

Master of Science in Applied Life Sciences Outcomes

The MS program is a two-year degree program. Most students enter the MS program during its second year, after completing the one year Postbaccalaureate Premedical Certificate (PPC) at KGI, and most course work for the PPC program can be applied for credit for the MS degree. We have also had a small number of Master of Business and Science (MBS) students switch into the MS program, sometimes after deciding to pursue a PhD. As of 2017, we have not offered direct admission into the MS program.

Program Learning Outcomes

1. Students can communicate effectively in an industry environment composed of scientists, engineers, and business professionals.
2. Students can contribute productively on an interdisciplinary team tackling complex problems.
3. Students understand the business, research and development, regulatory, production, and marketing functions of the bioscience industry.
4. Students understand the translation of basic science and engineering discoveries into products and processes, which benefit society.
5. Students adhere to ethical principles in research, development and business issues inherent in the bioscience industries.

Program learning outcomes and evidence used to evaluate student learning on the program are described in table 1. We used the general MS assessment plan to select these assignments, which cover the five program learning outcomes. Whenever possible we selected assignments assessed through rubrics that contained standards directly linked to program learning outcomes. However, with regards to program learning outcomes 3 and 4, which focus primarily on understanding graduate level scientific concepts, we relied primarily on exam grades. Rubrics generally used a scoring system focused on the categories “exceptional”, “proficient”, “emerging”, and “unacceptable.” For exams, scores in the 90 to 100 percent correct range were coded as “exceptional”, “80 to 89” as



“proficient”, “70 to 79” as “emerging” and scores below 70 as “unacceptable.”

The MS program does not have a capstone project taken by all students. While students do complete a MS Thesis (introduced during the 2016-17 academic year), and others complete the Team Masters Project, many students on the program complete the degree through coursework alone. To compensate for the lack of a required capstone that can be used to demonstrate mastery of program learning outcomes, we have generated aggregate scores across assignments used to assess student learning across each learning outcome, and used this data as a proxy for obtaining mastery.



Program Learning Outcome	Assignment	Assessment Method
<p><i>1. Students can communicate effectively in an industry environment composed of scientists, engineers, and business professionals</i></p>	ALS 320 Medical Diagnostics Writing Assignment	Rubric – Overall Grade
	ALS 321 Medical Device Engineering – Project Report	Rubric – Overall Grade
	ALS 321 Medical Device Engineering – Project Presentation	Rubric – Overall Grade
<p><i>2. Students can contribute productively on an interdisciplinary team tackling complex problems</i></p>	ALS 320 Diagnostics – Industry Team Report	Rubric – Overall Grade
	ALS 320 Medical Diagnostics – Product Development Team Report	Rubric – Overall Grade
	ALS 321 Medical Device Engineering – Project Team Report	Rubric – Overall Grade
<p><i>3. Students understand the business, research and development, regulatory, production, and marketing functions of the bioscience industry</i></p>	ALS 301 Quiz Average	Average Grade (3 Quizzes)
	ALS 320 Medical Diagnostics – Quizzes	Average Grade (3 Quizzes)
	ALS 321 Medical Device Engineering – Final Exam	Exam – Overall Grade
	ALS 333 Pharmaceutical Development – Final Exam	Exam – Overall Grade
<p><i>4. Students understand the translation of basic science and engineering discoveries into products and processes, which benefit society.</i></p>	ALS 321 Medical Device Engineering – Final Exam	Exam – Overall Grade
	ALS 333 Pharmaceutical Development – Final Exam	Exam – Overall Grade
<p><i>5. Students adhere to ethical principles in research, development and business issues inherent in the bioscience industries</i></p>	ALS 341 Bioethics – Essay	Rubric (Content, Strength of Analysis, Originality)
	ALS 341 Bioethics Final Exam	Exam – Overall Score



Learning Outcomes

Students are assessed regularly throughout the curriculum, as described in table 1 (above). The aggregate results are described in figure 2. Overall, student learning on the MS program has been outstanding. Over half of all assessed scores across all assignments were marked as “excellent” on rubrics or exam grades, and unacceptable grades were rare (only 2 across all assignments).

The evidence also suggests that virtually all students achieve mastery of all five program learning outcomes. Across all students, only one student received an “emerging” score on any aggregate assessment category. In both cases, this was caused by the student receiving a “C” grade in writing and project assignments for the ALS 320 Medical Diagnostics course.

Evidence of student learning is strong in the core science areas of the program (program learning outcomes 3 and 4). In both areas over 40% of all students achieved “exceptional” scores on learning, and all other students demonstrated proficiency.

MS students scored particularly well on communication and teamwork oriented program learning outcomes (PLOs 1 and 2). In both areas aggregate scores were in the “exceptional” range for over 80% of students. Achieving excellence in communication and teamwork is generally seen as important in most professional fields, but especially medicine, where most of KGI’s MS students are looking to enter. In this regard, the KGI faculty are encouraged that the MS program is preparing future doctors to have outstanding skills in these areas.

Overall, the KGI faculty is satisfied that strong evidence of student learning exists across all program learning outcomes within the Master of Science program. While this review only focused on direct evidence of learning, indirect evidence also suggests that the program is producing excellent outcomes. Over the last 3 years 85% of students that graduated from KGI’s premedical certificate program (from which most MS students matriculated) have gained acceptance into medical schools. While we have not conducted a targeted analysis for the MS program, anecdotal evidence suggests that most if not all, MS students are achieving their

career goals. Additional evidence of the program's success is that the graduation rate has been consistently high at 100% as shown in table 2, below.

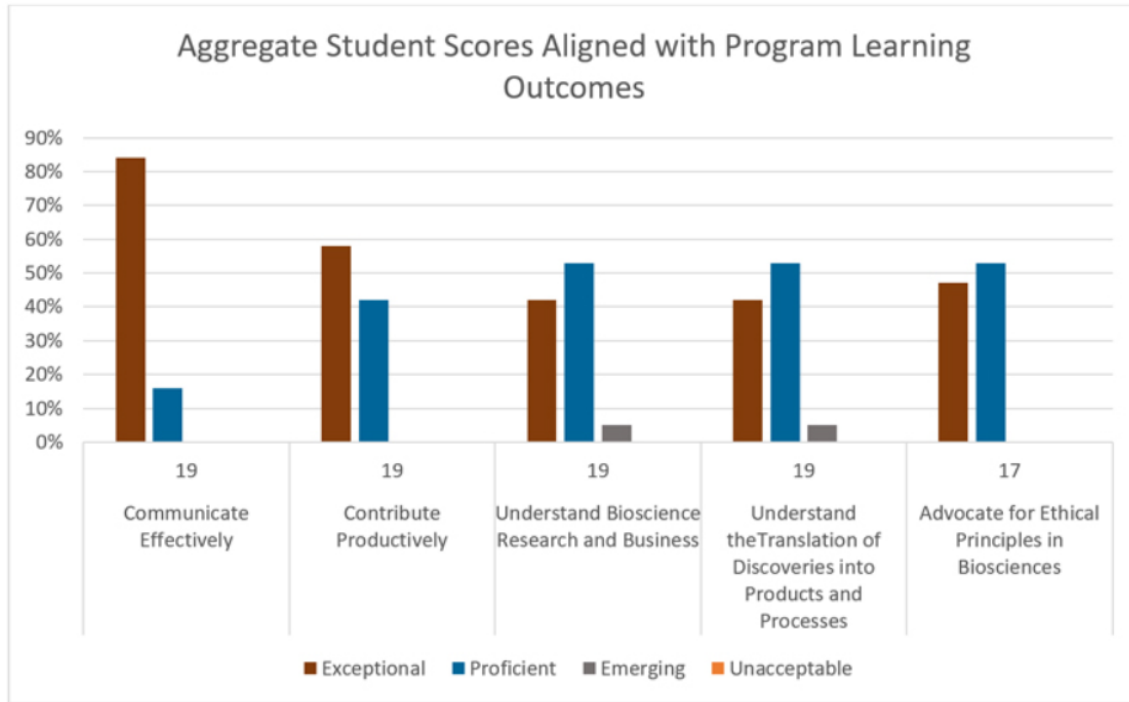


Figure 1: Aggregate student scores upon completing the MS core curriculum

Graduation Statistics

Table 2: MS Graduation rates (2011-2017)

MS (PPC – MS)				
Starting Year	Initial Enrollment (Total)	On Time Graduation Rate (Male)	On Time Graduation Rate (Female)	Total On Time Graduation Rate
2011-12	2	1/1	1/1	100%
2012-13	9	5/5	4/4	100%
2013-14	3	2/2	1/1	100%
2014-15	9	4/4	5/5	100%
2015-16	14	9/9	5/5	100%
2016-17	17	8/8	9/9	100%
			Six Year Graduation Rate	100%