It was easy to understand	27%
Quizzes	22%
Videos	16%
It helped me learn new material	13%
Other	11%
The activities	10%
It was interactive/fun	10%
It was easy to access	7%
The ability to review the material multiple times	7%
It was an effective study tool	6%
I did not use it	5%
The content covered	5%
The design of the tutorials	4%
It presented the material in an alternative way to lectures	3%
Nothing	3%
Definitions	2%

Student Feedback

The course content was easy to find (81%);
The concepts made sense (77%);
The modules were easy to follow (77%); and
The site was pleasing to the eye (67%).

Focus group participants mirrored these findings, stating that their favourite aspects were that the tutorials **"made the concepts 10x easier to understand",** the videos, and the reflection questions as they **"allow you to apply what you learned".**

Looking forward, students recommend making two primary changes to the present online tutorials: increasing the number questions in the quiz bank and providing more tutorials. In relation to questions for quizzes, it is recommended that more questions are added to the present quizzes that challenge students' understanding of the material.

CONCLUSION

The interactive tutorials were well received by the students, and students asked for more modules in the course to be supported with online tutorials. Students preferred quizzes, videos and easily understandable materials.

When tutorials were available, there was a significant increase in all grades compared to the previous year without tutorials. In addition, students who engaged with tutorials had significantly higher learning outcomes as measured by exams and grades within the cohort.

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References:
http://www.assessment.ua.edu/CLASSE/Documents/CLASSE_Student.pdf
Klymkowsky, M. W. and Garvin-Doxas, K. (2008). Recognizing Student Misconceptions through Ed's Tool and the Biology Concept Inventory. PLoS Biol 6, e3.