DOCUMENT SUMMARY

This paper provides strong evidence for the effectiveness and successful implementation of Peer Instruction (PI), an alternative, interactive teaching method that challenges traditional lecture formats. For Enlitens, this research serves as a powerful analogue and strategic roadmap for replacing a traditional, passive methodology (standardized testing) with an interactive, collaborative one (the Enlitens Interview). The paper demonstrates that alternative methods can yield superior results and achieve high user satisfaction, and, most importantly, it offers a detailed guide to overcoming the exact types of institutional, peer, and client resistance that Enlitens faces.

FILENAME

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METADATA

- **Primary Category**: RESEARCH
- **Document Type**: research_article
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- **Key Topics**: alternative_methods, pedagogy, interactive_engagement, data-driven_advocacy, overcoming_resistance, conceptual_understanding
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CRITICAL QUOTES FOR ENlitens

- "Correspondence and informal discussions indicate a user base of hundreds of instructors around the world who teach with PI, yet to date there has been no systematic study of PI implementation and effectiveness in the variety of settings in which it is used."
- "Thus, the vast majority of instructors completing our survey consider their experiences with PI to be successful."
- "Many successful users of Peer Instruction indicate that they had to overcome a number of challenges, which we describe here along with solutions suggested by the respondents."
- "Ten percent of respondents report that their colleagues are skeptical of the benefit of student discussions that take away lecture time."
- "A third of these instructors report addressing this skepticism by collecting data on student learning gains."

- "Because most students are unaccustomed to active participation in science classes, some feel uncomfortable participating in discussions, or initially consider the discussions a waste of time."
- "Persistence in using Peer Instruction in the face of initial student resistance is important..."
- "In summary, the PI survey results indicate that most of the assessed PI courses produce learning gains commensurate with interactive engagement pedagogies, and more than 300 instructors (greater than 80%) consider their implementation of Peer Instruction to be successful."
- "Over 90% of those using the method plan to continue or expand their use of PI."

KEY STATISTICS & EVIDENCE

- **Survey Size**: More than 700 instructors completed a survey, with 384 identified as using Peer Instruction (PI).
- **User Satisfaction**: Of 384 PI users, 303 definitely planned to use PI again, and 29 probably would. Only seven respondents had no plans to use PI again. Over 90% of users plan to continue or expand their use of PI.
- **Quantitative Effectiveness (FCI Scores)**: 81% of PI users who collected quantitative data used the Force Concept Inventory (FCI).
- **Normalized Gain**: The average normalized gain, *g*, for 30 courses taught with PI was 0.39 ± 0.09.
- **Comparison to Traditional Methods**: Hake's survey of FCI data defines a "medium-g" range (g=0.3 to 0.7) where 85% of interactive engagement courses fall, while none of the traditionally taught courses do.
- **PI Performance**: 27 out of 30 (90%) of the PI courses in this survey fell into the "medium-g" range, demonstrating learning gains consistent with effective interactive engagement pedagogies.

THEORETICAL FRAMEWORKS

Peer Instruction (PI) as an Alternative Pedagogy

Peer Instruction (PI) is a widely used pedagogy in which lectures are interspersed with short conceptual questions (ConcepTests) designed to reveal common misunderstandings and to actively engage students in lecture courses. The language of the survey was purposely broad in order to include instructors who had used a strategy similar to PI without being aware of our work; we therefore received responses from many instructors using other collaborative learning strategies.

PRACTICAL APPLICATIONS

Peer Instruction Challenges and Solutions

Many successful users of Peer Instruction indicate that they had to overcome a number of challenges, which we describe here along with solutions suggested by the respondents.

- **Challenge: Time and Energy to Develop Materials** Thirteen percent of instructors cite the time and energy required to develop ConcepTests as an impediment to using PI. Developing good ConcepTests certainly takes a great deal of effort; to minimize duplication of this effort, and to make PI easier to implement, we and other developers of ConcepTests have made online databases of ConcepTests for introductory physics, chemistry, and astronomy freely available.
- **Challenge: Colleague Skepticism** Ten percent of respondents report that their colleagues are skeptical of the benefit of student discussions that take away lecture time. A third of these instructors report addressing this skepticism by collecting data on student learning gains. One particularly effective approach is to compare achievement of students taught with and without PI on identical exams. Others suggest inviting skeptical colleagues to sit in on a class, sharing positive student feedback with them, or even giving the assessment tests to other faculty.
- **Challenge: Time Constraints and Curriculum Coverage** About 9% of respondents report that the quantity of material to cover in a semester often makes it difficult to devote class time to ConcepTests. One-tenth of these instructors reduce the amount of material covered by the course, but the majority do not have the freedom to do so. One option for those bound by a lengthy syllabus is to require students to learn some of the material on their own, especially by assigning reading of the text before class.
- **Challenge: Student Resistance to the Method** Another challenge is students' resistance to the method (7% of respondents). Because most students are unaccustomed to active participation in science classes, some feel uncomfortable participating in discussions, or initially consider the discussions a waste of time. Thus, respondents report that it is essential to thoroughly explain the use of PI to their students. Persistence in using Peer Instruction in the face of initial student resistance is important; 15 (4%) users report that, while their students were initially skeptical of PI, the students warmed up to it as they found the method helped them learn the material. Regularly presenting class-averaged data on student performance also shows students that the method is helping them and thus may also motivate students.
- **Challenge: Engaging All Students** A related challenge is the difficulty in fully engaging students in class discussions (7% of respondents). In the words of one instructor, "some students were too cool, too alienated, or perhaps too lost to participate". Nearly half of those citing this challenge say it is important for the instructor to circulate through the classroom during the group discussion of the ConcepTest, helping to guide and encourage students in discussion. Other students may be motivated by receiving credit for participation and by the presence of ConcepTest-like conceptual questions on exams.