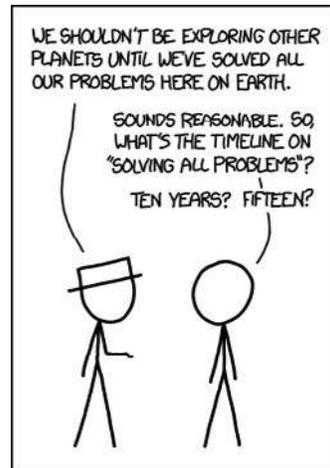


# Teach ill-structured problem solving with discussion

The University of Alaska Fairbanks has over 2000 courses leading to 149 degrees. What these programs have in common is that they prepare students to solve ill-structured problems. What is an ill-structured problem? Almost every interesting question and challenge on humanity's horizon is an ill-structured problem.

Consider a million degree plasma in a fusion reactor. How do you contain so much heat and energy safely when you bring the power of a star into your lab? How do we address complex problems like the opioid epidemic, or refugees, or climate change? These are all examples of ill-structured problems. An ill-structured problem has no clear or immediately obvious solution. There can be multiple ways of approaching the problem or even recognizing it. Possible solutions must be compared and cross examined, keeping in mind the outcomes which will often vary depending on the methods employed. Solutions will come from several disciplines.



"Realistic Criteria." m.xkcd.com/1232/.

The mission statement for our university reads, in part to educate "students for active citizenship" and prepare them for "lifelong learning and careers." What's a good way to prepare students to be solvers of such problems? That in itself is an ill-structured problem. One approach worth exploring is the use of rich asynchronous online discussion. Crafting posts of thoughtful nature after thorough reflection, being guided by instructor comments, and having a chance to hear multiple views from peers are the main advantages that asynchronous discussion has over face to face discussion.

In an online forum those with steady and unsure voices are on equal footing, everyone gets a chance to interact. That's the lofty goal of online discussion. But the quality of online discussion and its effectiveness at teaching ill-structured problem solving varies greatly with the structure of the conversation, the experience of the class and interactions with the instructor. If your expectation is that you can simply

ask students to address an ill-structured problem and you will see elegant solution some days later, you will be disappointed.

Competency in solving ill-structured problems can't be assessed using multiple choice questions and the skills necessary to work towards solutions can't be taught with lecture or textbook readings. In his article on designing learning outcomes for solving different kinds of problems, Jonassen [1] lists elements of ill-structured problems as arising from specific contexts, not being well defined, having no clear path to solution and requiring significant thought and metacognition in order to be solved.

Ng, Cheung and Hew [2] examined the structure of online discussions with and without structured scaffolding. They examined incidences of student responses as they participated in online discussions. Student responses which used instructor-provided sentence openers and message labels had significantly higher posts employing the ill-structured problem solving components of identifying problems, clarifying perspectives, developing solutions and assessing outcomes. Lund and Baker [3] found similar results in a 1997 study examining online student interactions with free text responses versus those with partially structured responses.

This means that you'll need to guide students beyond factual recall and superficial comments towards deep critical thought and metacognition. You'll want to provide examples of helpful responses, instructions for using specific opening sentence phrases, and frequent feedback.

## REFERENCES

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- [3] Lund, K., & Baker, M. (1997). Promoting reflective interactions in a computer-supported collaborative learning environment.