

## Case Study

# Higher Mastery Associated With Better Course Outcomes

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### SUMMARY OF FINDINGS

- Positive relationship between usage and mastery in prepU and student outcomes.
- Students in the high Mastery Level (ML) group had a significantly higher score on each outcome measure than those students in the low ML group

### Course

Foundations of Nursing Practice is a course with both a lecture and clinical component. During fall 2011, 57 students enrolled in the course and used the *Fundamentals of Nursing* (Taylor) textbook along with prepU.

### Course Grading Policies and Assessment

- Four exams (70%)
- Dimensional Analysis test (5%)
- Lab quizzes (5%)
- Foundation HESI as a final exam (20%)

Separate grade for the clinical part of the class:

- Care plan (80%)
- NCLEX Quizzes (10%)
- Journal (10%)

### prepU Implementation

prepU was implemented during the fall semester in the following way:

- a) Five 50-question quizzes in prepU with scores given based on the number of correct responses
- b) Students encouraged to study independently and create their own quizzes in prepU for each chapter assigned for class reading and after class

### Results

Usage data from the 57 students is shown in Table 1. Of the 57 students enrolled in the course, 100% of them took



quizzes in prepU, with an average of 123.9 quizzes and 80,190 total questions answered. The requirements for the course were for students to take five 50-item quizzes (250 items) with scores contributing to the final grade. All students used prepU far above the minimum requirements. On average, students answered 1,407 questions. For the 48 students who completed all requirements, the average number of questions answered was 1,534 and ranged from 580-3,791 ( $SD = 583.3$ ).

Number of Students	57
Students who've taken a quiz:	57 (100%)
Quizzes taken:	7,064
Average number of quizzes: (among those who've taken quizzes)	123.9
Questions answered:	80,190
Average number of questions: (among those who've taken quizzes)	1,407
Overall average class mastery level	3.9

## Course Outcomes

Course outcome data is presented in Table 2. These data include the total number of points earned ( $M = 84$ ,  $SD = 4.83$ ), scores on the entry HESI exams, and other course exams. The entry level HESI is broken into several categories and the two required categories were reading and math. Some students ( $N = 39$ ) completed the A&P portion as well. Of the original 57 students, only 48 completed all requirements and achieved a final grade in the course. Data for the 48 students who completed all requirements were used in the subsequent analyses.

	N	Min	Max	Mean	SD
Entry Level HESI Reading	57	76	98	88.68	6.39
Entry Level HESI A & P	39	32	92	78.05	11.19
Entry Level HESI	57	62	100	88.63	7.25
Entry Level HESI Cumulative	42	55	94	84.67	7.95
Exam1	55	66	100	83.56	7.54
Exam2	53	78	98	87.47	5.63
Exam3	49	64	94	81.92	6.76
Exam4	48	62	88	76.50	7.07
Foundation HESI/Final exam	48	58	100	81.65	8.63
Raw Test Average	48	72	91	82.65	4.86
DA Exam	48	75	700	108.58	87.45
Final Grade	48	72	92	84.00	4.83

## Course Outcomes and Mastery Level Groups

To investigate the relationship between ultimate prepU mastery level (ML) and other course outcomes, the class was divided into two ML groups, high and low. The division was made at the mean of 3.97 rounded to 4. The low ML group had a ML of 4 and below ( $N = 29$ ) and the high ML group comprised all students with a ML of 4.1 and above ( $N = 19$ ). To determine if these two groups were equivalent at the outset, scores on the entry level exams were investigated. Descriptive statistics for the entry level scores for these two groups are shown in Table 3.

	Mastery Level Group	N	M	SD	Std. Error Mean
Entry Level HESI Reading	1.00	29	88.48	6.75	1.25
	2.00	19	91.26	4.28	.98
Entry Level HESI A & P	1.00	23	78.61	8.83	1.84
	2.00	15	77.07	14.69	3.79
Entry Level HESI Math	1.00	29	88.97	5.99	1.11
	2.00	19	87.89	9.72	2.23
Entry Level HESI Cumulative	1.00	24	83.67	7.32	1.49
	2.00	17	86.18	8.99	2.18

Results of an independent samples t-test revealed no significant differences between these two groups at the beginning of the course on any of the entry level HESI exams. Thus we can assume that the groups were equivalent at the start of the course.

Course outcome data were compared between the high and low ML groups (see Table 4).

	Mastery Level Group	N	M	SD	Std. Error Mean
Foundation HESI/Final exam	1.00	29	79.52	8.650	1.606
	2.00	19	84.89	7.731	1.774
Raw Test Average	1.00	29	81.55	4.396	.816
	2.00	19	84.32	5.175	1.187
DA Exam	1.00	29	95.41	7.552	1.402
	2.00	19	128.68	97.11	5.877
Final Grade	1.00	29	82.90	4.601	.854
	2.00	19	85.68	4.796	1.100

Results of a set of independent samples t-tests indicated significant differences in scores on the Foundation HESI/ Final Exam, the raw test average, and the final grade in the course, with no significant differences in scores on the DA exam (see Table 5).

**Table 5: T-test results for high/low ML groups**

Outcome	t-test results
Foundation HESI	$t = -2.194, df = 46, p < .033$
Raw Test average	$t = -1.986, df = 46, p < .05$
Final Grade	$t = -2.019, df = 46, p < .049$

### Within prepU Correlations

Table 6 shows the number of prepU questions answered by each of the two ML groups. Results of an independent samples t-test indicated a significant difference between the number of questions answered by the low ML group ( $M = 1270.1, SD = 339.4$ ) and the high ML group ( $M = 1937.4, SD = 652.1$ ),  $t(46) = -4.65, p = .000$ .

**Table 6: Number of Questions answered in each ML Group**

	ML Group	N	M	SD	Std. Error Mean
Total Number of Questions	1.00 (low ML)	29	1270.10	339.43	63.03
	2.00 (high ML)	19	1937.42	652.06	149.59

A Pearson product-moment correlation coefficient was computed to assess the relationship between the student usage variables within prepU. There was a positive correlation between ML and number of questions answered,  $r(48) = .771, p < .01$ , and also for total number of quizzes taken,  $r(48) = .758, p < .01$  (see Table 7).

**Table 7: Within PrepU correlations**

		Total Number of Quizzes	Total Number of Questions	Final Mastery Level
Total Number of Quizzes	Pearson Correlation	1	.849**	.758**
	Sig. (2-tailed)		.000	.000
	N	48	48	48
Total Number of Questions	Pearson Correlation		1	.771**
	Sig. (2-tailed)			.000
	N			48
Final Mastery Level	Pearson Correlation			1
	Sig. (2-tailed)			
	N			

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

### Course Outcomes and PrepU ML

A Pearson product-moment correlation coefficient was computed to assess the relationship between ML and scores on the course outcomes. There was a positive correlation between ML and final HESI exam score,  $r(48) = .301, p < .05$ . Other course outcomes were not significantly associated with prepU mastery level.

**Table 8: Correlation between ML and Final HESI exam score**

		Foundation HESI/Final exam	Mastery
Foundation HESI/Final exam	Pearson Correlation	1	.301*
	Sig. (2-tailed)		.038
	N		48
Mastery	Pearson Correlation		1
	Sig. (2-tailed)		
	N		

One possible reason for the non-significant correlation between the final grade the raw test average and ML is that the range of scores was narrow, with a small standard deviation, see Table 8 below. There was, however, a significant positive correlation between final HESI score and final grade,  $r(48) = .733, p < .001$ .

**Table 9: Student Course Outcomes**

	N	Min	Max	M	SD
Final Grade	48	72	92	84.00	4.83
Raw Test Average	48	72	91	82.65	4.86
Foundation HESI/Final exam	48	58	100	81.65	8.63

### Regression Analysis

A linear regression established that final prepU ML could statistically significantly predict scores on the HESI final exam given in this course,  $F(1, 46) = 4.577, p < .05$ . Final prepU ML accounted for 7.1% of the explained variability in HESI final exam score which is a small/medium effect size according to Cohen's (1988) classification. The regression equation was: predicted HESI final exam score =  $65.486 + 26.558 \times (\text{Mastery Level\_Log}10)$ .

The predicted score on the HESI final exam can be calculated by inserting different mastery levels into the regression equation. For example, a student with a mastery level of 6 would be predicted to receive 86.15 on the HESI final exam (see Table 10 for a complete list of predicted total points based on this analysis). Mastery levels were transformed into log<sub>10</sub> to better fit the regression parameters of normality.

**Table 10: Predicted HESI Final Exam based on Mastery Level**

ML	Predicted HESI Final Score
1	65.49
2	73.48
3	78.16
4	81.48
5	84.05
6	86.15
7	87.93
8	89.47

The linear regression analysis between number of questions and final HESI score was not significant.

### Additional Instructor Comments

Professor Seal is a nursing instructor at Tyler Junior College, Texas. She has been using prepU as an integrated part of her course for two semesters. Additional comments from Professor Seal regarding prepU usage in her Foundations of Nursing Practice course are below:

### Student Feedback

This is the second semester that we are using prepU and we have received lots of feedback. Students feel that prepU really helps them prepare for tests. I have been using some of the questions from prepU on my exams. I chose some and then make them Private Reserve so students can't see them. But still students who use prepU will have seen similar questions and so they feel better prepared when they get to the exams.

### Student Attrition

In terms of attrition, last semester, which was the first time we used prepU, we had the fewest students drop the class since I have been here. I see the students have a more positive attitude toward the class and there is much less negativity. I feel the response from students is good.

### Learning Important Concepts

I think that answering questions in prepU helps students figure out the important concepts in the book. We have a huge textbook and it can be really overwhelming.

### Student Usage

We required students to use prepU as we had assignments built into the system, but they use it more than I thought they would—way above and beyond my expectations. Some of my students are actually still using it. When I looked at the *How is My Class Doing?* page for the fall 2011 students, there were 8/58 students still using it in January/February of 2012.

### Conclusion

prepU was used in Foundations of Nursing Practice both as an independent study tool for students and also as an integrated part of the course (with results from two quizzes making up a portion of the final grade). Usage for all students far exceeded the minimum course requirements and for the students who completed the course, the average number of prepU questions answered was 1,534. To further investigate the impact of prepU mastery level on course outcomes, students were divided into two ML groups (high and low). Entry level data indicated no significant differences between these groups at the start of the course, thus the two groups can be seen as equivalent at the outset with any differences at the end of the course attributable to some feature of the course. When course outcome data were

analyzed for students in high/low mastery level groups, the results revealed significant differences between the high and low mastery groups on 3 of the 4 course outcomes. Thus we see that students with a ML of 4.1 and above scored significantly higher on 75% of the course outcomes than did those students with a ML of 4 and below. Looking to determine if ML could be used as a predictor of student performance in this course, we conducted a regression analysis. Results of the analysis established that mastery level in prepU could be used, in this course, to predict a student's final HESI exam score. Regression analyses did not yield a significant impact of the number of questions answered in prepU and the other final course outcomes, although there was a significant positive correlation between final HESI score and final grade, so clearly the variables can be looked at together to get a picture of the predicted student course outcome.

The positive relationship between prepU mastery level and course outcomes is encouraging. Students in this course were not distinguishable on their pre-course/entry level measures, and yet after using prepU to practice and master course content, those who were more successful (achieved a higher level of prepU mastery) were more likely to have higher scores on the course outcomes and receive a higher grade in the course. The predictive nature of prepU mastery level has potential for instructor use in terms of encouraging students to increase their prepU mastery level—and in turn their course outcomes.

These data will prove useful when discussing the potential benefits of practicing and mastering course content within prepU.