

Just-in-Time Teaching: A Web-Based Teaching Approach

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What are the factors that lead to success in college? Spence (2001) argued that learning occurs best in one-on-one teacher-student relationships, and Astin (1993) identified three critical factors that are essential for student learning and success: student-student interaction, time-on-task, and student-teacher interaction. However, achieving these objectives is often difficult when we are teaching larger and larger classes. For example, a few years ago, the largest class in our department contained 100 students; now we are teaching sections of over 300 students. Is it possible to create sufficient student-student and student-teacher interactions and increase time-on-task while students are sitting in such large classes? How can we structure our classes to include more one-on-one interactions? We believe that the Internet can make the in-class experience more meaningful by providing the interactions necessary for increased student learning.

One Web-based approach, Just-in-Time Teaching (JiTT), was first devised by Novak, Patterson, Gavrin, and Christian (1999) to teach problem solving in physics. We have applied the same JiTT procedure to help our students learn about psychology. In fact, this approach could be applied to teaching in any discipline. Using the Internet, JiTT approximates a one-on-one teacher-student relationship. Specifically, before each class, the instructor obtains information from each student regarding what he or she knows about a topic. Then, the instructor uses that information to help structure the next class. Below we describe the general approach of JiTT, outline its pedagogical advantages, and identify some disadvantages of using this method.

The JiTT Approach

First, we ask students to respond to carefully constructed questions that we place on the Web a few days before class. These questions are usually a combination of essay, short-answer, fill-in-the-blank, and multiple-choice, depending on the size of the class. In smaller sections, we use more essay questions, whereas in larger sections (e.g., more than 300 students) we usually use more multiple-choice or fill-in-the-blank questions. (For an example of some JiTT questions, see <<http://cep.jmu.edu/jitt/psyc101/pcq.htm>>)

Once we post the weekly questions, students can go to the Web on their own time and submit their answers before the assigned class. Although we have chosen to use JiTT on a weekly basis, it is possible to use this technique on a daily basis. An advantage, however, of having JiTT exercises on a weekly basis is that students have an entire week to think about the answers. Students can spend as much time as they wish answering questions, but most report spending between 30-60 minutes on each JiTT exercise. We encourage students to use their textbooks and notes while answering questions. Students can also work in pairs, posting one

submission per pair. Students have a deadline to submit their answers, which is usually 2-3 hours before the specified class time. Once the instructor has received the responses, he or she uses them to make the time during class more valuable for both students and instructor. For example, if all of the students answer a question about operant conditioning correctly, the instructor does not need to spend valuable class time reviewing this topic. However, if students confuse punishment and negative reinforcement in their submissions, the instructor knows to review these misunderstandings and clarify the differences between these concepts.

Pedagogical Benefits

There are several aspects of JiTT that facilitate student learning. First, JiTT encourages students to spend more time reading assignments and preparing for class. Astin (1993) argued that success in college is a function of how much time students spend reading and working with intellectual ideas. In accordance, we ask questions that require students to read the assigned materials. Other arrangements that encourage reading before class, such as giving quizzes at the beginning of class, may take valuable class time and may not provide us with timely information regarding students' misunderstandings. With JiTT, we can ask questions that require students to integrate and analyze ideas that have been discussed in previous classes. Whereas we used to give these types of questions only on exams, with JiTT, we can now discuss answers to these conceptual questions in class and help students better prepare for future exams. In essence, JiTT encourages students to evaluate ideas critically in preparation for classes and exams.

Second, JiTT increases student-to-student interaction. In normal classroom arrangements, students seldom have a chance to read other students' writings or see how other students have attempted to solve a particular problem. The JiTT approach allows this to happen. When we read students' responses, we often choose exemplars and present them anonymously to the class to make a point and/or to stimulate class discussion. Sometimes we might present responses that incorrectly or only partially answer the question and then follow those responses with excellent answers. Not only does this process allow students to see examples of other students' work, it also increases student motivation to submit carefully written answers, which might be displayed during class. Students report that they learn from discussing their peers' answers in class. In fact, several students have reported trying to write excellent answers in order to increase the likelihood that their answers will be selected for class discussion.

Another way to increase interaction between students is to require them to work in pairs when submitting their responses. This approach might decrease performance anxiety and, more importantly, encourage students to discuss the essential issues and ideas of the course and ultimately learn from each other.

Third, JiTT increases contact between student and instructor, which is usually lacking in large classes. When students come to a typical college class, the instructor often has to guess what the students know. JiTT provides an opportunity for the instructor to read student submissions just before class and identify misunderstandings, misconceptions, and false beliefs. This information is then used to correct and/or build on the current level of understanding. In this

way, JiTT simulates a tutorial relationship where the tutor determines what the students know before building on or correcting that knowledge.

Also, many students are intimidated by the notion of stating their opinions and/or asking questions, especially in larger classes. Therefore, we always add an optional question to which students can respond and provide the instructor with comments. Generally, the content of the comments ranges from questions about assignments or grades to positive comments about the class to insights gained from class. If a response is required or if several students have the same comment, we can address it during class or e-mail the students individually. Moreover, these comments often help us get to know our students better.

Fourth, JiTT provides prompt feedback to students. Within a couple of hours of submitting their answers, students are shown other responses that are both correct and either incorrect or incomplete. After discussing the responses in class, students typically report that they understand the topics more fully. For example, 90% of the students in a psychological statistics course found it helpful to discuss different answers in class (Benedict & Anderton, 2004).

Because one of the major goals of JiTT is to provide the instructor with information regarding student comprehension, we usually give partial credit for attempting each assignment. In large classes, we have used a software program called Blackboard (Blackboard, Inc., 2002) to post and grade student submissions. This software program can be set to grade multiple-choice and fill-in-the-blank questions automatically, thus providing immediate feedback. The short-answer questions, however, need to be graded individually by the instructor and may take up to 2 hours per week for large sections. Although we do not always have time to grade each submission before class, we can usually grade and return them in the next day or two, thus still providing relatively quick feedback.

Fifth, JiTT facilitates the development of student meta-cognition. Meta-cognition is the level of awareness of one's understanding of a topic. When students are shown examples of their peers' complete, incomplete, and misconceived answers, they are better able to build an accurate awareness of their own levels of understanding. They can remember what they submitted and compare that with the answers discussed in class.

Disadvantages

There are disadvantages to using the JiTT approach, however. First, students may consider it a hassle to complete these daily or weekly on-line assignments. Second, because each assignment is only worth a small percentage of the total grade, it can be easy for students to skip or forget the assignment. Finally, it does create extra work for the instructor, especially when marking the student submissions.

We have dealt with these concerns by framing JiTT exercises in a positive light. We try to help students understand how the class, as a whole, benefits from JiTT. The main purpose of JiTT is to provide the faculty member with feedback about students' comprehension of course content. If the class seems to understand a concept, class time will not be wasted rehashing a

topic everyone already understands. However, if the majority of a class is confused about a concept, more class time will then be devoted to that topic. Thus, JiTT helps students by letting them adjust the speed at which course material is covered. We hope that reminding students about the main purpose of JiTT reduces their perception that the assignments are a hassle or not worth enough points.

Although grading JiTT assignments is extra work, the instructor does get valuable information about how students are learning the material. Because this additional information can improve the flow of the class, we believe that the extra work is worthwhile.

In Summary

We believe that JiTT improves classes because it encourages students to work outside of class, and it provides additional feedback to both students and faculty. As class sizes have increased, it has become more difficult for instructors to give students individual feedback on a regular basis. Critics of large classes worry that students are not able to develop the one-on-one, teacher-student relationships necessary to facilitate learning (Spence, 2001). Through the Internet, instructors of large classes (and small classes as well) can foster stronger relationships with their students by using the JiTT approach.

This approach also provides the instructor with extra feedback about students' comprehension of the course content. Although this extra feedback is important for all instructors, we believe it is particularly important for less-experienced faculty. When teaching a course for the first time, it is very difficult to know how to pace the class. Students' answers to JiTT exercises can help instructors gauge which material needs additional class time.

Finally, although JiTT can be extra work for the student and the instructor, we believe the benefits of using JiTT outweigh the disadvantages. Given our positive reactions to the approach and the positive evaluations we have received from students, we will continue using Just-in-Time Teaching.

References

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