Formative Assessment by Continuous Access to Assignments

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Introduction and Objectives

Imagine that you have just given an assignment in your engineering class, and you have the following capabilities:

- At any time, you can see the latest version of each student's or student group's assignment
- At any time, you can see who has made what edits and contributions to the document
- At any time, you can replay the complete document history including all edits and revisions and the times when they occurred

What, if anything, would you do with these capabilities?

My Objectives:

- To understand how to best use the formative assessment opportunities of these capabilities to improve student learning
- In particular, I want to improve student-teacher interaction on assignments in ways that enhance student learning and comprehension

I am currently targeting early courses in the Engineering curriculum.

Developmental History of Innovation

Motivation: Most students do not seek help on an assignment even though they may not fully understand how to solve the problems. *With continuous access, I can provide timely feedback* that students are motivated to follow since the assignment has not been turned in yet.

I have used different implementations of **EtherPad**, an online real-time collaborative editing tool, in five different class offerings.

Over the past year, I have developed a new course management framework, tentatively titled **EtherWork**, that interacts with an EtherPad server, to simplify many common tasks such as keeping track of all the assignments and being able to quickly identify which pads have been edited since I last viewed them.

Citations on timely feedback improving learning.

- Mory, 2004, Feedback research revisited. In *Handbook for research on education communications and technology* (2nd ed.), ed. D. H. Jonassen, 745-783.
- Kester, Kirschner, Meerinboer, 2006. Just-in-time information presentation: Improving learning a troubleshooting skill. *Contemporary Education Psychology* 31(2): 167-85.

Learning Activities and Materials

Example of Early Feedback Leading to Improved Learning

1) Below is a good solution with two issues identified for improvement (in green). Assignment due 9/28/13.

Version 2225 Saved September 20, 2013

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Two notes: 1) Not necessarily a binary tree
2) Your solution is correct, but see if you can design this so you do not need to visit grandchildren.

1. Planning a company party (problem 15-6 on page 408)

For this problem:
a) Clearly define subproblems and solutions for each node of the given tree structure
We let P(i) be the problem of finding the optimal subtree rooted at node (employee) i and C(i) be the maximum conviviality rating of the tree rooted at node i.
Since each employee only has one immediate supervisor, we note that the subproblems P(i) are independent of one another.
Our original problem is finding C(president)

…

We now give the recurrence relation for this solution:
C(i) = max{ i.conviviality + C(i.left.left) + C(i.left.right) + C(i.right.left) + C(i.right.right), C(i.left) + C(i.right) } [Not necessarily a binary tree]

2) Below is a better solution where the student has addressed the two issues.

Version 2408 Saved September 21, 2013

For this problem:
a) Clearly define subproblems and solutions for each node of the given tree structure
We let P(i) be the problem of finding the optimal subtree rooted at node (employee) i and C(i) be the maximum conviviality rating (MCR) of the tree rooted at node i.
We also let Y(i) be the MCR of the tree rooted at node i that contains node i, and N(i) be the MCR of the tree rooted at node i that does not contain node i.
Since each employee only has one immediate supervisor, we note that the subproblems P(i) are independent of one another.
Our original problem is finding C(president)

…

We now give the recurrence relation for this solution:
C(i) = max{ i.conviviality + ∑ C(i.grandchild), ∑ C(i.child) } [Not necessarily a binary tree]

N(i) = ∑ C(i.child)
Y(i) = i + ∑ N(i.child)
C(i) = max{N(i), Y(i)}

Student eliminated visiting grandchildren.

Student addressed binary tree.

Execution

I review student drafts of assignments before the due date. I follow up by providing feedback individually on their pads or to the class as a whole in subsequent lectures.

What works:

• Most students use my feedback to edit their assignments since it will improve their grade.

•I have often founds errors in my assignments by seeing how a few students have misinterpreted my questions and have started off on the wrong path.

What does not work:

•Reviewing student drafts is a time-consuming process. I often cannot maintain my reviews of students drafts through the entire semester.

•The interaction is still limited, and some students need more interaction. Despite giving feedback, students can miss the point and not learn the desired lessons. This semester, I have addressed this more successfully as I have been able to follow up more often.

Major Issues to Resolve

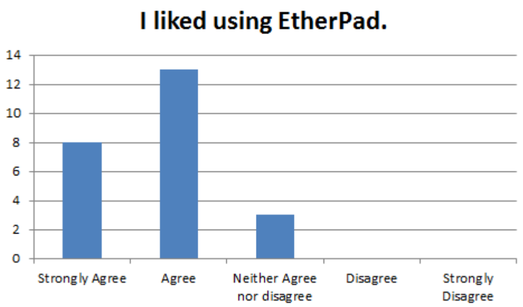
1) **Automation of Assessment**. Reviewing drafts is time-consuming. With EtherWork, I efficiently find the pads that have been updated so I don't waste time opening pads that I have already fully reviewed. However, doing the manual inspection is time-consuming. Is there a way to speed up this review through automation?
2) **How quickly and in what instances should I intervene and provide early feedback?** Part of a good assignment is having a student struggle to answer a question and decide for themselves that an answer is complete. If they count on my feedback, they may lose this aspect of the assignment.
3) **Are there specific problem domains where such interaction is especially useful?** I am currently working with Raven McCrory to develop a RIGEE proposal. We believe that using such an approach on basic problem solving skills may be very helpful. I have ideas for other potential problem domains, but I would like to talk about other possibilities.

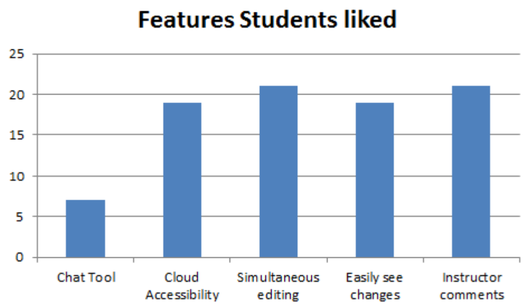
Discussion

Overall, students like the increased interaction, though many do not fully take advantage of it.

I am working with Raven McCrory to develop an NSF RIGEE proposal focusing on improving problem solving skills in early engineering classes.

2010 survey results: Class of 34, 24 responses





Acknowledgments

This work has been partially supported by the College of Engineering at Michigan State University.

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Irvine, California

October 27-30

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The National Academy of Engineering and
John McDonnell and the McDonnell Family Foundation

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