

## **2006-1121: A TIME MANAGEMENT ASSESSMENT TECHNIQUE THAT IMPROVES STUDENT PERFORMANCE**

### **Rick Covington, California State University-Northridge**

RICHARD G. COVINGTON is an Assistant Professor in the Department of Computer Science at California State University Northridge. His research interests include Computer Architecture and Simulation, Graphical User Interfaces, and Non-Western Language Information Processing. He received his Ph.D. in Electrical and Computer Engineering from Rice University in 1989.

### **G. Michael Barnes, California State University-Northridge**

G. MICHAEL BARNES is a Professor of Computer Science at California State University Northridge. His areas of interest are Computer Graphics, Human-Computer Interaction, and Computer Science Education. He earned a Ph.D. in Experimental Psychology from the University of Kansas in 1980.

# A Time Management Assessment Technique That Improves Student Performance

## Abstract

We describe two studies that examine the relationship between student performance and student assessments of their attention to time management using a short periodically administered survey. The first study examined a class of senior Computer Science students. It demonstrated a positive correlation between progress on class related activities that the student reported in the survey and the project grade that the student ultimately received. There was no correlation between the survey and exam grades. The second study was an experiment using two sections of one class of lower division Computer Science students. The experimental group reported time spent on projects and lecture preparation in periodically administered surveys and the control group did not. The study showed that the experimental group achieved significantly higher performance on all project grades and on the exam grade during one time period compared to the control group. We discuss the use of our results in Computer Science and Engineering and the need for replication and generalization of these results.

## Introduction

There is little quantitative research on time management and student performance that we were able to find. As an example, Loomis<sup>1</sup> reports a significant correlation between time management and student performance in a Journalism on-line research course. Trueman and Hartley<sup>2</sup> found a modest relationship between age, time management skill, and performance for first year Psychology majors. The work we found that has been done in Engineering has focused more on student personality or learning styles, and time management<sup>3,4</sup>. As educators, we intuitively and anecdotally identify time management skill as an important determiner of student classroom performance<sup>5</sup> and of workplace productivity and professional success<sup>6</sup>. Yet most educators would admit that planning and time management are often not an explicitly addressed element of the Computer Science and Engineering curriculum. Rather than teach students how to manage time, most instructors do the work themselves, incorporate the results into the time frames and deadlines documented in the course syllabus, and assume that students will allocate their time accordingly. In reality, many students, especially those with weaker performance, do not know how to do this, or do not realize the consequences of not taking deadlines seriously. We show that a brief periodically administered self-assessment survey that requires students to state how much time they have allocated on class tasks helps students better manage their time and effort for extended project assignments and results in better performance as measured by their grades, especially for project grades.

We examined the effect of time management skills on performance in two studies of courses from different parts of the Computer Science curriculum. The first study looked at Object Oriented Programming (Spring 2004, lecture only), a senior level elective. This study examined the correlation between student self assessment of course activities and their grades. The second study looked at Introduction to Algorithms and Programming (Fall 2005, lecture and lab). This is a freshman-level introductory course on algorithms and Java programming. This study used two parallel sections of the same course and tested the hypothesis that periodic self assessment of

time management by the experimental section would improve performance as measured by project grades compared to the control section.

The remainder of the paper is organized as follows. In the Study 1 section, we describe the details of the first study, including a description of the assessment surveys, how the surveys were graded, and the results of two different analyses: (1) a hypothesis test analysis and (2) an assessment survey validity test analysis. In the Study 2 section, we describe the details of the second study, with a description of the experimental design and the survey questions used. We also present the results of the multivariate and univariate analysis of variance tests, and the results of tests of two specific hypotheses with confidence intervals. In the last section, we offer some conclusions and guidelines or “lessons learned”.

### **Study 1: A Relationship Between Student Self Assessment and Grades**

The hypothesis for this study was that there should be a positive correlation between student scores on a self-assessment survey and their scores on programming assignments and exams. Forty seven students enrolled in two sections of Object Oriented Programming in the Spring 2004 semester using an on-line self enrollment system. Students self selected which section of the course they enrolled in, beginning several weeks before the start of the semester. The instructor had no contact with the students during the enrollment period, and no influence over their choice of section, so the mix of students across sections is assumed to be random. Six were graduate students and the rest were seniors. They were given 6 self-assessment surveys at regular intervals throughout the semester. This course was taught by the second author. The surveys were evaluated by the instructor as 0 (absent, no assessment), 1 (present, behind on class schedule), 2 (present, on schedule), 3 (present, ahead of schedule). Graded surveys were returned to students the next class session. The assessment grade accounted for 5% of the students’ course grade. The average assessment evaluations were: 20% 0, 22% 1, 50% 2, and 8% 3. The assessment evaluation was based on the work students self reported they had done with respect to course and project assignments. Again, the purpose of the assessment and its evaluation was to have the student’s reflect upon their time management periodically during the course. The six assessment surveys are posted on the web<sup>7</sup>. The class had two medium-sized programming assignments, a midterm, and a final. Each programming assignment was to be completed within 6 weeks. All grades were percentages.

In study 1 we report results from two analyses. First, we test our hypothesis by examining the correlation between all 47 student assessment, exam, and program grades. Second, we examine the fourth and sixth assessment scores to evaluate the validity of the assessment questions. We hope the second analysis will provide information for improving future assessment surveys.

### **Results for Study 1**

We used SPSS 14.0 software<sup>8</sup> to calculate our statistics. The survey evaluations, programs, and exams were each summed to yield an aggregate assessment (max = 100), program (max = 200), and exam (max = 200) score for each student. The average and the standard deviation for the three student scores were: assessment (90.6, 7.66), program (169.6, 14.55), and exam (165.02, 9.89). The Pearson correlation matrix of the assessment, program, and exam scores for the 47

students is shown in Table 1. This table gives the result of the hypothesis test analysis for Study 1.

	Assessment	Programs
Programs	.327 *	
Exams	.159	.642 **

\* Correlation is significant at the 0.05 level (1-tailed).

\*\* Correlation is significant at the 0.01 level (1-tailed).

**Table 1. Correlation Matrix for Assessment, Exam, and Program Grades**

Not surprisingly, the strongest correlation was between student exam and program grades. There was a significant correlation between assessment and program grades. Interestingly, there was no significant correlation between assessment and exam grades.

In the assessment survey validity test analysis, we performed a more detailed examination of the fourth and sixth assessment surveys (both surveys are in the appendices). The fourth survey was given before submission of the first program and midterm exam. The sixth survey was given before the submission of the second program and final grade. Thirty three students were in attendance for both class sessions and submitted complete fourth and sixth assessment surveys. This is a loss of 30% of the full class enrollment for the second analysis due to missing data. There was not a 30% attrition in the class. We do not know if this 30% represents the less motivated students or not. As an example, students who attended one class session and completed the assessment survey on that day but not on the other day, or students who did not answer all the assessment survey questions on either day, led to missing data for those students.

The assessment survey validity test analysis is based on student responses to 10 questions gathered from the fourth and sixth assessment surveys. These questions asked students how much they worked (effort in hours, labeled “hrs”), the percent of work they thought they had completed (“cmp”), and what they expected as a grade on the individual projects and exams (“exp”). For example, “P1 hrs” is the number of hours students reported they had worked so far on program 1, “P1 cmp” is the percent of program 1 they believed they had completed so far, “P1 exp” is the grade they thought program 1 would receive, and “P1 grd” is the instructor’s grade for program 1 that the student ultimately received. There are four equivalent variables for program 2. There are three equivalent variables for the midterm (percent complete for exam preparation, expected and actual grade) and three for the final (preparation hours, expected and actual grade). Table 2 is the correlation matrix for these 14 variables. Note that the column headers range from “P1 hrs” to “Fin exp”, and row headers range from “P1 cmp” to “Fin grd”. Correlations that are significant are displayed in bold. For example, the number of hours students reported working on program 1 (“P1 hrs”) correlated significantly ( $r = 0.36$ ) with their assessment of how complete their first program was (“P1 cmp”), and with the number of hours they reported working on program 2 (“P2 hrs”,  $r = 0.45$ ). The remaining correlations of P1 hours with other variables were not significant.

	P1 hrs	P1 cmp	P1 exp	P1 grd	P2 hrs	P2 cmp	P2 exp	P2 grd	Mid cmp	Mid exp	Mid Grd	Fin hrs	Fin exp
P1 cmp	<b>.36</b> *												
P1 exp	.29	<b>.84</b> **											
P1 grd	.18	<b>.67</b> **	<b>.69</b> **										
P2 hrs	<b>.45</b> **	.33	<b>.38</b> *	.20									
P2 cmp	.21	<b>.61</b> **	<b>.59</b> **	.29	<b>.35</b> *								
P2 exp	.22	<b>.57</b> **	<b>.55</b> **	.19	.32	<b>.91</b> **							
P2 grd	.11	<b>.38</b> *	<b>.40</b> *	<b>.55</b> **	.19	<b>.48</b> **	<b>.52</b> **						
Mid cmp	.19	<b>.35</b> *	.23	.30	<b>.38</b> *	<b>.49</b> **	<b>.46</b> **	.13					
Mid exp	.33	.27	.06	.19	.24	.27	<b>.35</b> *	.01	<b>.48</b> **				
Mid Grd	.06	.20	.09	<b>.46</b> **	-.02	-.05	.03	<b>.43</b> *	.14	.20			
Fin Hrs	.05	.18	.06	.04	.26	.25	.25	.05	.17	.28	-.22		
Fin exp	.16	.22	.01	-.01	.08	<b>.56</b> **	<b>.60</b> **	.22	<b>.45</b> **	<b>.59</b> **	.15	.17	
Fin grd	.09	<b>.38</b> *	.29	<b>.55</b> **	-.08	.29	.26	<b>.48</b> **	.18	.20	.30	-.17	.14

\* Correlation is significant at the 0.05 level (2-tailed).

\*\* Correlation is significant at the 0.01 level (2-tailed).

**Table 2. Correlations Between 14 Assessment Survey Variables**

Clearly, these 14 variables are not orthogonal; the “hrs”, “cmp”, and “exp” variables are asking students to evaluate their work on the same task from slightly different perspectives. For this reason, a factor analysis of the 14 variables was performed to see if the correlations in Table 2 could be described with a simpler model (fewer variables, or, components). Factor analysis is a data reduction technique that looks for correlations between the variables and underlying, or meta, components. The results of a principal components extraction with a varimax rotation analysis are presented in Table 3. Four orthogonal components were determined: Program Assessment, Exam Grade Expectation, Grading, and Programming Effort. The percent variance accounted for in each component is also shown. The component loadings of variables with high

values were used to define the components and are shown in bold and prefixed with a double asterisk “\*\*”.

	Component			
	Programming Assessment	Exam Grade Expectation	Grading	Programming Effort
Component Variance	24.9 %	18.0 %	14.4 %	14.1 %
P1 hours	.051	.172	.069	<b>** .729</b>
P1 complete	<b>** .725</b>	.098	.192	.459
P1 expect	<b>** .806</b>	-.145	.111	.433
P1 grade	.539	-.083	<b>** .615</b>	.382
P2 hours	.229	.125	-.215	<b>** .735</b>
P2 complete	<b>** .809</b>	.477	-.179	.071
P2 expect	<b>** .757</b>	.548	-.148	.038
P2 grade	.667	.115	<b>** .407</b>	-.069
Midterm Complete	.212	<b>** .619</b>	.074	.332
Midterm expect	-.081	<b>** .773</b>	.168	.389
Midterm grade	.003	.167	<b>** .820</b>	.063
Final hours	.168	.268	<b>** -.462</b>	.252
Final expect	.181	<b>** .895</b>	.005	-.095
Final grade	.424	.140	<b>** .632</b>	-.087

\*\* factor loading of variables used to define the components

**Table 3. Factors Extracted by Data Reduction**

As an example of how the factors were identified, we will focus on the “Grading” component shown in the 4<sup>th</sup> column of Table 3. This component accounts for 14.4% of the variance in the data set. Component loading is a “correlation” of that variable with the extracted component. Each row represents a variable. The variables labeled “Midterm grade” (0.820), “Final grade” (0.632), “Program 1 grade” (0.615), “Final hours” (-.462), and “Program 2 grade” (0.407) had the highest contribution to this factor, so it is therefore identified as “Grading”. It is encouraging that all the grades loaded positively with a single factor. Interestingly, the time that students expected to spend studying for the final exam loaded negatively (had an inverse relationship) with grades. Similar inference was used to name the other factors.

### Discussion of Results for Study 1

As shown in Table 1, our hypothesis was supported for programs, but not exams, in the hypothesis test analysis of all 47 students in the course. Programming grades were positively related to student assessment of their course work. Successful programming projects take time and require planning: design, partial implementation, debugging and problem solving, verification, and documentation. It is difficult to “cram” for a medium-size programming assignment. As a result, student performance on programming projects is positively associated

with student attention to their progress across the assignment time period. In contrast, our hypothesis was not supported for exam grades. Specifically, exam grades were not related to student assessments of their course work. The most obvious explanation to us is that students are inoculated against warnings to study for an exam in the distant future, because they plan to simply “cram” a few days in advance of the exam (“Just-In-Time” studying). Admittedly, many students pass their exams with just such a strategy.

The identification of the four components that we found to underlie the correlations among our 14 variables in the assessment survey validity test analysis -- Programming Assessment, Exam Grade Expectation, Grading, and Programming Effort – confirms that future assessment surveys should have more orthogonal questions. In our case asking students to estimate the grade they expected to earn on course work is redundant with asking them how much of the task they have completed. We should also have been more consistent in having students evaluate the hours they spent studying for exams or the completeness of their studying. Our results suggest that students are consistent in how they assessed their behavior. In addition, the four components we obtained have instructional relevance with respect to student self assessment of their time management and performance.

Our correlation results clearly show that brief periodic student assessment of class-related activities is a viable instructional technique. However, as with any correlation result, we cannot infer a causal relationship between student assessment of time management and performance.

## **Study 2: The Benefit of Student Self Assessment on Grades**

Given the results of the first correlation study, we then designed a second experimental study to go further and try to demonstrate a causal relationship between periodically administered surveys of class activities and student performance. In addition, in order to further test the generality of our initial results, we chose an introductory Computer Science course. Since this course traditionally has a high student attrition rate, a demonstrated benefit from this technique would be particularly useful.

A two-factor assessment (no assessment, periodic assessment) by 5-week period (first, middle, and last third of the semester) multivariate analysis of variance design was performed to test the hypothesis that periodic assessment of time management would improve programming grades but not exam grades. The dependent measures were students’ grades for exams and programming projects. Two sections of the course, taught by the first author, were used as the basis for the experiment. A coin flip determined which section was administered the periodic assessment surveys and which was the control. The data of 15 students in the experimental section and 17 students in the control section were analyzed. As in study 1, students self selected which section of the course they enrolled in through the on-line system, so the mix of students across sections is assumed to be random.

Over the course of the 10 weeks covered by periods two and three, a total of 7 surveys were completed. The survey consisted of two questions:

1. How much time have you spent in general lecture preparation since the last survey?
2. How much time have you spent working on the current lab project since the last survey?

For the project question, students were reminded to include time spent both in and outside of lab. Surveys were performed during the last 5 minutes of class. At the beginning of each survey, summary results from the previous survey were displayed on the screen at the front of the classroom in the form of a 3 or 4 line histogram (i.e., “more than 3 hours: 2 responses; between 1 and 3 hours, 5 responses; less than 1 hour: 7 responses). As a result, students knew before completing the current survey how their own preparation time compared to the class distribution on the previous survey. Students were reminded each time that honest and accurate responses were more important than reporting inflated preparation times, and that there was no grade penalty for reporting low preparation times. Presentation of previous survey results probably introduced bias into the numbers reported on the current survey, but the test of the hypothesis for study 2 does not depend on the quantitative results of student responses to the time management questions. As explained later, our hypothesis depends only on the act of completing the surveys, not the reported values.

Assessment surveys were not administered to either section during the first 5-week period. This allowed us to see if the enrollment sampling of students in the two sections was different. The grades for the first midterm, second midterm, and final exam were used as the exam grade for each student in the three 5-week periods. For student program grade, the first period grade for each student was the average of the grade for programs 2, 3 and 4, the second period grade was the average of programs 5, 6, and 7, and third period grade was the average of programs 8 and 9. The first programming assignment was a simple introduction to using the lab and was not graded. All grades were normalized to percentages. Students with missing grades were excluded from the analysis. Six students (26%) from the no assessment control group and 5 (24%) students from the assessment experimental group had missing data. Once students with missing data were excluded, we were left with complete data for 17 students in the control group and 15 students in the experimental group being analyzed. To minimize grading bias, both sections completed the same exams and projects. During grading, projects and exams from both sections were first grouped together into a single stack and then graded in random order.

We had specific hypotheses (1) for the first 5-week period and (2) for the last two periods.

1. In the first 5-week period, we expected no difference between the exam grades for the no-assessment (control) and assessment (experimental) groups; we also expected no difference between the program grades for the no-assessment and assessment groups.
2. In each of the second and third 5-week periods, we expected no difference between the exam grades for the no-assessment and assessment groups; we also expected the program grade of the no-assessment group to be lower than that of the assessment group.



We had no hypothesis about how exam or program grades would vary across the three periods independent of group.

## Results for Study 2

We used SPSS 14.0 software<sup>8</sup> General Linear Model with repeated measures to calculate our statistics. We will first describe the results of the multivariate analysis of variance, and then use confidence intervals to test our specific hypotheses. The multivariate dependent measure, grades (Roy's largest root), is the common component of program and exam grades. Table 4 presents the program and exam grade means for the assessment and no-assessment groups. Confidence interval results are discussed separately below. The assessment group grades were higher than the no-assessment group; marginally significant Multivariate  $F(2, 29) = 2.693, p < 0.085$ . Grades were lower across the three 5-week periods as the semester progressed; significant Multivariate  $F(2, 60) = 21.307, p < 0.001$ . There was a marginally significant interaction of survey by period; Multivariate  $F(2, 60) = 2.648, p < 0.079$ .

Measure	assessment	periods	Mean	Std. Error	95% Confidence Interval	
					Lower Bound	Upper Bound
exam	no	1	77.882	4.908	67.859	87.906
		2	70.147	5.310	59.302	80.992
		3	71.667	4.511	62.454	80.880
	yes	1	82.667	5.225	71.996	93.337
		2	82.250	5.653	70.705	93.795
		3	80.056	4.802	70.248	89.863
program	no	1	90.490	1.928	86.553	94.428
		2	85.000	3.228	78.408	91.592
		3	59.254	6.992	44.975	73.534
	yes	1	93.778	2.052	89.586	97.970
		2	95.511	3.436	88.493	102.529
		3	80.121	7.444	64.919	95.323

**Table 4. Means and Confidence Intervals for Hypothesis Testing**

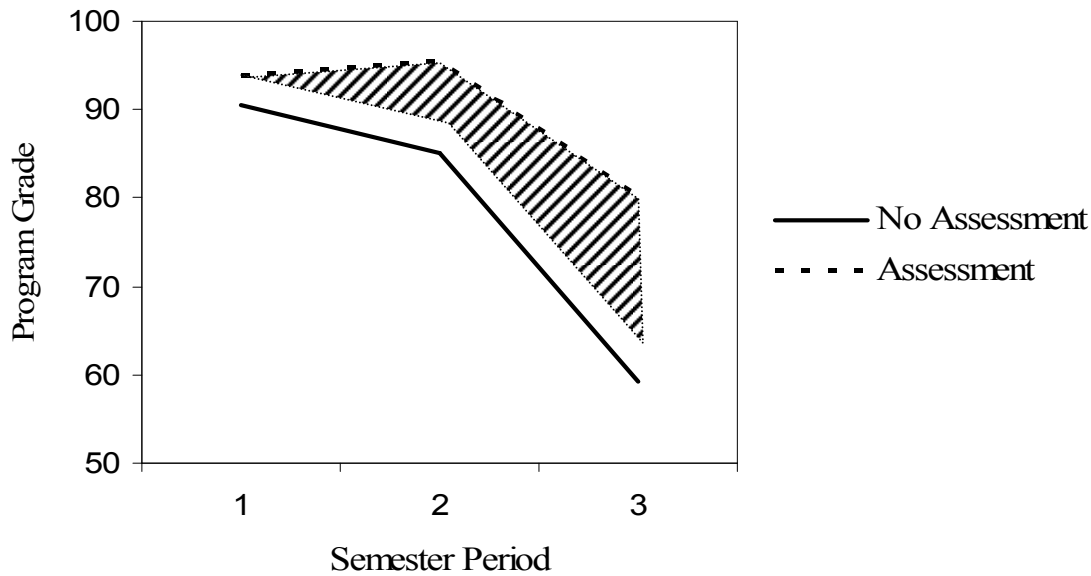
Only program grades were significantly higher for the assessment group compared to the no-assessment group; univariate  $F(1, 30), p = 5.396, p < 0.027$ . We cannot assume sphericity for our within-subjects univariate tests and so report the Huynh-Feldt corrected tests of significance. Only program grades were significantly lower across semester periods; univariate  $F(1.372, 41.152) = 20.6, p < 0.001$ . The interaction of survey by periods was almost marginally significant for program grades; univariate  $F(1.372, 41.152) = 2.593, p < 0.104$ .

Our results are best understood by examining our specific hypotheses which we tested using 2-tailed 95% confidence intervals. Two means are significantly different if they do not lie within the mean  $\pm$  one confidence interval of each other. Table 4 lists the means, standard error, and 95% confidence interval lower and upper bounds for the 12 means in our design.

As we predicted in the first hypothesis, although the assessment group has higher performance on exams and programs than the no-assessment group during the first 5-week period, the difference is not significant (meaningful). In Table 4, the mean exam grade for the no-assessment group during period 1 is 77.882 and the upper bound of its confidence interval is 87.906. The corresponding exam grade the assessment group for period 1 is 82.667, which is within the confidence interval for the no-assessment group. Likewise, the exam grade for the no-assessment group falls within the confidence interval of the assessment group's exam grade. Contrary to the second hypothesis, the assessment group had significantly higher exam grades in the second period. Consistent with the second hypothesis, there was no difference between exam grades in the third period. Also consistent with the second hypothesis, the assessment group had significantly higher program grades in the second and third periods than the no-assessment group.

## **Discussion of Results for Study 2**

Periodic assessment of time management consistently increased student performance of program grades and had an inconsistent effect on exam grades. As the semester progressed, students in both the experimental and control condition generally performed worse on exam and program grades. One possible interpretation is that as the semester progresses, students must micromanage their time budget across competing classes that tend to schedule increasingly more difficult assignments and exams, all at the same “crunch” time at the end of the semester. The estimated benefit of periodic assessment of time management for programming performance in our class is shown in Figure 1. If there was no effect for time management assessment, the curves for the program grades in Figure 1 would be parallel; the difference between the assessment and no-assessment groups in period 1 would remain the same in periods 2 and 3. Thus, the shaded area above the no-assessment programming performance curve in Figure 1 represents the benefit of time management assessment – the improvement in programming grade achieved by the experimental assessment group.



**Figure 1. Estimated Effect For Periodic Assessment Of Time Management On Programming Performance.**

### Conclusions

Study 1 examined if the grade earned by students on the periodic assessments of class-related activities was related to grades earned on programming projects and exams. The results indicate that student assessment of class activity is significantly correlated with programming but not exam grades. Additional investigation determined that assessment survey questions and student performance could be explained by four underlying components of class activity: program assessment, exam grade expectation, grades earned, and effort (hours) spent on programming. These components may prove useful in the design and development of subsequent assessment survey questions.

The results from Study 2 confirmed that the technique of brief periodic surveys on time management improved student performance on programming projects and on one exam. Given the recent history of CS1 (the typical entry-level Computer Science course) as a course with a high non-pass rate, any such simple, easy-to-apply technique for enhancing student performance is worth considering for much wider application.

These results are initial findings. We have not found other studies examining the assessment of student time management in the college classroom. Therefore, while the results are encouraging, we plan on conducting replication and generalization experiments. We present these results here in the hopes that others may also attempt to replicate, and hopefully extend, our results. With the qualification that these are initial findings, we next proceed to discuss the use of this technique in Computer Science and Engineering courses with the assumption that it is both replicable and generalizable.

A key characteristic of the surveys is that they are brief, which increases the odds that students will actually fill them out without perceiving them to be burdensome. This advantage also extends to the minimal effort required by the course instructor to administer the surveys and collect and analyze the results.

Beyond their primary benefit of quantitatively improving student performance, such surveys could be easily tailored to provide other more qualitative benefits. Study 1 used surveys that asked both quantitative and qualitative questions. For example, they could provide incremental review and preparation for exams. If the papers are collected, evaluated, and returned to the students, they could provide frequent informal feedback to the student on their progress.

One surprising result of Study 2 is that performance on projects generally dropped across periods 1, 2, and 3 (with the exception that performance on projects for the assessment group increased slightly between periods 1 and 2). The best explanation that we can offer is based on personal observation of student behavior near the end of the semester, which most directly impacts grade performance for period 3. Specifically, students encounter so much time pressure from other courses that their level of completeness on the last few submitted projects suffers. In the case of Study 2, this result applies most strongly to projects 8 and 9 during the last 5-week period (period 3). Many students who were more conscientious during periods 1 and 2 only partially completed these last two projects or did not even attempt them. This trend only reinforces our hypothesis that lack of time management skills is a significant contributor to poor student performance. As pointed out earlier, the assessment group was more aware of the time management because of the surveys, and although their performance also dropped during period 3, it dropped far less than the performance of the no-assessment group.

Our results support our original observation that poor time management skills are one factor among many that contribute to poor student performance. The significance of this factor is especially pronounced for courses that require students to work on extended projects outside of class or lab. It is also relevant for courses with a less mature student population like CS1. If we agree that such courses could benefit from explicitly addressing the lack of time management skills among students, then it follows that we need to identify and study further the techniques that are the most effective at teaching these skills. We feel that the assessment survey technique described here has merit and is a worthwhile contribution. The characteristics for this technique that most strongly recommend it are:

1. It is brief
2. It is administered at regular periodic intervals
3. It provides timely feedback about the class's last assessment results either from the perspective of the instructor's expectations, or peer expectations (descriptive statistics of the student's last assessment).

We believe that the surveys are generic, and should therefore be applicable in the Engineering curriculum where there are extended projects, such as lab based or design courses. Readers interested in incorporating assessment techniques into their college classroom should see Angelo and Cross's handbook<sup>9</sup>. Still, we realize that the data reported here need replication to confirm the claim of generality to other courses in other disciplines. The authors plan to take advantage

of a grant program at their institution that is earmarked for proposals that address techniques for improving teaching and student performance. We are interested in applying the technique to other lower division courses with high student attrition rates to find out if this technique is of any value to those courses.

In summary, we conducted two studies examining the use of a brief, periodically administered, assessment of student course activities. Both studies found evidence of an association between assessment and performance. In the first study, we found a significant correlation between the assessment of student course activities and programming grades, but did not find any correlation with exam grades. In the second study, we had students assess their time management of course activities in an experimental group and compared it to a no-assessment control group. There was a significant benefit for all program grades and a significant benefit for one exam grade when comparing the assessment group grades with the no assessment (control) group.

## Bibliography

1. Loomis, K., **Learning Styles and Asynchronous Learning: Comparing the LASSI Model to Class Performance**, Journal of Asynchronous Learning Networks, 4(1), 23-32 pp., 2000.
2. Trueman, M. and Hartley, J., **A comparison between the time-management skills and academic performance of mature and traditional-entry university students**, Higher Education, 32(2), 199-215 pp., 1996.
3. Felder, R.M., Felder, G.N., and Dietz, E.J., **The Effects of Personality Type on Engineering Student Performance and Attitudes**, Journal of Engineering Education, 91(1), 3-17 pp., 2002.
4. Kember, D., Jamieson, Q.W., Pomfret, M., and Wong, E.T.T., **Learning approaches, study time and academic performance**, Higher Education, 29(3), 329-343 pp., 1995.
5. Landis, R., **Studying Engineering: A Road Map to a Rewarding Career**, Discovery Press, 304 pp., 2000.
6. Humphreys, W.S., **Introduction to the Personal Software Process**, Addison-Wesley, 304 pp., 1996.
7. Barnes, G. M., **Comp 432 Assessment Forms**, <http://www.csun.edu/~renzo/pub/asee/assessmentForms.pdf>, 2006.
8. SPSS Inc., **SPSS 14.0 for Windows**, <http://www.spss.com>, 2005.
9. Angelo, T.A., and Cross, K.P., **Classroom Assessment Techniques: a Handbook for College Teachers**, second edition, Jossey-Bass Inc., 427 pp., 1993.

**Appendix A: Assessment Survey 4 from Study 1**

Name: \_\_\_\_\_ MW or W \_\_\_\_\_ COMP 432 Assessment 4

Circle or write the appropriate response. If the question is not applicable write "NA".

I finished the readings in the Squeak book. ( no / yes )

I have read through the following chapters in the C# book.

4      5      6      7      8      9      9+

I worked in a group of two with \_\_\_\_\_ for the project.

The group worked \_\_\_\_\_.  
well, equally sharing work      I did not do my share      partner didn't do their share

Remaining questions referring to group can mean just you if you are working in a group of 1.

Group design for the simulation assignment has \_\_\_\_\_ classes.  
don't know    1 - 5    6 - 10    11 - 15    16 - 20    21 - 25    more than 25

I worked \_\_\_\_\_ hours on the project.

I am \_\_\_\_\_ sure my group's submission was correct and complete on 3/24/04.  
30%      50%      80%    100%

I expect the project to be graded as \_\_\_\_\_.

I am \_\_\_\_\_ confident that I know the material to be covered on the exam.  
30%      50%      80%      100%

I expect to earn a grade of \_\_\_\_\_ on the midterm.

Write a brief comment on how the class and project is going for you, if you want.

**Appendix B: Assessment Survey 6 from Study 1**

Name: \_\_\_\_\_ MW or W \_\_\_\_\_ COMP 432 Assessment 6

Circle or write the appropriate response. If the question is not applicable write "NA".

I have read through the following chapters in the C# book.

8      9      10      11      12      13      14      18      21.serialization

I worked in a group (<= 3) of \_\_\_\_\_ for the second project

Group members were:

The group worked \_\_\_\_\_.  
well, equally sharing work      I do not do my share      partners not doing their share

Remaining questions referring to group can mean just you if you are working in a group of 1.

Group design for roboticLife assignment has \_\_\_\_\_ classes (total count).

I worked \_\_\_\_\_ hours on the project so far (enter a number).

Group project submission is \_\_\_\_\_ complete.

25%      50%      75%      90%      95%      100%

I think a fair/valid assessment of my project to be graded as \_\_\_\_\_.

F      D      C-      C      C+      B-      B      B+      A-      A

I expect to study \_\_\_\_\_ hours for the final.

< 5      5 – 10      11 – 15      16 – 20      20 – 25      25<

I think my final exam grade will be \_\_\_\_\_.

F      D      C-      C      C+      B-      B      B+      A-      A

RoboticLife project was \_\_\_\_\_ as a second project in a 3 unit class.

Easy    ok      difficult / large      very difficult / very large      impossible

So far this class has satisfied \_\_\_\_\_ of my objectives.

10%    25%    33%    50%    66%    75%    85%    90%    95%    100%