

## **WeBWork vs Written Assignments, MATH 110**

### **Introduction:**

Since 2010, WeBWork and written assignments were assigned in parallel throughout the course in Math 110. Because of the benefits and conveniences of WeBWork, we would like to investigate the practicability in promoting WeBWork to other courses. In this report, we are interested in observing the differences between WeBWork and written assignments in terms of student performance and involvement.

### **WeBWork vs written assignments – averages and submission rates:**

**Table 1: The average grades on WeBWork and written assignments (N = 238).**

	WeBWork	Written assignments
Average (%)	68.1 ± 1.3	51.0 ± 1.4

It is expected that the average WeBWork grade is significantly higher than the average written assignment grade. Part of the reasons is because students have infinitely many retries on their WeBWork assignments, while they only have one attempt on written assignments. It is also found that students are more likely to do a WeBWork assignment than a written assignment. The following table and graph show the average percentage of assignments that are submitted and received a score of 20% or higher. We do not consider students to have put appreciable effort on their assignments if they cannot get a mark of 20%.

**Table 2: The percentage of assignments submitted with marks over 20%.**

	WeBWork	Written assignments
% assignments submitted	85.3 ± 1.2	72.9 ± 1.5

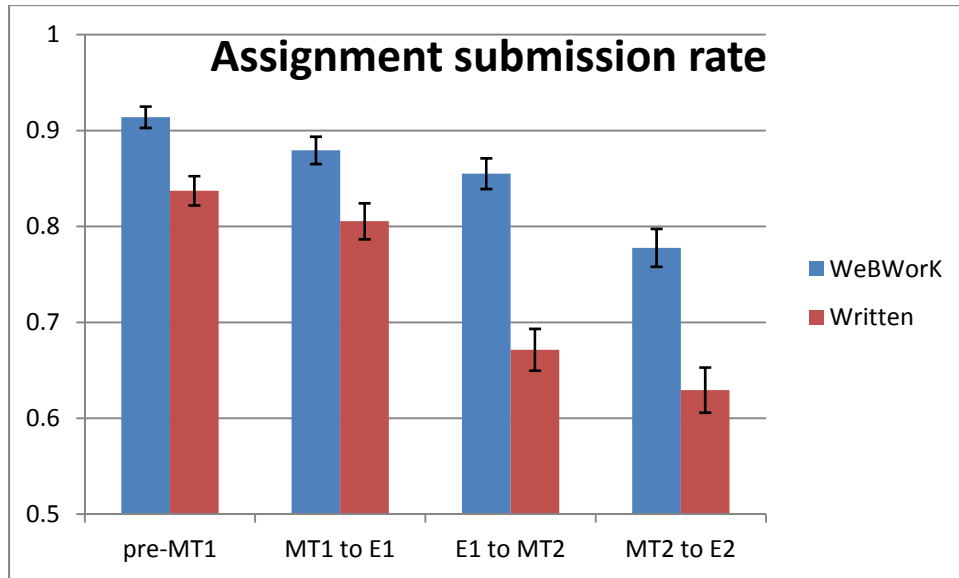


Figure 1: Submission rate of WeBWorK and written assignment. In this context, an assignment is considered submitted if its mark is above 20%. MT1: October midterm; E1: December exam; MT2: February midterm; E2: April exam.

### Correlation between assignments and grades

Table 3: Correlation coefficients ( $r$ ) between assignment grades/submission rates and final exam/final grades.

	April final exam	Final course grades
WeBWorK grades	$0.50 \pm 0.05$	$0.67 \pm 0.04$
Written assignment grades	$0.53 \pm 0.05$	$0.70 \pm 0.03$
WeBWorK submission rates	$0.43 \pm 0.05$	$0.59 \pm 0.04$
Written assignment submission rates	$0.44 \pm 0.05$	$0.62 \pm 0.04$

We do not find significant differences between WeBWorK assignments and written assignments in terms of the correlation with the final exam and the final course grades. It is also consistent with our belief that those who put more effort on assignments, either WeBWorK or written assignments, tend to perform better in the course. This can be shown by the non-trivial correlation between submission rates and grades.

### Observations, discussions and conclusion

We found that students are more willing to do WeBWorK assignments than written assignments. Students like the fact that WeBWorK assignments provides convenient access, infinite (or multiple) trials, and instant feedback. Since most WeBWorK questions involve routine calculations, students have the opportunity to practice their technical skills.

It is sometimes believed that because WeBWork allows infinitely many retries, students may tend to complete their assignments with perfect marks by all means. This is not the case when we observe the grades and the submission rates of WeBWork assignments. The average WeBWork grade is only 68% and the submission rate is only 85%. It is still apparent that students who tend to complete their WeBWork assignments are more likely to receive a higher grade on their final exam and final grade. The WeBWork grades and submission rates correlate with the exam and final grades similarly as written assignments. Based on these statistics, it appears that the effects of doing WeBWork assignments and written assignments are not vastly different, but WeBWork assignments are more popular to students than written assignments.