



Patterns of Student Effort in General Chemistry

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Abstract

The goals of the study were to determine when students were studying throughout the semester, whether the time spent studying had an effect on course success, what study techniques students were using, and which were most useful, and which course assignments motivated students to study. Data was collected via Qualtrics survey. A notable finding was that the majority of students in Chem 103 reported spending less time studying during the second and third survey weeks compared to the first week. The amount of time spent studying during the three weeks did not correlate with overall course success.

Student Effort and Student Success in Chemistry

Szu, et al Study on Learning in Organic Chemistry¹

- Importance of regular study strategies early in the course
- Positive correlation between early effort and course success
- "Late Starters" did not close the gap in performance even when making greater effort later
- Students who had put in early effort reported studying fewer hours later in the semester than students who delayed

Zone of Proximal Development

- Social learning theory- most learning progress can be made when the content is just at the edge of the students ability to learn the material independently, but can be learned with some support from instructors or informed peers.^{2,3}
- Time lag between content presentation in class and student study would increase the difficulty because the student is more distant from support or scaffolding as time passes

Does Early Study in General Chemistry Predict Exam Success?

- Based on the model of prior study, early study during an ordinary week (no exam) early in the semester would lead to greater success

Math Skill as Predictor of Success

- Research on general chemistry students has shown that Math SAT scores are predictive of success.^{4,5}

Study Design

- Pool chosen from volunteers to balance gender, have a composite ACT Score close to average score for incoming freshman students
- Initial pool included 35 volunteers enrolled in one of two Chem 103 courses.
- Data was complete for 26 students who replied to at least four surveys sent each week during week 3, week 7, and week 10 of the semester.
- Compensation: Gift card at the end of each week
- Survey asked students to report their activities that day, assignments they had coming up, and the time they studied in 15-minute increments.
- Students also completed a modified Motivated Strategies Learning Questionnaire at end of the third week.

References:

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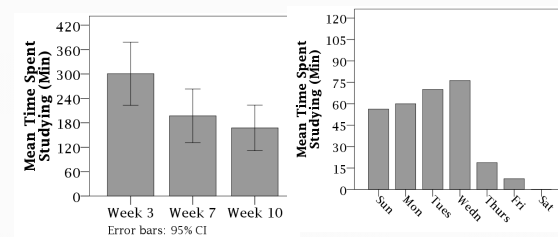
Exam Correlations

Correlation between the hour exams and the final exam was high, with the score on exam 3 being most highly correlated with the final exam score. This result is expected for a typical student pool and series of course exams.

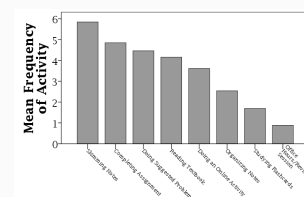
A correlation between Math ACT and exam success was found, confirming the results of prior studies. We also found a correlation between the Composite ACT and exams.

	Pearson Correlation	Significance		Pearson Correlation	sig
Ex 1 vs Ex 2	.744	.000			
Ex 1 vs Ex 3	.534	.005	ACT (Comp) vs Exam 3	.543	.004
Ex 2 vs Ex 3	.595	.001			
Ex 1 vs Final	.745	.000	ACT (Math) vs Exam 3	.442	.024
Ex 2 vs Final	.700	.001			
Ex 3 vs Final	.754	.000			

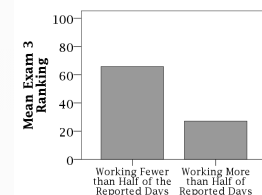
Patterns of Effort-Time



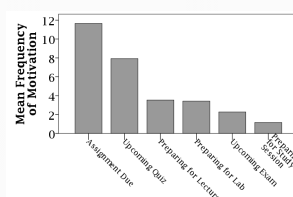
How Students Study



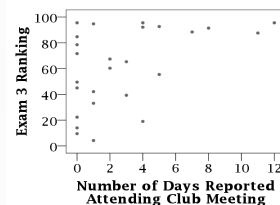
Too Much Work for Pay?



What Prompts Studying?



Extra-Curriculars



Did Study Hours Affect Course Success?

- No correlation between total time studied and exam grades
- No correlation between the study week and the subsequent exam (e.g. study week 1 with exam 1).
- No correlation between the early study week time and later exams. (e.g. study week 1 with exam 2 or 3).

We looked for any relationship between types of studying and exam success, and between motivations for study (assignments worked on) and exam success. None of these showed a clear connection.

MSLQ Results

- Student Motivation was probed with questions on task value (importance of the course) and self-efficacy (how well does a student expect to do in the course)
- Study Strategies were probed with questions on rehearsal, organization, self-regulation, study environment, and effort regulation
- A strong correlation was observed between self-efficacy, meta-cognitive self-regulation, and exam success.

	Pearson Correlation	sig
Self-Efficacy vs. Final Exam	.585	.002
Meta-Cognitive Self Regulation vs. Final Exam	.563	.003

Limitations of the Study

Which weeks are surveyed? The study looked only at ordinary non-exam weeks. How different are study patterns the week before the exam?

Does the response behavior change as a student retakes it? Is the diminishing study time real or due to over-exposure to the survey?

Does the behavior reflect balancing effort between classes? Our survey asked only about chemistry study. Later in the semester, is more time devoted to other classes?

Does the behavior reflect differences in the material in General Chemistry? Chem 103 has two or more main topics in each unit. These topics may draw on different skills, with some more difficult than others.

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