

Interactive Lecture Demonstrations: Assessing the Effectiveness of Predict, Experience, and Reflect in Economics Instruction

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Background:

Maier is co-PI for *Starting Point: Teaching and Learning Economics*, a web-based portal for 16 teaching methods (Simkins et al.) including Interactive Lecture Demonstrations (ILDs). The effectiveness of this pedagogy has been proven in the physics education literature (see references). Do ILDs work well in economics? In the fall semester of 2010, we tested ILDs in our principles of economics courses (Ruffer in two sections of micro; Maier in two sections of micro and two sections of macro.)

What are Interactive Lecture Demonstrations (ILD)?

The ILD is a carefully scripted, three-step classroom activity based on a demonstration that can be an experiment, a survey, a simulation, or an analysis of secondary data.

In the three steps, students:

- **Predict** the outcome of an upcoming demonstration. Students articulate their understanding, even if it is ill-formed or incorrect, explain their choice to a partner, changing their answers if they like, after which the instructor polls student answers without revealing which are correct.
- **Experience** the demonstration. Students either perform the demonstration in small groups or the instructor does it in front of the class.
- **Reflect** on the results. Students identify differences between what they predicted and what occurred in the demonstration, and explain how their understanding may have been modified.

The problem: Do the prediction and reflection steps in ILDs help students learn economics?

Research literature in other disciplines suggests:

- the prediction step connects students' prior understanding with the concept to be learned in the ILD
- the reflection step enhances student learning in subsequent lectures

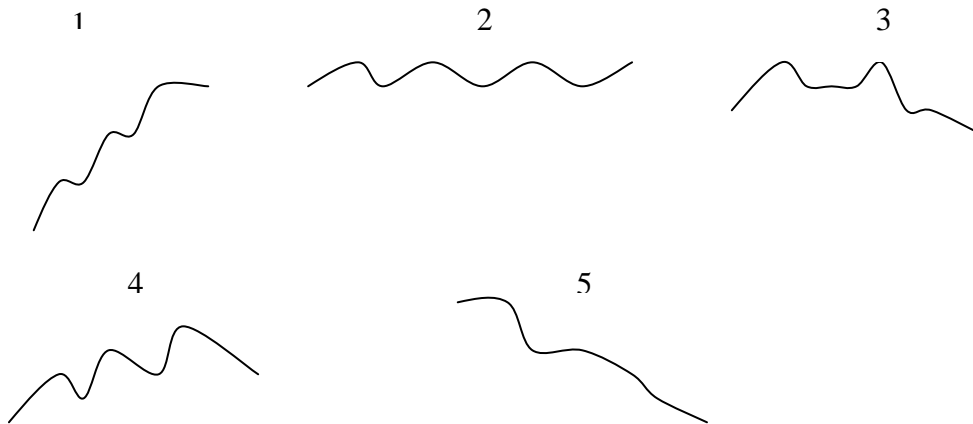
We conducted 14 ILDs in paired sections of principles courses, completing all steps (predict/experience/reflect) in one section, but omitting the prediction and/or reflection step in the paired section. At the next class meeting, students were tested on the core concept demonstrated in the previous meeting's ILD. Mean scores were compared between sections that completed all ILD steps with sections that omitted the prediction and/or reflection step.

Examples

Example 1: Real GDP Growth

Concept: Understanding and Interpreting US Real GDP per capita growth

Predict: Which of the following graphs best shows US real GDP per capita over the last twenty years?



Experience: Graph US real per GDP per capita during the last twenty years.

Reflect: Students complete an essay beginning with: "Although most people believe _____ about the US growth in real GDP/capita because _____, in fact _____."

Example 2 – What’s the Best Payment?

Concept: Present Discount Value

Predict: Students predict which payment is best: \$10,000 at the end of 10 years or \$1000 per year for 9 years.

Experience: Students, working in pairs or small groups, use a discounted present value table to calculate the present value of the two earnings streams.

	1%	2%	3%	4%	5%	6%	7%	8%	9%	10%
Year 1	\$990	980	971	962	952	943	935	926	917	909
2	980	961	943	925	907	890	873	857	842	826
3	971	942	915	889	864	840	816	794	772	751
4	961	924	889	855	823	792	763	735	708	683
5	952	906	863	822	784	747	713	681	650	621
6	942	888	838	790	746	705	666	630	596	564
7	933	871	813	760	711	665	623	583	547	513
8	924	854	780	731	677	627	582	540	502	466
9	914	837	764	703	645	592	544	500	460	424
10	905	820	744	676	614	558	508	463	422	346

Reflection: Students write a short essay explaining to a professional athlete whether he should accept \$10,000 at the end of 10 years or \$1000 per year for 9 years.

Summary of Results:

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	# classes	# of times difference is significant
R or P&R Class Performed Better than NR or NR & NP	9	2
NR Performed Better than R	5	1
Total # of paired experiments	14: 12 with R as treatment and 2 with R & P as treatment	
average # students per class	30.3	
R: Reflect; NR: No Reflect; P: Predict; NP: No Predict		

In Maier's Micro and Macro sections, when the section with higher overall grades completed the prediction and reflection steps, it outperformed the section with lower overall grades by 35%. When this same section with higher overall grades did not complete the prediction and reflection step, it outperformed the weaker section by only 23%. In Ruffer's Micro sections, there was no significant difference between sections receiving the treatment versus the control group.

Conclusion:

Weaker students benefited from the reflection step more than stronger students. Likely stronger students mentally perform the reflection step on their own if it is not part of the classroom pedagogy. We can help weaker students by explaining the reflection step in greater detail and demonstrating how it can be completed even if not explicitly assigned.

Stronger students benefited from the prediction step more than weaker students. Likely we provided insufficient support for this step, not explaining why we ask students to make a prediction, nor making certain that students came to class prepared with the vocabulary and background knowledge to make an other-than-random prediction. We can help weaker students by making certain that they have completed the assigned reading before class.

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<http://serc.carleton.edu/econ/demonstrations/index.html>

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