Prevalence of biomedical examples among students enrolled in traditional and IPLS-focused algebra-based courses

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IPLS Course Development

The following data details results gathered from data from a reformed, biomedical_focused introductory physics for life science majors (IPLS) class. The course includes a "flipped" classroom with modular material. Each module includes interviews with medical professionals who describe details of their jobs and how the work they do relates to content learned in the introductory algebra-based physics course. The modules also include biomedically relevant homework, which combines physics concepts with biomedical context. For instance, specific content in the course covers Snell's Law and the idea of total internal reflection, but unlike traditional courses, the IPLS course looks at how this phenomenon is put to use in the process of endoscopy.

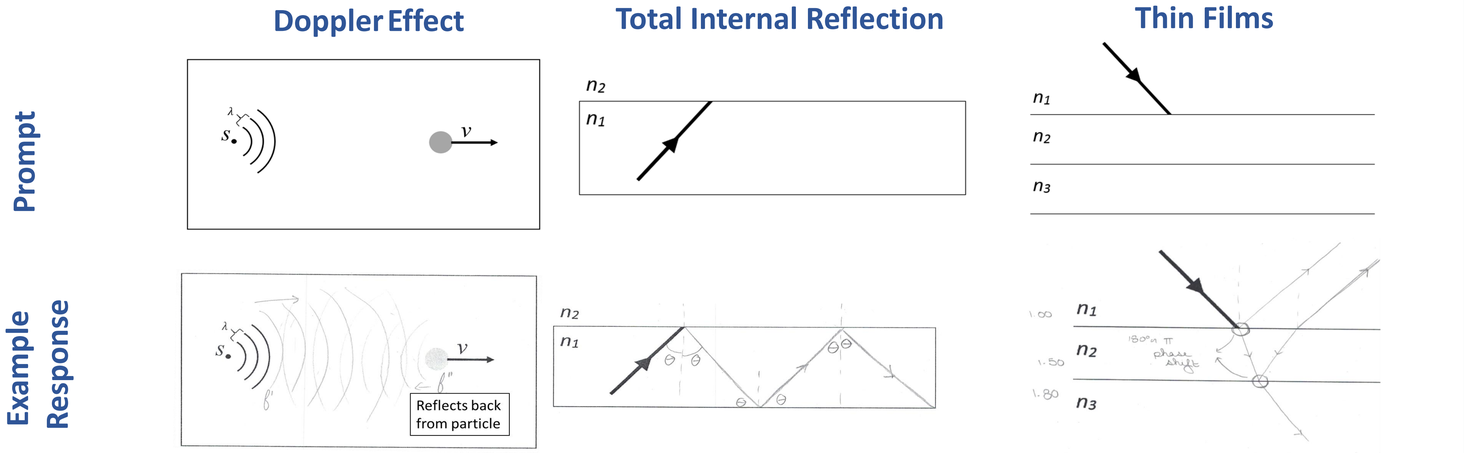
Multiple assessment tools were employed to determine the impact of instruction over the quarter-long course. This work focuses on student-generated real-world examples and the prevalence of biomedically relevant examples.

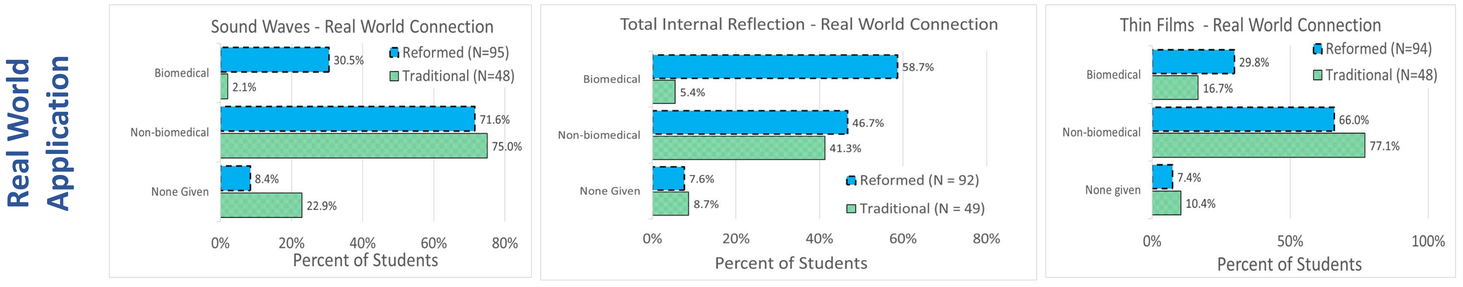
Research Design

In the Spring of 2016, the IPLS course was offered during a morning section while the traditional algebra-based physics course was offered in the evening. This provided comparisons across these different courses and curriculums. Student data from both courses were collected, anonymized (for the purposes of coding) and mixed together. After coding schemes had been developed, executed and tallied, the students were un-anonymized and proportions of correct, incorrect, etc. responses were determined for comparison. In terms of content knowledge, ***no significant differences were observed in the data.*** Students in both classes performed similarly regardless of whether they received the reformed instruction or the traditional. Thereby implying that the IPLS course did not improve students' conceptual understanding any more than a traditional course.

Illustration Quizzes

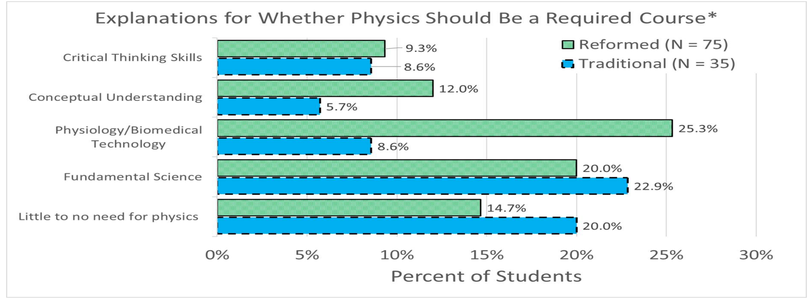
The illustration quizzes shown in the chart were used to gauge student understanding of introductory physics concepts. Quizzes were graded on correctness during the course. As data, they were coded for unique features . For example, thin films quizzes were coded for whether students gave specific values for each film layer, whether they measured the angle from the normal, and which direction each ray bent upon meeting the interface. We were looking for students who made a real-world connection to the physics concept they were working on. The data was analyzed by several raters, using an inductive analysis of emergent categories, as to avoid assumptions about the categories.





Why Do Students Think Physics Is Important?

After the course had concluded, students were asked a variety of questions about the overall course and their interest in science. Both sections of students agreed that physics was important. However, they detailed different reasons as to why they felt that way.



Equal Learning, More Connections

In the end, our analysis showed that there was no significant difference in the understanding of introductory physics concepts by students in the reformed IPLS class vs. the traditional class. However, when looking at real-world connections, students in the reformed class were more likely to make multiple, diverse real world connections, unlike their traditional counterparts.