



Are ILEs Ready for the Classroom? Bringing Teachers into the Feedback Loop



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Tenth International Conference on Intelligent Tutoring Systems, June 2010

<http://www.teachableagents.org>

The Goal: Classroom Integration

The goal of our present work is to derive useful practices for incorporating intelligent learning environments (ILEs) into classrooms. In order to do this, we aim to:

- **Create methods** by which the design of ILEs encourages interactions between the teacher and computer.
- **Appropriately divide** responsibilities between the computer and the teacher (mixed-initiative dialogues).
- **Provide the right data** to teachers, while omitting data that is overwhelming or confusing.

The Current Student-Teacher-ILE Relationship

Current practices in ILE design inform the following two models: the first model describes a basic student-teacher relationship, and the second model shows how traditional ILEs change that relationship.

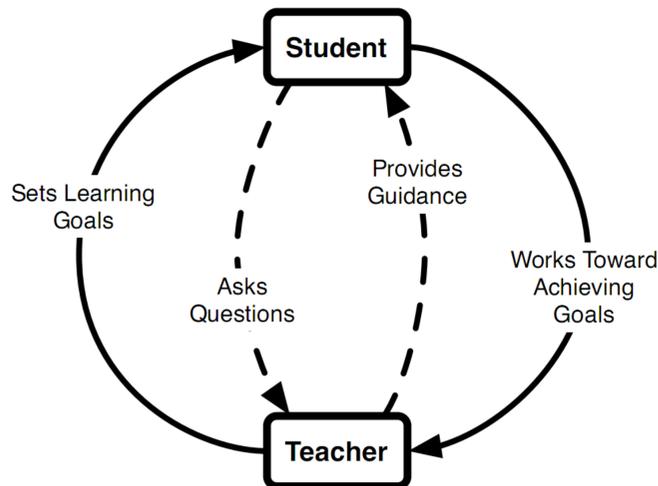


Figure 1. The Student-Teacher relationship

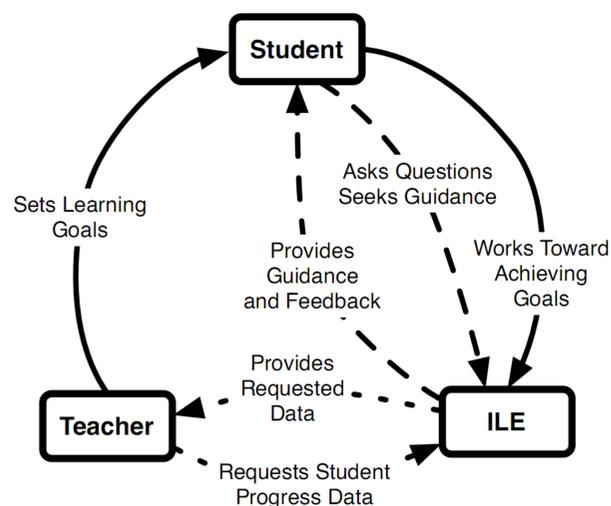


Figure 2. The Student-Teacher-ILE relationship

Our Proposed Integrated Model

Integrating ILEs into the classroom requires a new model for the relationship between students, teachers, and ILEs. This new model should account for the separate and complementary strengths of students and teachers. Our proposed model appears below:

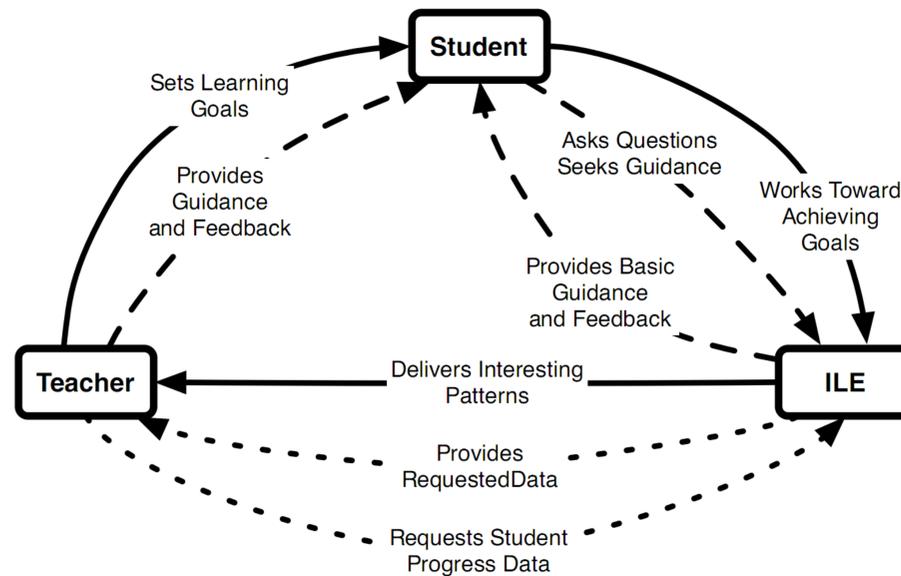


Figure 3. The integrated Student-Teacher-ILE relationship

The integrated model adds the following to the model from figure 2:

- It **divides** the guidance and feedback task between the ILE and the teacher. The ILE handles basic feedback; the teacher handles more complex feedback.
- It requires the ILE to **automatically deliver** pertinent data trends to the teacher. The teacher, then, can use this information to inform his or her teaching.

Testing the Model

In order to assess the usefulness of the integrated model, we tested it in conjunction with a classroom intervention in Fall 2009. Three 5th-grade classrooms used our ILE, Betty's Brain, and we provided teachers with reports on student progress at the end of each day. Our reports consisted of:

- High-level reports of student performance, such as *"Everyone is having trouble understanding this concept."* or *"This student is performing much better than the rest of the class."*
- Movie replays of each student's work as it evolved, step-by-step. In our case, these replays consisted of each step a student took in constructing a causal concept map. Figure 4 shows two sample frames from one of these replays.

Testing the Model (continued)

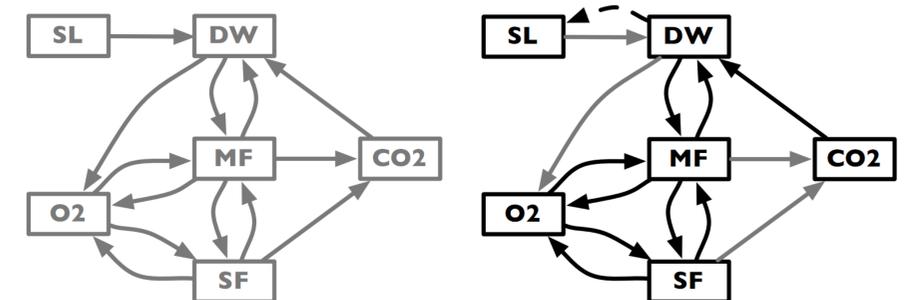


Figure 4. Two frames from a student's concept map movies, in temporal order

Empirical Results

Our results, while only of an empirical nature, are encouraging. We found that the issues contained in our high-level reports of student performance helped teachers plan future lessons, which in turn alleviated the problems that were identified. Ideally, this helped students overcome their difficulties sooner rather than later. An example follows:

- After a day in which students worked on constructing causal concept maps, our software detected that a large percentage of students added an incorrect causal relationship.
- This finding was reported to the classroom teachers that afternoon.
- The next day, the teachers discussed this problematic relationship with their students, and tried to correct student understanding.
- At the end of the day, the software noted that this incorrect relationship was no longer a problem.

It's important to note that we are not prescribing specific pedagogical actions in response to what the reports find. Rather, we believe that equipping teachers with this information provides them with a valuable tool to enhance their teaching.

Future Directions

As we move forward with this work, we hope to create a stronger implementation of a software system supporting the integrated model. We plan to:

- Analyze student-data and deliver interesting trends to teachers in near real-time.
- Analyze more complex student-data (affect, engagement, etc...) to create richer reports.
- Create a "teacher dashboard" through which the teacher can receive this data from a computer or hand-held device.