

Just-in-Time Teaching: Using Web Technology To Increase Student Learning

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Just-in-Time Teaching or JiTT (Novak, Patterson, Gowin, & Christian, 1999) is a pedagogical technique that combines the best features of traditional in-class instruction with the exciting new communication channels opened by the World Wide Web technologies. This article describes specific JiTT components that take advantage of student-learning principles crucial to success.

Unfortunately, there is no proof that mere investment in technology produces significant gains in learning outcomes. But by examining which learning strategies are most beneficial and which technologies best support those forms of learning, technology can be harnessed not just for technology's sake, but to promote learning (Ehrmann²). Three strategies have been found to make a positive difference in learning at the college level: increased time on assignments, student-student interaction, and faculty-student interaction, (Astin, 1993).

JiTT promotes student learning by fostering these three learning strategies:

1. Out-of-class assignments increase student study time and structure student learning for maximum benefit.
2. Students work together in teams to solve problems and teach each other.
3. Faculty gather insights into student thinking and feelings that they can use to adapt lectures and exercises to better meet student needs.

Although Just-in-Time Teaching makes heavy use of the web it is not to be confused with either distance learning (DL) or with computer-aided instruction (CAI.) Virtually all JiTT instruction occurs in a classroom with human instructors. The web materials, added as a pedagogical resource, act primarily as a communication tool and secondarily as content provider and organizer.

While JiTT web pages cover a lot of ground (Novak, 2002), the heart of the method is the use of short exercises dubbed WarmUps. These prompt the student to think about an upcoming topic and to answer a few simple questions prior to class. WarmUps demand a great deal of thinking on the part of students because they must read and understand concepts in the text in order to compose brief answers to the WarmUp exercises on the course web page. A key JiTT component is the time spent studying out of class for WarmUps. The assignments are due just a few hours before class time. They become the framework for the classroom activities that follow.

Classroom research has shown superior results from collaborative learning compared to traditional lecturing. JiTT's collaborative recitations (Novak, Patterson, Gowin, & Christian, 1999, p. 17) foster student-student interaction through increased student involvement. As students prepare for class, they know that peers will see their work and that they will have to be able to explain things in their own words. When students discuss course concepts and problem sets in small groups, they teach each other and learn more themselves. At IUPUI where 60 to 70 students meet in a large room, groups of 2 to 4 students work at whiteboards installed around the periphery of the room. Teachers assign them fresh problem sets selected on the basis of what students have found difficult in WarmUps and lectures.

Faculty-student interactions are enhanced primarily by the efforts of the teacher, who reads student WarmUp assignments and adjusts the lecture based on what students have understood and what they found difficult. But getting feedback on students' grasp of the content through WarmUps is not enough. Astin³ found that personal contact between students and the teacher is a crucial factor. Therefore, every assignment page provides space for spontaneous student thoughts and comments. Faculty gauge student reactions to gain insights into the affective side of student learning. These prove to be a remarkably rich resource for the teacher and a bridge builder between students and teachers.

Students typically comment on:

The course: I know I learned most of this in high school, but for some reason it seems totally foreign to me - and a lot more complicated. I'm starting to get a little frustrated b/c I feel like I should understand easily, but I don't."

The assignment: “. hmm...the force equation does not seem to fit here. so, how about $r=mv/qB$...then $v=rqB/m$...which I can't solve w/o the radius of the earth, in this case, but that's the equation anyway (I think)”

The student's own performance: “Feels oddly like I'm guessing on these questions. I don't want to guess, but I can't find any of this in the book, and the good Lord knows I'm too old to think this hard anymore,” or, “As frustrating as these assignments can be, I've actually realized that they do help me prepare mentally for the next lesson and spark my curiosity about what we're learning. In short, I've come to think that these are pretty valuable - at least for someone w/my learning style.”

Such comments, arriving daily and frequently shared with the class contribute immensely to the learning environment. As Astin (1993) notes, “...it appears that how the students *approach* general education (and how the faculty actually *deliver* the curriculum) is far more important than the formal curricular content and structure” (p. 425).

Planning for instruction can be derailed by debates about the content to be covered. A substantial part of course development ought to be spent on the method and the delivery of instruction. JiTT provides a blueprint for structuring out-of-class assignments for maximum learning benefit, creating and sustaining in-class collaborative learning, and maximizing instructors' understanding of student learning. Students and instructors work as a team toward the same objective, to help all students pass the course with the maximum amount of retainable knowledge.

For more information, examples of JiTT materials from many academic disciplines, and a partial list of JiTT adapters and courses please visit our web site <http://jitt.org>.

REFERENCES

- Astin, Alexander W. (1993). *What Matters in College? Four Critical Years Revisited*. New York: Jossey-Bass Publishers (425).
- Ehrmann, Stephen C. (1995). Asking the Right Questions: What Does Research Tell Us About Echnology and Higher Learning? *Change*, 27(2), (20-27).
- Gavrin, Andrew and Novak, Gregor. (1999). “WHAT IS PHYSICS GOOD FOR?” MOTIVATING STUDENTS WITH ONLINE MATERIALS. <http://webphysics.iupui.edu/JITT/CATE1999.doc>
- Gavrin, A., Marrs, K., Blake, R., & Watt, J. WebScience at IUPUI. <http://webphysics.iupui.edu/webscience/webscience.html>
- Novak, Gregor M., Patterson, Evelyn T., Gavrin, Andrew D., and Christian, Wolfgang. (1999) Just-in-Time Teaching: Blending Active Learning with Web Technology. Upper Saddle River, NJ: Prentice Hall.