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Unrealized Potential: Course Outcomes and Student Learning

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Unrealized Potential: Course Outcomes and Student Learning

Abstract
Do you recall those course-level student learning outcomes on your syllabus? Ones that were argued over in some curriculum planning meeting long ago when they were developed to satisfy an accreditation agency. You know, those outcomes that students rate at the end of the semester as to how well they agree that they learned various things in class. When you read through your course outcomes you may nod in agreement, "Yes, yes. These are all things my students should take away from my class." But what are they doing for you? When they see the outcomes in the end-of-course evaluation time, do your students even remember that you told them the outcomes on the first day of class? By having them on the syllabus have you helped focus your teaching or the students' learning? This paper explains the author's experiment in implementing daily (lecture-level) outcomes as a way to make the course outcomes serve the student's better and improve student learning.

In the "Construction Estimating" course at Texas State University - San Marcos the author implemented the use of daily lecture outcomes and their assessment in an effort to increase student learning. The daily outcomes were intended to both help focus lectures for the author and to show the students that they were indeed learning something every time they attended class. In this paper the author describes the procedure for implementing daily outcomes, share the useful benefits from using daily outcome surveys and other lessons learned after one semester of implementation.

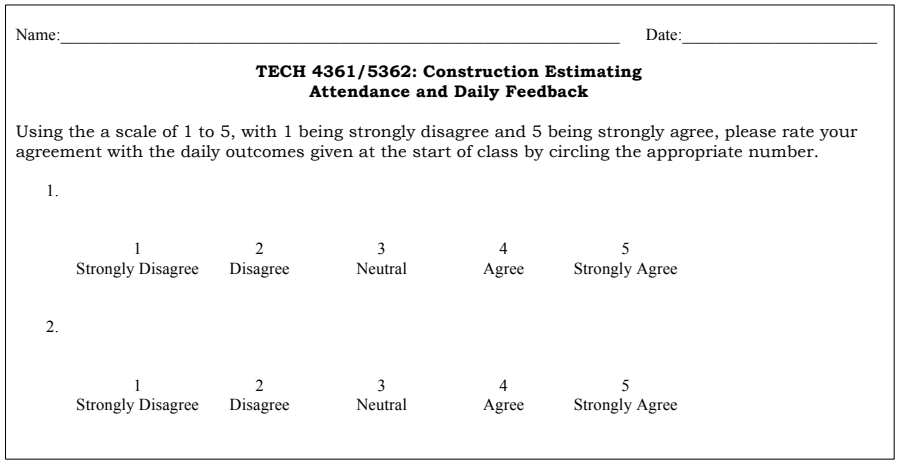
Introduction
There is a growing body of work examining the effectiveness of course- or program-level outcomes assessment[1-5]. Instead, this research project focuses on daily, lecture-level outcomes in lieu of the commonly considered course- or program-level outcomes, such as are requested by accrediting agencies. This research was inspired by a process education workshop that the author attending during Summer 2012. During that workshop there was considerable discussion about how students that were aware of what their learning expectations or outcomes better grasped the concepts[6]. From these viewpoints, the author wanted to make the course outcomes prescribed for "Construction Estimating" to be more helpful for the students taking the course. Additionally, the author sought a framework for lectures to consistently show the students what they should learn in class each day. The idea of daily, lecture-level outcomes developed to help the author with class preparation and to help the students identify what they should be learning during each lecture.

During the implementation of these daily outcomes, the author discovered they were also useful for providing quick feedback on which students had trouble on the assorted topics as well as providing a guide to what areas needed greater review for the final exam. While this work is still preliminary, the process and lessons learned can be useful to other educators interested in making their outcomes more productive.

Procedure

Daily Outcomes

While preparing for each lecture, the author would identify to concepts that seemed to be the main points of the day's class. These concepts were phrased as a statement, such as "I understand the difference between jobsite and general overhead," and were written on the board at the start of each lecture as the two daily outcomes. A listing of all daily outcomes used during the semester is included in the appendix for reference. During the opening minutes of lecture, the author would draw the students' attention to the outcomes as a part of reminders and housekeeping announcements. At the end of class, the students were expected to rate how well they agreed with the two outcome statements on a Likert scale (as shown in Figures 1 and 2). During the first two weeks of class this feedback was collected via a paper survey, as shown in Figure 1. At that point in the semester, the author switched to using the university's course management software (TRACS) to host the surveys online. An example of the TRACS-based online survey is shown in Figure 2.



Name:_____ Date:_____

TECH 4361/5362: Construction Estimating
Attendance and Daily Feedback

Using the a scale of 1 to 5, with 1 being strongly disagree and 5 being strongly agree, please rate your agreement with the daily outcomes given at the start of class by circling the appropriate number.

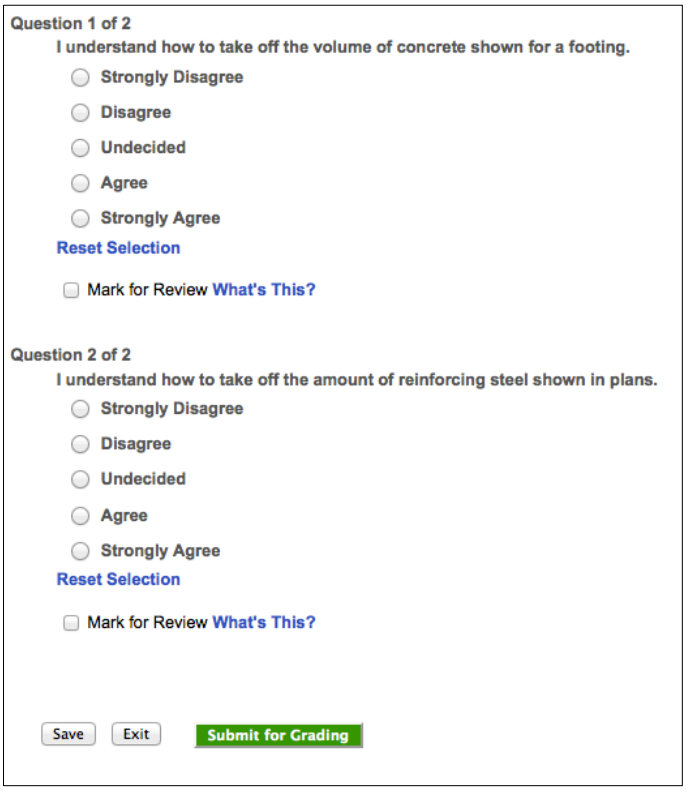
1.

1	2	3	4	5
Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree

2.

1	2	3	4	5
Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree

Figure 1: Daily Outcome Paper Survey Form (Students wrote in the daily outcomes)



Question 1 of 2

I understand how to take off the volume of concrete shown for a footing.

- Strongly Disagree
- Disagree
- Undecided
- Agree
- Strongly Agree

Reset Selection

Mark for Review What's This?

Question 2 of 2

I understand how to take off the amount of reinforcing steel shown in plans.

- Strongly Disagree
- Disagree
- Undecided
- Agree
- Strongly Agree

Reset Selection

Mark for Review What's This?

Save Exit Submit for Grading

Figure 2: Daily Outcome TRACS (online) Survey Form

Student Feedback

Although originally envisioned as a method to help organize lecture and learning, the author quickly found that the daily surveys provided useful feedback from the students on which topics they felt were challenging. Especially using the tools through TRACS, it was easy to identify those students who indicated disagreement with the daily outcomes and then send an email to reach out to those students. The author would invite the students to office hours or to make an appointment to see them to help sort out the issue. In any cases of widespread lack of understanding, the author could identify

topics for additional review in class.

Summary Survey
In an effort to customize the final exam review, the author gathered all of the daily outcomes from the semester into one document and had the students complete this summary survey during the penultimate lecture of the semester. From that survey, the author identified the areas where the students felt they were weakest and flagged the corresponding final exam topics that needed extra review and discussion. This summary survey also allowed a comparison between how well the students felt they knew the material on the day of the original lecture versus the end of the semester.

Course-level Outcomes
As a part of this ongoing work, the author will map the daily outcomes to the course-level outcomes that are part of the syllabus. By mapping the students perceptions of their knowledge of the components of the course-level outcomes to their reported perceptions of the outcomes, which is collected as a part of the department's ACCE (American Council for Construction Education) accreditation process/maintenance, the author will be able to examine the relationship between these two levels of outcomes. Further, the reported level of student agreement with the course objectives averaged over several semesters will be compared to the historic average of these objectives prior to the implementation of daily outcomes.

Results & Discussion
For the reader's reference, this class met twice a week during a regular long semester. Of the twenty-eight class meetings, there were two daily outcomes for all but four class periods as there were no daily outcomes for in-class tests or the exam review. As well, on the day the students completed the summary survey, which was also the day they completed the university's teacher evaluation forms, the students were not required to additionally complete daily outcomes. The class consisted of nineteen undergraduate students and four graduate students. Thus, with a sample size of only twenty-three students, it is too early to draw definitive conclusions, but instead observe the preliminary trends.

At this early stage the key impact on student learning has been the students' perception that the daily outcomes help them learn the material, although there has not been a dramatic change in test scores. Further, the use of daily outcomes has proven to be a valuable tool for the instructor to identify struggling students early in the semester and offer additional support. An additional question in the summary survey asked the students if they felt that the use of daily outcomes helped them learn the lecture material. As shown in Figure 3, over eighty percent of the students either agreed or strongly agreed with that statement while only one student disagreed. Thus, the students'

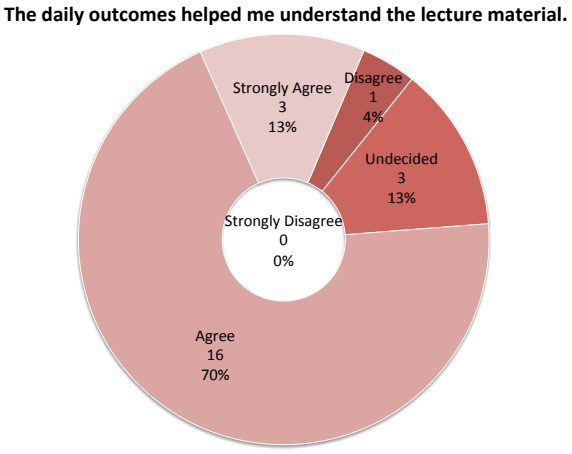


Figure 3: Student Perception of Daily Outcomes

responses indicated that they overwhelmingly believe that the daily outcomes did help them learn the course material.

Overall, the students typically agreed with the statements, thus indicating that they felt like they understood the course material. Of the forty-eight daily outcomes surveyed, forty-three outcomes (approximately ninety percent) averaged "agree" or higher across the class. Of the only five outcomes averaging less than "agree" on the daily survey, all were greater than "undecided."

From the comparison of the daily outcomes surveys and the summary survey, which are included in the appendix, we can see that there were no major changes in student perceptions of their learning. The changes with time ranged from an approximate ten percent increase in confidence to an approximate ten percent decrease in confidence. It was not surprising to the author that when students were surveyed at the end of the semester, their confidence in topics presented earlier in the semester has decreased versus their confidence at the time of the original lecture. As an educator, it was gratifying to see that some topics garnered an increase in student perceptions of confidence, which could be attributed to the additional practice with the topics in the form of labs that were completed after the original lecture. Of course, the decreases in confidence could also be a result of the additional practice; in that the students realized they did not understand the concepts quite as well as they had originally estimated. In all cases, the changes were not large and still remained typically positive with over seventy percent of the topics averaging "Agree" or higher on the summary survey. As was the case in the daily survey results, those topics that had averages less than "Agree" were all still higher than "Undecided," which indicated that there were no topics that the entire class felt were not understood.

Lessons Learned & Conclusions

After completed the first semester of this long-term project, the author offers the following lessons learned and conclusions to assist others interested in implementing a similar program.

- The author found the use of daily outcomes and feedback on those outcomes to be a useful tool for identifying students who are having trouble with the course material. This tool assigns no grades and does not require "bravery" on the part of the student to initiate a conversation with the instructor. Instead, the author contacted (via email) the students who indicated they did not understand concepts.
- After two weeks of using paper surveys to collect the daily outcome feedback, the author switched to using the university-provided course management software (TRACS) to collect the daily feedback electronically. The switch to electronic surveys greatly reduced the workload of the author, but also resulted in a decrease in response of the students. The author believes that using clickers to administer the outcome survey at the end of class would be a good balance of high response rate from students and low effort for the instructor to collect and monitor the class progress.
- In the summary survey at the end of the semester, the students strongly indicated that they believed the daily outcomes helped them understand the lecture material.
- The author used a compilation of the daily outcomes as a summary survey given during the penultimate lecture of the semester. The student feedback on how they currently viewed their understanding of the material was used to adjust the exam review presented

during the last lecture of the semester. The topics identified by the students to be the least understood were noted and the corresponding topics that were going to appear on the final exam were stressed.

- Overall, the class always felt confident that they understood the material.

The author intends to continue to use daily outcomes and daily outcomes surveys to garner student feedback. The specific daily outcomes will be refined as needed to better address the course-level outcomes and to accommodate any alterations in the material presented during the course.

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Appendix

	Averages			
Question	Daily	Summary	change	% diff (from daily)
The daily outcomes helped me understand the lecture material.		3.9		
I would prefer to take paper surveys instead of taking surveys on TRACS.		3.3		
I would prefer to have a weekly quiz and a weekly attendance survey instead of daily surveys and periodic quizzes		2.7		
I enjoyed class the jelly bean estimating exercise on the first day of class.	4.7	4.2	-0.5	-10%
I understand the basic elements of an estimate.	4.6	4.5	-0.1	-3%
I understand various types of construction estimates.	4.3	4.4	0.1	2%
I understand how to develop basic conceptual estimates.	4.4	4.3	0.0	-1%
I understand what price indices are.	4.0	4.1	0.0	1%
I understand the basics of the bidding process.	4.1	4.2	0.1	3%
I better understand the process for estimating materials.	4.5	4.2	-0.3	-7%
I enjoyed the bid game lab.	4.3	4.0	-0.4	-9%
I understand how to use labor productivity.	4.3	4.3	0.0	1%
I understand how overtime affects labor productivity.	4.3	4.3	-0.1	-1%
I understand the difference between specific use equipment and general use equipment.	4.3	4.3	0.0	0%
I understand how to calculate equipment depreciation cost.	4.2	4.1	-0.1	-2%
I understand the difference between jobsite and general overhead.	4.2	4.3	0.2	4%
I feel like the amount of work required for this course is reasonable for a senior level class.	4.0	4.0	0.0	0%
I understand what factors affect the amount of contingencies and profit added to a bid.	4.3	3.9	-0.4	-9%
I understand the difference between bonds and insurance.	4.3	4.2	-0.1	-2%
I better understand how estimating works in the "real world"/in professional practice.	4.3	4.0	-0.3	-6%
I enjoyed having guest speakers.	4.5	4.3	-0.1	-3%
I understand at least three factors that influence sitework costs.	4.3	3.9	-0.4	-9%
I understand the relationships between bank, loose, and compacted cubic yards.	4.4	4.3	-0.1	-1%
I understand how to use the average end area method.	4.0	3.9	-0.1	-3%
I understand how to take off cut and backfill for general excavations.	3.8	3.7	-0.1	-2%
The in-class model was helpful for learning the cross section method of taking off cut and fill.	4.0	3.8	-0.2	-5%
I felt that concentrating on example problems instead of spending time on general lecture content was more useful to me than the typical class structure.	4.2	4.2	0.0	0%
I understand how to take off the volume of concrete shown for a footing.	3.8	4.2	0.4	9%
I understand how to take off the amount of reinforcing steel shown in plans.	3.7	4.0	0.3	7%
I understand three ways to increase masonry productivity.	4.3	4.2	0.0	-1%

Figure 4: Daily Outcome Questions and Average Student Responses (1=Strongly Disagree, 2=Disagree, 3=Undecided, 4=Agree, 5=Strongly Agree) on Daily and Summary Surveys (Page 1 of 2)
Note that daily outcomes used more than once, such as "I enjoyed having guest speakers," had the daily outcomes averaged for comparison to the summary survey results.

I understand how to take off the number of bricks needed to construct a single wythe wall.	4.2	4.0	-0.3	-6%
I understand how to estimate the time to construct a CMU wall.	4.0	4.1	0.1	2%
I understand how to estimate the direct cost of constructing a CMU wall.	4.0	4.0	0.0	-1%
I understand how to read structural steel framing plans.	4.0	3.8	-0.1	-3%
I understand how to estimate the quantity of structural steel shown on framing plans.	4.1	4.0	-0.1	-3%
I understand how to estimate the time to construct structural steel as shown on framing plans.	4.3	3.8	-0.5	-11%
I understand how to calculate board feet and MBF.	4.2	4.3	0.1	2%
I understand how to take off wood floor framing.	4.3	4.2	-0.1	-2%
I understand how to take off wood wall framing.	4.2	4.2	-0.1	-2%
I understand how to price wood floor framing.	4.2	4.1	-0.2	-4%
I understand how to take off & price moisture barriers.	4.3	3.9	-0.3	-8%
I understand how to take off and price insulation.	4.3	4.0	-0.3	-6%
I understand how to take off doors and windows.	4.3	4.2	-0.1	-2%
I understand how to estimate the price of doors and windows.	4.3	4.2	-0.1	-2%
I can identify finishes that are used on walls.	4.4	4.2	-0.2	-4%
I can identify finishes that are used on floors.	4.3	4.2	-0.1	-2%

Figure 5: Daily Outcome Questions and Average Student Responses (1=Strongly Disagree, 2=Disagree, 3=Undecided, 4=Agree, 5=Strongly Agree) on Daily and Summary Surveys (Page 2 of 2)
Note that daily outcomes used more than once, such as "I enjoyed having guest speakers," had the daily outcomes averaged for comparison to the summary survey results.