Physics & Astronomy, University of British Columbia

Supporting students' self-regulated learning in physics

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Supporting students in class and online

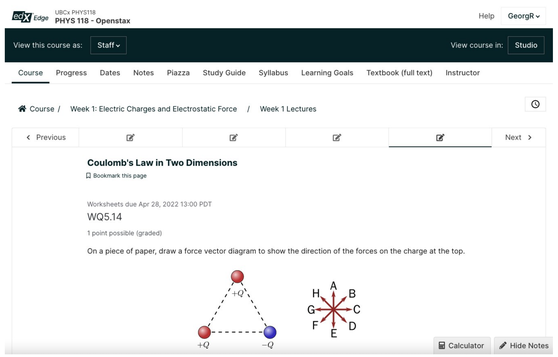
- Started as an online project
- Shifted focus to in class SRL support after Deb Butlers talk on SRL[1] at 2019 FYE Symposium at UBC and workshop by Silvia Mazabel and Deb Butler

Online

Idea: create resources that enable students' self-regulated learning outside of class.
Principle: Try on your own as many times as you need, get support.

OER Resources (on edge.edX)

- Custom reading: excerpts from openstax textbook with integrated quizzes
- All lecture questions
- All tutorial questions
- Homework questions
- Videos with solutions for difficult questions
- Numerical solutions for all questions available after trying.
- Correct incorrect always shown
- Students have infinite attempts
- Roughly 400 questions in total
- Everything available on day 1



In lecture

Idea: Targeting task-interpretation and strategic planning helps students getting started on solving problems-and/or concept questions

Implementation

- Emphasis on first steps
- Encourage students to use their resources: own initial ideas, course materials, discussion with peers
- Additional scaffolding steps and hints on worksheets

Encouragement through feedback

- Instructors acknowledged all contributions as valuable
- Class discussions: how student ideas and course resources can be constructively combined
- Instructors modeled strategies for evaluating ideas, double-checking and sensemaking
- Instructors encouraged inclusive communication in peer discussions and on Piazza

Example

- In the clicker question shown in Fig. 1, majority chooses incorrect answer (A).
- While incorrect, (A) is based on relevant concepts.
- After hearing student reasoning, opportunity to acknowledge relevant ideas.
- Then give hint and ask students to discuss again.
- Finally student who changed their answer explains.

From worksheets to exams

Idea: Use the space on paper to write initial ideas and potentially relevant resources next to a question.

- Helps making connections between potential solutions and resources
- Frequent encouragement to annotated questions with initial ideas, relevant equations and other resources

More information

The work presented here is accepted for publication in The Physics Teacher[2]

Reference / Bibliography

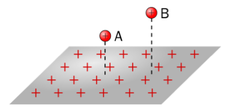
1. https://fyesymposium.ubc.ca/event/2019-first-year-educators-symposium/2019-featured-speakers/
2. Rieger, G. W., McIver, J., Mazabel, S., and Burkholder, E. W. (2022), "Supporting students' self-regulated learning in an introductory physics course", The Physics Teacher (in print).

Fig. 1: Example Clicker Question

Two protons, A and B, are next to an infinite plane of positive charge. Proton B is further away from the plane than proton A.

Which proton has the larger acceleration?

A. Proton A.
B. Proton B.
C. Both have the same acceleration.



Study

Compare SRL-focused section to similar section without SRL focus
Noted increase of annotations with ideas and resources on midterm exam (see Fig. 2)

- Small but significant effect on midterm grade (see table 1)

Fig. 2 Increased use of annotations in the SRL-focused lecture section

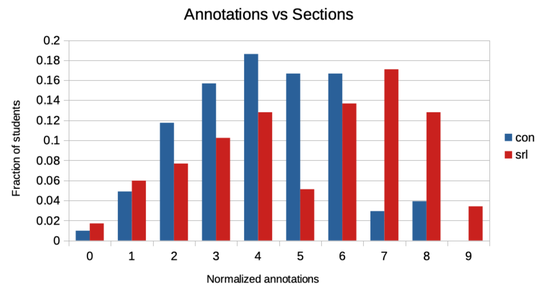


Table 1: summary of regression models

Table 1: Summary of the two models

Model 1 ($R^2 = 0.283$)			
Predictor of (Q1–Q10) score	$b_{predictor}$	StdErr	p-value
Previous Grade	0.488	0.064	<0.001
+ Section	0.306	0.128	0.018
Model 2 ($R^2 = 0.404$)			
Predictor of (Q1–Q10) score	$b_{predictor}$	StdErr	p-value
Previous Grade	0.365	0.064	<0.001
+ Section	0.197	0.121	0.150
+ Annotations	0.338	0.065	<0.001

Acknowledgements

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