

An Attempt to Improve Student Engagement with Class Content via a Student-produced Wiki

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Abstract. In a freshman-level honors astronomy class, an attempt was made to use a student-produced wiki to improve student engagement and connection with the class material. This attempt was not entirely successful due to unforeseen challenges such as the assignment being too open-ended and too time consuming to grade. Despite these challenges, the wiki was successful in encouraging the students to reflect more on the class material, and to connect that material to the “real world.” While the wiki assignment that was originally attempted will not be repeated in future classes, certain portions will continue to be used to enhance student engagement.

1. Introduction

In an attempt to improve student engagement with and ownership of class content, a wiki assignment was implemented (in Spring 2013) in a freshman-level George Washington University (GWU) Honors Program science seminar for non-science majors entitled “Revolutions in Astronomy.” Students were required to make weekly contributions to the wiki. Here, I describe both the challenges with and successes of this wiki, and reflects on how the assignment will be modified for future implementation.

The primary motivators for developing this assignment were the following three problems: 1) disengaged students, who do not take responsibility for their own learning, 2) students failing to make connections between class material and the “real world” outside of the classroom, and 3) students cramming for exams, and failing to identify which topics/skills will be probed on exams.

2. Wiki Pedagogical Theory and Literature

Studies of the effectiveness of wikis in science undergraduate classes are limited, but wikis in general have demonstrated at least moderately positive effects on learning (O’Bannon & Britt 2012). The theory behind wikis is that students learn best when involved in actively constructing knowledge, as opposed to passively absorbing knowledge. Requiring students to actively construct the wiki, then, may help to increase knowledge retention and to impart to the students a “heightened sense of responsibility for their learning process” (Johnson & Bartolino 2009). Additionally, the relative anonymity of the wiki format may provide shyer students and those uncomfortable with asking questions in class a “safe” platform for engagement, discussion and inquiry (Beeson 2005).

A study of pre-service teachers in 2009 (Matthew & Felvegi) found that students using a wiki collaborated more outside of the classroom and delved more deeply into the material. Other optimistic results include those of Hazari, North & Moreland (2009), who found that students responded with a mean of 4.97 on a 7-point Likert scale to the statement: the “[b]enefit of using the wiki is worth the extra effort and time required to learn it.” Additionally, first-year psychology students received improved final exam scores after engaging online (Kelly, Baxter, & Andrewson 2010). Interestingly, the students in this study who were not planning on majoring in psychology saw the most significant exam improvements—this may suggest that non-science majors might have the most to benefit from a wiki system.

3. Wiki Assignment Description

Students were required to make weekly contributions to the wiki including (but not limited to) listing topics and skills covered in class, asking or answering peer questions about the class material, summarizing and reflecting on class readings, adding videos/images or links to external websites that would be helpful in learning, providing examples of the material as mentioned in popular culture (including both fiction and non-fiction), or even writing (and providing solutions for) possible exam questions. An example section of a wiki page is shown below—student contributions have not been edited, but student names have been removed for privacy. The wiki was worth 5% of the final course grade, giving students a modest grade incentive to engage with and reflect on the course material outside of class time, while also keeping the assignment relatively low-stakes.

Additional Sources of Information:

This is an [interactive page from NASA](#) that allows us to see the affects of black holes. This allows you to view the black hole form different distances and from different forms of light.

Helpful image from [Hubble NASA page](#) on the idea of "spaghettification" through their animation of falling into a black hole. The animation assumes you start at the event horizon (Rs). The other tabs on the page are also helpful for general knowledge and understanding.

Interesting article on the [Scientific American blog](#), that discusses the length of time before distruction of objects in a black hole. Hawking's theory is discussed, in addition to more current thoughts on the process.

Stephen Hawking made a [speech](#) discussing black holes and what happens when you fall into one. He discusses a lot of information we covered in class but it's cool to hear Stephen Hawking's view and read more about whether information is lost in a black hole. I was surprised to learn that the idea of a black hole was first proposed in the eighteenth century.

This is an [infographic](#) from space.com that has a lot of good, and easy to follow, information on black holes. It can act as a good summary of the information presented in class.

Recent Related Media/Press Links:

["Using Black Holes to Measure the Universe's Rate of Expansion" Science Daily 4/22/2013](#) This article explores how astronomers are now using black holes to measure the rate of expansion more accurately than before. Scientists use the amount of radiation emitted and the amount that actually reaches Earth to measure the distance. This distance is translated into looking back in time. Scientists hopes that this method will help them make some progress on dark energy as well.

A student at neighboring George Mason University has [discovered a mini-supermassive black hole](#). This is one of the least massive supermassive black holes ever discovered.

Stephen Hawking [visits CalTech](#) to discuss his theories on falling into a black hole and what happens to data and objects that fall in. Do they end up in another universe? Is it lost?

["NASA's Webb Telescope Gets Its Wings"](#) While we were able to get instantaneous results during our Black Hole game, this article puts into perspective how much the process takes to put a telescope into space. The Webb telescope is Hubble's successor, and its wings were just completed a year after the center section of it. Even as the telescope itself is almost finished, it won't be ready for launch until 2018.

["Scientists Find Possible Hint of Dark Matter"](#) This article by the Associated Press talks about how scientists have discovered a lead on proving that dark matter, the theoretical material that holds together the universe, exists. Scientists now believe they have discovered "cosmic footprints" of dark matter that help to prove that it is there. However, there is a possibility that the so-called footprints were from quasars rather than dark matter.

4. Challenges

4.1. Too Open-Ended

The design of the wiki assignment was too open-ended. While a wiki is an excellent platform for a more freeform assignment, the students had difficulty with its lack of

definite structure. They initially struggled with what to post and expressed discomfort with experimentation on the wiki—they wanted to know exactly what edits they were responsible for each week. Also, without a fixed due-date the students were often unable to remember to complete their weekly work on the wiki. The solution to this was to provide a “checklist” of required edits and a firm due-date—once this structure was put into place (in the second half of the semester), student performance on the wiki became much stronger. However, this meant that the wiki became less of a creative, dynamic space and more like a traditional homework assignment.

4.2. Difficult to Grade

Grading the wiki was a major challenge. I had assumed that most of the students would get into the habit of editing the wiki regularly, and I could spot-check contributions rather than having to evaluate each contribution individually. Unfortunately, because participation was not uniform amongst the students and not consistent week-to-week for each individual student, I had to go through the wiki edit-by-edit to evaluate contributions. The only way to do this is to compare each version of the wiki, but this was extremely time consuming as each page could have many versions. I eventually requested that students indicate in parentheses, e.g. (name), their individual contributions so that I could see at a glance who was actually participating and at what level. Unfortunately, there is no obvious solution to this grading problem beyond self-labeled contributions. While this solution did make grading easier, I disliked this labeling because I strongly prefer the semi-anonymous nature of the wiki (wiki edits are not truly anonymous, but you have to dig a little to figure out who edited/added what).

4.3. Lack of Online Interaction/Dialogue

I was hoping that students in the semi-anonymous wiki would feel comfortable asking actual questions they had about the material. Instead, most of the questions asked/answered were forced and not genuine questions about the material. Students would often ask and answer their own questions and therefore the wiki stimulated only a small amount of actual dialogue. Also, students only occasionally examined the material that other students had posted online. Therefore, the wiki ended up being primarily a sum of individual efforts, rather than a truly collaborative effort.

4.4. Not Simultaneously Editable

Only one student could edit the wiki at a time, which made working on the wiki during class time logistically challenging. This was disappointing because having groups of students writing their own exam-like questions was a particularly successful aspect of this wiki.

5. Successes

5.1. Additional Learning Resources and Connections to the “Real World”

The wiki did successfully make the students reflect more on the class material and find connections between material in the news and in the media and the material being presented in class. Students found it helpful to be responsible for finding online sources that presented additional or alternative explanations of the course concepts—as these

sources acted like supplemental course texts. Having to find, read and summarize outside sources also helped them to review key course concepts.

5.2. Collaboration on Exam-like Questions

Students were required to work together to ask (and answer) questions similar to those that would be found on a class exam. To help them develop these questions, we discussed Bloom's Taxonomy, which was new to them. The students found that this framework gave them insight into how I think when developing exam questions, which they appreciated. Writing these exam-like questions forced them to reflect more deeply on the class material and to synthesize material presented over multiple class periods.

6. Future Plans

I plan to use only the most successful portions of this wiki in future semesters, rather than repeating this exact assignment. From now on, I will link the wiki to the weekly homework assignments and provide more clear-cut instructions about exactly which edits are required—I will also enforce a strict deadline to keep students on track. I will focus the wiki around having students find and summarize additional resources to enhance their understanding of the material and connect the class material with the "real world." Students will be asked to label contributions in the wiki to allow for straightforward grading, or a different digital technology such as a Blog will be used. This new version of the wiki will be less focused on producing an online dialogue since that failed this semester. However, the new version will still address the three major motivations to developing the wiki in the first place. I will also repeat my discussion of Bloom's Taxonomy with future classes, and continue to challenge them to develop exam-like questions—though I will shift this to primarily in-class collaborative work.

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