

Just-in-Time Teaching (JiTT)

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What is it?



[Just-in-Time Teaching](#) (JiTT) is a teaching and learning strategy designed to promote the use of class time for more active learning. Developed by Gregor Novak and colleagues, JiTT relies on a feedback loop between web-based learning materials and the classroom (Novak et al., 1999). Students prepare for class by reading from the textbook or using other resources posted to the web and by completing assignments (called WarmUps and Puzzles) online. These assignments often have complex answers; students' work outside class serves as preparation for more complete work in class. The students' answers are delivered to the instructor a few hours before class starts, allowing the instructor to adapt the lesson as needed. Importantly, JiTT allows the instructor to create an interactive classroom environment that emphasizes active learning and cooperative problem solving.

There are several types of JiTT exercises.

WarmUps are short, web-based assignments designed for students to complete before receiving instruction on a topic. They prompt students to think about the upcoming lesson and to answer a few simple questions before class to prepare them to develop more complex answers in cooperative groups in class. Class time can focus on the points for which students need more help, and it can be structured around specific student responses, allowing an element of personalization. An example from Biology is shown [here](#).

Puzzles are short, web-based assignments that are designed to help structure a wrap-up session on a topic that has already been covered in a class. They provide closure and often integrate concepts. An example from Mathematics is shown [here](#).

GoodFors are enrichment essays that help students connect the class to the real world, help keep material fresh, and are starters for classroom discussion. An example from Physics is shown [here](#).

The goal of the JiTT assignments is for students to come to class prepared, engaged, and motivated.

What's the theoretical basis?

Kathleen Marrs and Gregor Novak suggest that Just-in-Time Teaching incorporates three major elements that are important for helping students learn (2004).

1) **Just-in-Time Teaching incorporates active learning approaches.** By moving the "content-transfer" element of the course to pre-class preparation and focusing class time on cooperative problem solving, JiTT encourages the active learning approaches that have been found to promote learning (National Research Council (NRC), 2000; Hake (1998); Paulson 1999, Udovic et al., 2002).

2) **Just-in-Time Teaching provides structured opportunities for students to actively construct new knowledge from prior knowledge.** As noted in *How People Learn*,

Current research on learning indicates that all new learning depends on the learner's prior knowledge and current state of understanding. If students' initial understanding is not engaged, they may fail to grasp the new concepts they are taught, or...they may revert to their preconceptions outside of the classroom (NRC 2000).

This theory of learning, termed “constructivism,” was developed by Piaget and others, and posits that learners build new understandings on existing attitudes, experiences, and knowledge (Kujawa and Huske, 1995). Pre-existing misconceptions can serve as barriers to the development of new, more accurate mental models. Effective learning requires that students uncover and address preexisting knowledge and misconceptions. Just-in-Time Teaching incorporates this element regularly through the use of the WarmUps, which can help reveal misconceptions and prior knowledge and help focus class activities on the elements that need the most thought.

3) **Just-in-Time Teaching provides prompt feedback.** *How People Learn* notes that the best learning environments are assessment-centered, and emphasizes that formative assessment is particularly valuable for learners because it provides opportunities for learners to adjust or clarify their thinking prior to a summative assessment (such as a graded exam). This is a key element of JiTT, occurring during essentially every class meeting through instructor responses to the WarmUps that student submit in preparation for the class.

Where can I learn more?

The [Just-in-Time Teaching website](#) provides links to examples and citations.

References

Hake, R.R. (1998). Interactive-engagement versus traditional methods: A six-thousand-student survey of mechanics test data for introductory physics courses. *Am. J. Physics* 66, 64–74.

Marrs KA and Novak G. (2004). Just-in-Time Teaching in Biology: Creating an Active Learner Classroom Using the Internet. *Cell Biology Education* 3: 49-61.

National Research Council (2000). *How People Learn: Brain, Mind, Experience and School*, Bransford, J.D., Brown, A.L., and Cocking, R.R., eds. Washington, D.C.: National Academy Press.

Novak, G, Patterson, E.T., Gavrin, A.D., and Christian, W. (1999). *Just-In-Time Teaching: Blending Active Learning with Web Technology*, Upper Saddle River, NJ: Prentice Hall.

Paulson, D.R. (1999). Active learning and cooperative learning in the organic chemistry lecture class. *J. Chem. Educ.* 76, 1136–1140.

Udovic, D., Morris, D., Dickman, A., Postlethwait, J., and Wetherwax, P. (2002). Workshop Biology: demonstrating the effectiveness of active learning in an introductory biology course. *BioScience* 52, 272–281.



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