



The Benefits of Using Excel-Based Homework That Grades Itself

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Background

A large body of research from the 70s & 80s shows the benefits of homework [1, 2].

- Time-on-task is positively correlated with achievement [3]
- Increased time benefits everyone, but lower-ability students and highly anxious students benefit disproportionately [4]
- Homework increases learning, graded homework greatly increases learning [5]
- Frequent homework better than sporadic or infrequent homework (increases spaced practice) [6]
- Homework improves problem-solving skills and allows scaffolding of increasingly complex problems [7]
- Homework acknowledges different learning/testing strengths
- Homework can serve as a method of pretesting [8]
- Homework provides more information about student difficulties
 - Individual students
 - Common issues for class
- Homework is a low-pain way for students to monitor studying effectiveness

The Problem

The time to create, distribute, grade, and return homework is burdensome.

How can homework assignments that meet the following requirements be created?

Practical Criteria

- Low time & effort for creating, distributing, grading, and returning
- Low investment in programming knowledge
- No special software for students
- Familiar look to students
- Easy to modify/re-use
- Unhackable
- Platform independent

Pedagogic Criteria

- Short - 10 to 20 items
- Any "objective" item
- Connectable to classwork
- Re-takable
- Problem solving OR pretesting
- Immediate feedback (or at least pretty darn quick)

Why not use Web-based tools?

- Lack of control (formatting, delivering, etc.)
- Difficulty of use (for instructor and students - almost everyone is familiar with Excel already)
- Lack of seamless integration with gradebook
- Requires online access
- Unreliable - system downtime renders it non-functional

The Solution

Forms that use drop-down menus are easy to create in Microsoft Excel and distribute as email attachments. Their format is very familiar to students, and they are easy to complete and return via email. They are graded, marked, recorded, and returned to students automatically using Visual Basic scripting. Once one form is created and a script written, an assignment is easily modified for use in later assignments. The examples below illustrate the kinds of forms that can be generated, including those where the questions vary depending on previous responses. A sample of the scripting is also included.

Fill-in-the-blank form

Multiple choice form

Multiple choice form showing drop-down menu.

Recorded Grades

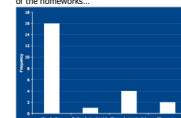
Graded assignment

Visual Basic scripting

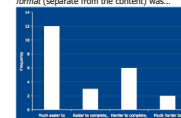
Four Courses over Three Semesters

1. Twenty-three students from Chicago with a semester's experience with the format: In-class quizzes vs. electronic homework

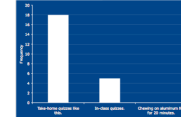
Compared to the in-class quizzes, I like the format of the homework...



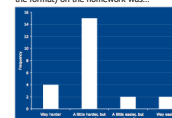
Compared to the in-class quizzes, the homework format (separate from the content) was...



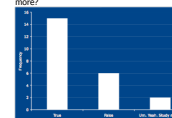
If I got to pick, all of our quizzes would be...



Compared to the in-class quizzes, the questions (i.e., the content, separate from the format) on the homework was...



True or false: the homeworks led me to study more?



Results

3. Thirty-nine students from Boston with a semester's experience with the format: Electronic homework only

Evidence from course evaluations: Selected comments and rating data

How do you think the teaching in the course could be improved?

More homework assignments
What did you like about the way the course was taught?
I enjoyed that it was interactive. I used the
quizzes & the homework. They were both
a helpful way to increase my understanding
of the material.
-Homework on excel was good and did help on
problems we were learning in class
Very much enjoyed the material. I enjoyed the
assignments that were assigned. The really helped me learn the
material & I think I should use more of them.

	Disagree	Disagree	Neutral	Agree	Strongly Agree	Not Applicable
The course assignments contributed to my understanding of the subject.	0.0	0.0	2.6	47.4	50.0	0.0
n =						
38	Mean: 4.47/5	SD: 0.56	Mode: 5/6	Rank: 7/15		

98% Agreed that homework helped their understanding

4. Forty-eight students from Boston: Active-learning assignment vs. electronic homework

	JND Lab	Excel-based Homework	t(47)=5.5, p<.001
Helped Learning	5.63	7.77	t(47)=3.1, p<.005
Liked the Format	5.85	6.90	t(47)<1
Easy	7.81	7.60	t(47)<1
Time to Complete	6.85	6.77	t(47)<1

How long does it take?

• Creation	30 minutes
• Collecting	14 minutes
• Grading	3 minutes
• Distributing	10 minutes
Total	57 minutes

Practically speaking, work time is independent of the number of students in class.

Conclusion

Excel homework that is easy to create and administer was preferred over other, similar evaluation methods by students and had a greater impact on self-reported learning in every one of the four circumstances. Examples of assignments that can be used and adapted are available at <http://web.simmons.edu/~turnerg/APA2008/>

References

- [1] Brophy, J.E., & Good, T.J. (1986). Teacher behavior and student achievement. In M.C. Wittrock (Ed.), *Handbook of research on teaching* (3rd ed, pp. 328-375). New York, NY: Macmillan.
- [2] Cooper, H. (1989). *Homework*. White Plains, NY: Longman.
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