Student Development of Class Notes using a Wiki as an Alternative to a Single Course Textbook

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Abstract
How often do we as faculty members complain about the textbook? Not to mention the complaints we get from our students. Yet, the first thing we often do when planning a course is select a textbook. Selecting and relying on a single text tends to be teacher-centered and content-driven. A more learner-center, objective-driven approach is easier today given the availability of digital resources and collaborative tools.

As an alternative to requiring a textbook for a senior-level mechanics course, the students are creating a set of notes as a class using the wiki function in Blackboard. Through this process the students will:
- Synthesize information from different texts and resources, and
- Collaboratively create a set of notes that they can use for quizzes and the final exam (and later in their careers).

The students are working in groups. Each group is responsible for a separate section (the sections include: General Discussion, Theory and Equations, Definitions, Concept Map, and Example) of the class notes for each of five separate units of the course. Each person in the group is required to select a different reference(s) and draft the section individually; the group then evaluates the individual sections and combines them to create a single section, which they post to the class wiki. In addition to digital resources available to the students through Blackboard, I have placed several textbooks on reserve at the library.

Student responses so far have been mixed. In addition to midterm and end-of-term surveys related to the effectiveness of this approach, I am tracking student usage of the digital resources. A comparison of the class notes developed by individual students with those developed by the groups allows me to assess the contributions of the individuals and the changes in quality affected by the group process.

Introduction
How often do we as faculty members complain about the textbook? Not to mention the complaints we get from our students. Yet, the first thing we often do when planning a course is select a textbook. And often one of the first things we are asked about our course is “what textbook are you using?” Selecting and relying on a single textbook tends to be teacher-centered and content-driven, whereas a learner-centered, outcome-driven approach to course design is generally recommended⁶ and results in more learning². A more learner-centered, outcome-driven approach is easier today given the availability of digital resources and collaborative tools.
Using multiple resources for an engineering course seems more authentic as it better represents how the students will use resources and information when they are working as engineers, where they won’t have a single textbook with sections and examples for each type of problem they might encounter.

**Objectives**

As an alternative to requiring a textbook for a senior-level mechanics course, the students are creating a set of notes as a class using the wiki function in Blackboard. Through this process the students will:

- Synthesize information from different texts and resources, and
- Collaboratively create a set of notes that they can use for quizzes and the final exam (and later in their careers).

In addition, I hope to eliminate the complaints about the textbook and get students to search and organize the information for themselves, an exercise that I hope will promote greater learning.

**Class Wiki Description**

Below is an introduction to the class notes/wiki that I put on the course syllabus:

*The textbook has always been a struggle – I have yet to find the perfect textbook to complement this course (someday I’ll find the time to write my own – but then I fear you’ll only be exposed to one perspective). So... through the term we will create our own set of class notes based on lectures, discussions, and outside resources. Everyone in the class will collaborate to create the class notes, which you will be allowed to use for quizzes and the final exam. I am confident that by synthesizing information from multiple resources you will better understand the material than you would by using a single textbook for the course. I will provide resources and information – through Blackboard, library reserves, and printed handouts.*

The entire class is responsible for developing the set of class notes using a wiki in Blackboard. The students are working in groups of four (I assigned the groups but they were allowed to request up to 2 group members). Each group is responsible for developing a different section of the wiki for each of the five main units of the course. The sections of the wiki are as follows:

- **General Discussion** – When is this assumption valid? When is it not valid? Give examples (no numbers just general discussion).
- **Theory** – What equations apply?
- **Definitions** – Provide definitions for key terms.
- **Concept Map** – Develop a visual representation of the concepts and interconnections.
- **Example 1** – Each example should include a clear explanation of the steps.
- **Example 2** – Each example should include a clear explanation of the steps.

Each person in the group must select a different reference (or references) and individually draft the section. The groups each have a group wiki in Blackboard where they can post and share their individual wikis with their group. The groups then evaluate the individual draft wikis and develop a single section (ideally using portions from each of the individual posts)
that they then post to the class wiki. The students are allowed to use the wiki/class notes on all quizzes and the final exam.

The class wiki project counts for 25% of the students’ grade in the course (with the remaining 75% split evenly between quizzes, assignments, and a final exam). I evaluate each wiki section using the rubric shown in Table 1. At the end of the term, each person will evaluate the performance and participation of the group members, including themselves.
<table>
<thead>
<tr>
<th>Category</th>
<th>Full Pts</th>
<th>No Pts</th>
<th>Points</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Content</strong></td>
<td>Key information is included. Subject knowledge is excellent and there are no factual errors.</td>
<td>Includes essential information about the topic. Subject knowledge appears to be good.</td>
<td>40 points</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Includes essential information about the topic but there are 1-2 factual errors.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Content is minimal, OR there are numerous factual errors.</td>
<td></td>
</tr>
<tr>
<td><strong>Organization</strong></td>
<td>Content is well organized – easy to read and follow.</td>
<td>Content is fairly well-organized.</td>
<td>20 points</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Organization is unclear.</td>
<td></td>
</tr>
<tr>
<td><strong>Amount of Information</strong></td>
<td>The length is reasonable (~1/2 page if printed).</td>
<td>A bit too much or too little information is included.</td>
<td>10 points</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Too much or too little information is included.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Lots of extraneous information is included or very little useful information is included.</td>
<td></td>
</tr>
<tr>
<td><strong>Deadlines Met</strong></td>
<td>The wiki was available on time.</td>
<td>The wiki was posted up to one day late.</td>
<td>20 points</td>
</tr>
<tr>
<td></td>
<td></td>
<td>The wiki was posted up to 2 days late.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>The wiki was posted more than 2 days after the deadline.</td>
<td></td>
</tr>
<tr>
<td><strong>Details</strong></td>
<td>No misspellings, grammatical errors, or linking errors.</td>
<td>Two or fewer misspellings, grammatical errors, or linking errors.</td>
<td>10 points</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Three misspellings, grammatical errors, or linking errors.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>More than three errors in spelling, grammar, or linking.</td>
<td></td>
</tr>
</tbody>
</table>

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While I did not require a textbook for the course, I recommended the following two textbooks: *Advanced Mechanics of Materials* by Boresi and Schmidt and *Advanced Mechanics of Materials* by Cook and Young. I placed these two textbooks and several other textbooks on reserve at Feldberg Library (the engineering library at Dartmouth). In addition, I worked with librarians to find appropriate digital resources (owned by the library); I placed links to these resources on the Blackboard course website. Finally, I use a Tablet PC to annotate my lectures (developed in PowerPoint) and I post all of these annotated lecture notes in Blackboard for the students to access.

### Examples

As an example, the General Discussion section of the wiki for Unit 1: Unsymmetric Bending is shown in Figure 1. This example is typical of the postings for the General Discussion sections. While I had hoped that the students would combine their individual drafts to create a final class wiki section, I’ve found that what they do in practice is select one of the individual drafts and post it as the final class wiki “as is.” This is true of the section shown in Figure 1; it was posted in the group wiki by an individual student and then simply copied to the class wiki. An example of the Concept Map section of the wiki, which was developed for Unit 4: Non-prismatic and Non-homogeneous Beams is shown in Figure 2.

### Unit 1: General Discussion

**Symmetric bending occurs when...**

1. Cross section of beam has a plane of symmetry.
2. Load is applied in this plane of symmetry and is transverse to neutral axis and in line with the principal axis.- i.e. no applied loads/moments at angles. Load must be perpendicular to the N.A.

**Assumptions...**

1. The plane cross-sections of the beam remain plane and normal to the longitudinal fibers of the beam after bending.
2. Material is elastic and homogeneous.

**Unsymmetric Bending occurs when...**

1. There is no plane of symmetry
2. Transverse loads are not applied in the plane of symmetry. i.e. Load at an angle other than vertical or horizontal relative to longitudinal plane of symmetry.

**Shear Center:** The shear center is the point on a cross-section through which the resultant force acts, so that the beam experiences only bending and no twisting (Craig Jr.). For thin-walled beams, the location of the shear center can be found by summing the moments about the centroid. Then, finding the distance to the shear center, which is called eccentricity (e) and if the cross-section has an axis of symmetry, the shear center will be located along it (Craig Jr.).

Survey Results

I administered an anonymous survey through Blackboard to get feedback from the students about the class notes/wiki (and other aspects of the course). Twenty-two of the twenty-four students in the class completed the survey. Note that I encouraged them to complete the survey by counting it as an assignment worth 5 points – they got the five points if they completed the survey, 0 points if they did not. Results from the survey are presented in Figures 3, 4, and 5. In addition, written comments about the class notes/wiki are given in Table 2.

Based on Figure 3, students in general stated that they would prefer that I had required them to purchase a textbook for this course. Approximately 65% of the students agreed or strongly agreed with the statement, “I would prefer that we had...”
a required textbook for this course.” Looking at the comments, it seems that the main reason students would prefer a textbook is so that they can refer back to several more examples. Interestingly, looking at Figure 4, where students reported what resources they had used for the course, less than 20% of the students purchased one of the recommended textbooks (yet they felt a textbook should be required?). While the students did not feel that the wiki development had helped their learning, I think, at least in part, this is because they are not taking it as seriously as I was hoping nor are they truly collaborating. The majority of the students reported being neutral or disagreeing with the statement, “Development of the class notes/wiki helps me to learn the material.” I believe that with some improvements to the process, students will learn more by developing a set of class notes than they would by using a single textbook. It is significant to note that over 80% of the students said that they had used Wikipedia as a resource for this course; thus, they are comfortable using wikis, but they don’t seem as comfortable developing a wiki.

![Figure 3. Textbook Preference](image3.png)

![Figure 4. Learn the Material](image4.png)
I like the idea of having a wiki but I feel it is very difficult to accommodate peoples’ different note taking and learning techniques. A textbook would only be handy because all the information is supposed to be in one location with many examples, but sometimes they are hard to understand.

We don’t do enough examples in class to be able to finish all the hw, and we don't have a textbook to look in for guidance to do the problems. The wiki is useless.

Some of the stuff isn’t easily found online or in the course reference book so it’s hard to find the correct material to put in the wiki (mostly applies for advanced topics like large angle theory). I would prefer to have a textbook that provided example problems for us to follow. This would make it easier to do the homework, since sometimes I have no idea where to start and seeing an example done would fix this.

Didn’t do too much for me, since you needed some form of text to help you figure out the homework, but you couldn’t really write the wiki until after doing the homework. I think I would have liked to have a textbook. Doing a wiki that you could use on the quizzes would still be fine, cause it could help to condense the key info. I could go either way on the wiki.

The wiki is of moderate value. The jury is still out. I find that making my own cheat sheet for quizzes and exams is often the best way for me to learn and review the material because I put things in my own words and in an order that I understand them best. Please find a good textbook!

While a textbook would be useful at times, I really don’t end up using it too much. It might be nice to have all the equations typed up. Maybe like a binded handout that had copies of some examples (or something like that).

I thought it was a waste of time, personally.

Very good to use on exams.

A textbook would have been very helpful.

Class notes are good, wish we had a text, the wiki helps but is not my primary resource.

The wiki is helpful, and I’ve learned from doing the wiki assignments, but I think it might work better as a supplement to (or supplemented by) a textbook.

I don’t find I have so far learned all that much from the wiki, the formula sheet that results from it is helpful. But it hasn’t been extremely helpful.

I am not a fan of the wiki. It’s a good idea (in theory) but it hasn’t helped me with the course. I don't like textbooks but would appreciate a packet with example problems.

We need one [textbook] - even if it is just for reference.

I guess I would rather just have a textbook for reference. The problem with just having notes is...
there are a limited number of examples from which to draw on, and, if something is unclear, there is not an immediate source of reference.

The wiki is a waste of time. The only real part I like is the equation sheet and the examples. I think the quizzes should be open notes because that is what I use to study (along with the homework examples).

Wiki not very useful other than the equation sheet. I think a little summary of the subjects is helpful, but not looking for an example or copying definitions from another text book. People just kind of do this sort of assignment for completion, not real learning. Some groups might find one subject less important than another or visa versa, but maybe there could be a way to edit another group’s response....This way even if another group doesn't highlight something you are struggling with, you can have that reference yourself when using the wiki for quizzes or assignments. Although it tries to promote collaboration, that isn't really what's happening. People tend to work individually and slap it together quickly rather than try to make something useful for reference.

The wiki is helpful because it helps me to learn the material.

The examples given in the class wiki are often not very helpful.

The class notes and wiki cannot effectively replace a textbook. The notes/wiki materials are not nearly as comprehensive or easy to use as a textbook, and making a wiki/textbook is a less efficient way of learning than just using an existing textbook.

Although I really hate doing it, I do think it helps me to learn the material and really think through each unit before the quizzes. A textbook would be a helpful resource, but I use old books for that.

Conclusions and Future Directions

While I’m disappointed that the feedback about the development of the class notes/wiki was not more positive, I am not giving up on the project. As is often the case when a new teaching paradigm is introduced, I feel that the students are still somewhat uncomfortable with the process of developing a wiki. They are used to having a textbook and like the security of knowing which section to refer to and where to find lots of examples. I believe the potential for learning through the development of a wiki, however, is too great to abandon the project. As stated by Andrea Forte and Amy Bruckman4, “Writing a book from which others can learn is itself a powerful learning experience.” They go on to state that, “The idea of turning over responsibility for knowledge production to students is sometimes met with confusion and resistance”4.

I do plan to make some modifications to the class notes/wiki project in the future, however. Improvements include making the wiki public or semi-private, rather than keeping it within the Dartmouth Blackboard course management system, where only students enrolled in the course may access the content. Sarah Guth5 outlines some of the advantages and disadvantages of public wikis. Among the advantages are that using a public wiki:

- “promotes collaboration beyond the classroom,
- leads to an increased sense of responsibility and more accurate writing, and
- gives the students a sense of empowerment.”5

Disadvantages listed by Guth5 focused on control and management of input by the broader community. One recommendation for reducing this disadvantage was to write clear editing rules.
I feel that making the wiki public will improve the class notes/wiki quite a bit; I recognize, however, that I will have to carefully set up the project and possibly start with a semi-private wiki.

I also plan to develop additional assessment strategies to measure the impact of developing a wiki on student learning. And I plan to work more closely with librarians and instructional technologist on campus to improve the class wiki project.

References