Supporting Information for

Implementation and Evaluation of an Adaptive Online Summer Preparatory Course for General Chemistry: Whom Does it Benefit?

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Table S1. Course Key

Course Abbreviation	*Course Description*
CHEM 1001 = GC1-nonM	General Chemistry 1 (includes mostly non-majors)
CHEM 1002 = GC2-nonM	General Chemistry 2 (includes mostly non-majors)
CHEM 1013 = GC1-M	General Chemistry 1 for majors
CHEM 1014 = GC2-M	General Chemistry 2 for majors
CHEM 2111 = OC1-nonM	Organic Chemistry 1 (includes mostly non-majors)
CHEM 2112 = OC2-nonM	Organic Chemistry 2 (includes mostly non-majors)
CHEM 2113 = OC1-M	Organic Chemistry 1 for majors
CHEM 2114 = OC2-M	Organic Chemistry 2 for majors

Table S2. Breakdown of ALEKS preparatory module, Summer 2018.

Sub-Module	***Sub-Module Topic***	***Number of Topics***
Math and Physics		40
	Math	12
	Algebra	15
	Linear Equations	1
	Quadratic Equations	1
	Graphing Equations	2
	Graphing Equations	2
	Electrostatics	7
Measurement		23
	Scientific Notation	6
	SI Units	5
	Measurement Math	3
	Measurement Uncertainty	5
	Problem Solving	4
Matter		17
	Mass, Volume, Density	7
	Atomic Theory	4
	Chemical Elements	6
Atoms and Ions		9
	Atomic Structure	4
	Ions	5
Chemical Compounds		16
	Chemical Formulas	3
	Binary Ionic Compounds	3
	Polyatomic Ions	4
	Names of Compounds	6
Stoichiometry		20
	Moles and Molar Mass	10
	Chemical Equations	4
	Solution Stoichiometry	6
Basic Reactions		6
	Precipitation Reactions	2
	Acid-Base Reactions	2
	Oxidation-Reduction	2
Gases		6
	Gas Laws	6
TOTAL		**137**

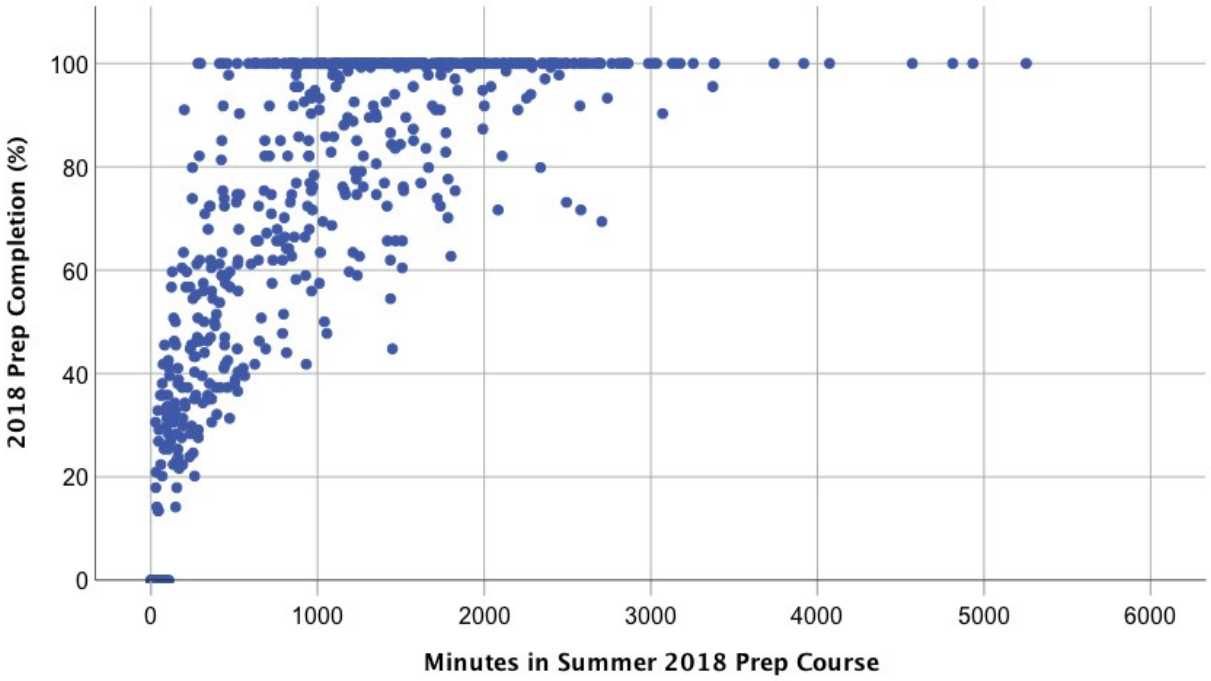
Table S3. Descriptive statistics for the ALEKS learning rate (topics per hour) for two student cohorts based upon prep module completion.

Key	*N*	*Mean*	*SD of mean*	*Skewness*	*SE of Skewness*	*Kurtosis*	*SE of Kurtosis*
Partial Completion	395	12.2	11.3	2.63	0.12	9.50	0.25
Full Completion	360	6.2	3.5	2.46	0.13	9.77	0.26

Table S4. Pearson Correlations of Course grades with PQPA and PM completion.

		PQPA	PM Completion	Grade 1001	Grade 1002	Grade 2111	Grade 2112
PQPA	Pearson Correlation	1	0.456	0.585	0.543	0.377	0.371
	Sig. (2-tailed)		<0.001	<0.001	<0.001	<0.001	<0.001
	N	578	578	517	381	223	170
PM Completion	Pearson Correlation	0.456	1	0.496	0.478	0.373	0.420
	Sig. (2-tailed)	<0.001		<0.001	<0.001	<0.001	<0.001
	N	578	578	517	381	223	170
Grade 1001	Pearson Correlation	0.585	0.496	1	0.748	0.551	0.519
	Sig. (2-tailed)	<0.001	<0.001		<0.001	<0.001	<0.001
	N	517	517	517	375	215	161
Grade 1002	Pearson Correlation	0.543	0.478	0.748	1	0.627	0.648
	Sig. (2-tailed)	<0.001	<0.001	<0.001		<0.001	<0.001
	N	381	381	375	381	193	148
Grade 2111	Pearson Correlation	0.377	0.373	0.551	0.627	1	0.775
	Sig. (2-tailed)	<0.001	<0.001	<0.001	<0.001		<0.001
	N	223	223	215	193	223	168
Grade 2112	Pearson Correlation	0.371	0.420	0.519	0.648	0.775	1
	Sig. (2-tailed)	<0.001	<0.001	<0.001	<0.001	<0.001	
	N	170	170	161	148	168	170

Figure S1. Preparatory course completion % vs. minutes spent for students enrolled in the summer 2018 preparatory course.



SUMMER PREP COURSE FOR GENERAL CHEMISTRY: QUICKSTART GUIDE

Are you enrolled in general chemistry at Marquette for Fall 2018? Welcome to the 2018 summer prep course!

What is the prep course?

This year we are using the ALEKS program to host a free, online prep course for all students taking general chemistry courses in the fall. The prep course is designed to help prepare you for college-level chemistry.

Do I have to complete the prep course? What do I receive if I complete the course?

You are not required to complete the course. However, not only will it prepare you for general chemistry, all instructors have agreed to count completion of the prep course as a small portion of the fall course grade.

How long will it take me to complete the prep course? When is the prep course due?

The ALEKS program performs an initial assessment of your knowledge across the selected topic areas, as described fully below. The time needed to complete the course will depend upon this assessment – the median time is around 20 hours. **The course will close on Sunday, September 9th, 2018 at 11:59 pm.**

What is ALEKS?

Assessment and **LE**arning in **K**nowledge **S**paces is a Web-based, artificially intelligent assessment and learning system. ALEKS uses adaptive questioning to quickly and accurately determine exactly what a student knows and doesn't know in a course. ALEKS then instructs the student on the topics she is most ready to learn. As a student works through a course, ALEKS periodically reassesses the student to ensure that topics learned are also retained. ALEKS courses are very complete in their topic coverage and ALEKS avoids multiple-choice questions. A student who shows a high level of mastery of an ALEKS course will be successful in the actual course she is taking.

ALEKS also provides the advantages of one-on-one instruction, 24/7, from virtually any Web-based computer for a fraction of the cost of a human tutor.

Do I need to purchase access? What does it cost?

No. Your instructor has arranged for use of this powerful software at no charge this term.

How do I log-in?

1) Go to www.aleks.com

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2018 Summer Preparatory Course Survey

Start of Block: Prep Course Survey

Q1 This survey concerns the ALEKS preparatory course offered in summer 2018. You are being invited into the survey because you were invited to participate in that course. All data collected from the survey will be used in aggregate form, and all responses are anonymous. By selecting yes below, you consent to allow your responses to be used in our analysis.

- ○ Yes, I consent to participate. (Survey will start) (1)
- ○ No, I do not wish to participate. (Survey will end) (2)

Skip To: End of Survey If This survey concerns the ALEKS preparatory course offered in summer 2018. You are being invited i... = No, I do not wish to participate. (Survey will end)

Q2 Section 1: Participation in the 2018 ALEKS Preparatory Course

If you can recall, approximately what percentage of topics in the summer preparatory course did you complete?

- ○ All: 100% (1)
- ○ Most: at least 50%, but not 100%. (2)
- ○ Some: less than 50%. (3)
- ○ None: I did not complete any topics. (4)
- ○ I do not remember or do not wish to answer. (5)

Q3 If you did not attempt or did not complete the preparatory course, which of the following factors (if any) played a role? (Select all that apply)

- [ ] The preparatory course was too difficult. (1)
- [ ] I did not have time to complete the course due to other activities (work, etc.) (2)
- [ ] I did not need to complete the prep course, as I was already well prepared for college level chemistry. (3)
- [ ] I did not wish to participate. (4)
- [ ] I did not have access to resources needed to complete the course. (5)
- [ ] Other (please explain) (6) _____

Q4 This question concerns your experience with the summer 2018 preparatory course. For each statement, rank your level of agreement, from strongly agree to strongly disagree.

	Strongly Agree (1)	Slightly Agree (2)	Neither Agree nor Disagree (3)	Slightly Disagree (4)	Strongly Disagree (5)
The summer preparatory course helped prepare me for CHEM 1001. (1)	○	○	○	○	○
The range of topics in the preparatory course well matched the topics covered in CHEM 1001. (2)	○	○	○	○	○
The explanations given in ALEKS were helpful. (3)	○	○	○	○	○
Looking back, I wish that I had spent more time in the preparatory course. (4)	○	○	○	○	○
Having access to an instructor through virtual office hours would have been beneficial in completing the prep course. (5)	○	○	○	○	○
I would recommend a summer prep	○	○	○	○	○

course to future CHEM 1001 students. (6)					
The summer prep course helped me in my subsequent chemistry courses following CHEM 1001 (i.e., CHEM 1002, 2111, or 2112). (7)	○	○	○	○	○

Q5 Section 2: Basic Demographic Data

Please answer the following demographic questions.

What is your current major at Marquette?

- ○ Biomedical Sciences (1)
- ○ Biology (2)
- ○ Biochemistry or Chemistry (3)
- ○ Engineering (any major) (4)
- ○ Heath Sciences (other than Biomedical Sciences) (5)
- ○ Other (6)

Q6 How would you identify your gender?

- Male (1)
- Female (2)
- Non-binary (3)
- Prefer not to answer (4)

Q7 How would you identify your ethnicity?

- Asian (1)
- Black/African (2)
- Caucasian (3)
- Hispanic/LatinX (4)
- Native American (5)
- Pacific Islander (6)
- Other (7)
- Prefer not to answer (8)

End of Block: Prep Course Survey