SAINT LOUIS UNIVERSITY

Program-Level Assessment: Annual Report

Program: MS Applied Analytics and Post Baccalaureate Certificate in Applied Analytics	Department:
Degree or Certificate Level: Master's	College/School: School for Professional Studies
Date (Month/Year): June 2020	Primary Assessment Contact: Srikanth Mudigonda

In what year was the data upon which this report is based collected?

2019 Fall; 2020 Spring

In what year was the program's assessment plan most recently reviewed/updated?

2020

1. Student Learning Outcomes

Which of the program's student learning outcomes were assessed in this annual assessment cycle?

The learning outcome assessed during this cycle is, *Graduates will be able to implement analytics systems that facilitate context-appropriate decision making.*

2. Assessment Methods: Student Artifacts

Which student artifacts were used to determine if students achieved this outcome? Please identify the course(s) in which these artifacts were collected. Clarify if any such courses were offered a) online, b) at the Madrid campus, or c) at any other off-campus location.

The students' final projects from a subset of the "regular" courses that address this learning outcome and the final (i.e., implementation part) credit hour(s) of the master's research project AA 5950 (which is part of the old curriculum) or AA 5963 (which is part of the new/revised curriculum) will be used in assessing this outcome.

Note that the program underwent two revisions one in 2017, following a program self-study, and anothere in Spring 2020, based on changing market conditions. The immediate curricular revisions made in light of these revisions involved the courses AA 5000, AA 5300, and the master's research project sequence. So artifacts from these courses will be used in this assessment cycle. Changes to the other courses that also address this outcome, AA 5800 AA 5100 and AA 5750, will be made during AY 2020-2021, so artifacts from these courses will be excluded from the current cycle's assessment.

The program is offered in an entirely online format, so each course in the program is offered in an entirely online format.

3. Assessment Methods: Evaluation Process

What process was used to evaluate the student artifacts, and by whom? Please identify the tools(s) (e.g., a rubric) used in the process and include them in/with this report.

Rubrics that were used for evaluating the final projects of the students were used in assessing the learning outcomes. In addition, data from end-of-course evaluations by the instructor of the courses, along with exit interviews of graduating students is also used.

4.Data/Results

What were the results of the assessment of the learning outcomes? Please be specific. Does achievement differ by teaching modality (e.g., online vs. face-to-face) or on-ground location (e.g., STL campus, Madrid campus, other off-campus site)?

In the case of AA 5000, out of 14 students taught during Spring 1 and 2 terms, 10 did very well, 2 did fairly, and 2 struggled with the data analysis project, which is one of a set of two projects (the other, which is a conceptual report, is used as an artifact for a different learning outcome, so is not considered here). Looking at the performances of the students, and combining these data with the experiential data (the program director taught this course during both terms), it appears that students who did well were those who sought help (after having put in substantial efforts to solve their problems by themselves) when needed, participated actively in the live sessions, Q+A discussion forums on Blackboard, in addition to emailing and having one-one sessions with the instructor as needed. Those who did not do well had challenges related to programming-related to self-efficacy ("May be this program is not for me, since don't think I can understand programming"), time-management, and challenges at work (e.g., COVID19 was just beginning to disrupt the lives of students during Spring 1 term, towards the end, and caused quite a bit of chaos during the Spring 2 term).

In the case of AA 5300, out of 13 students, 9 students' data analysis projects were done exceptionally well, 3 were done with some areas of weakness, and 1 student did not complete the project (requested a course extension, owing to health- and work-related reasons). Their difficulties arose from a certain lack of fluency with the R statistical programming environment on the one hand, and in a couple of instances, with understanding how predictive modeling is different from inferential modeling in its goals, and therefore in the way models are fit to the data and how they are assessed. Upon discussing their difficulties, it became apparent that they did not spend enough time studying the materials or watching the video lectures. Once they started doing this, their performance improved. One student continued performing poorly despite the instructor's multiple efforts to help. The one student who sought and received a course extension was from a different academic degree, taking the course as an elective. This student, while having the requisite statistical background, lacked the needed programming background, so when challenges related to health and work-related travel arose, this lack of programming fluency delayed his ability to keep up.

In the case of the final credit hour/hours (1 credit, in the case of the revised curriculum, and 3, in the case of the previous curriculum) of the master's research project (MRP), data in the form of final project deliverables, presentations, and exit interviews were used to assess the current learning outcome. Here, data from the Fall and Spring semesters (Fall 2, Spring 1, 2) was used. There were 16 students who have finished their master's research project. Here are the key findings:

1. Our students come from a wide variety of professional backgrounds. Of the 16, 13 students' projects involved a problem from their organization that they addressed via their MRP. The remaining three, due to constraints by their organization or because of their own interests, chose to work on projects in the public domain.
2. 14 of the 16 projects involved students learning and applying concepts that were not formally covered in the curriculum. These usually were in the category of methods of data analysis

and/or in presentation of the outputs and interpretations in the form of an interactive tool to aid decision-making. The other 2 projects involved a synthesis of several concepts covered across the curriculum, in performing in-depth analyses of data and presenting the results, along with their interpretation, in a detailed report.

3. All 16 projects' deliverables included written reports, visualizations, if appropriate interactive decision-making tools (with associated source code), and where feasible, data.
4. Exit interviews of the students showed a strong consensus opinion that the program has been very helpful to them in acquiring knowledge and skills that they can apply, and in several instances have already been applying, in solving their organization's problems. The 14 students mentioned earlier also indicated that the program gave them a foundation and confidence that allowed them to learn newer sets of analytical techniques, tools, methods of research, to solve problems in a self-directed way. The more technically-oriented students indicated a desire for more technical content in the program (11), while others said that they were more than satisfied with the technical depth of the program. One student mentioned that she did not see herself as a hands-on analytics professional (she is at the VP level in her organization), but following what she learned in the program, she can now work both in a decision-maker role and, as and when needed, work alongside the technical staff to help them as needed ("though not as a full-time programmer!").

5. Findings: Interpretations & Conclusions

What have you learned from these results? What does the data tell you?

The lessons learned from the data related to AA 5000 are:

1. Since this is the first course students take in the program, providing an "on-ramp" in the form of a short orientation module, to be completed before the core begins (at no monetary cost to the students) may be helpful. Such an orientation can be part of the on-boarding set of activities, helping, in particular those with a bit of anxiety related to statistics and programming.
2. The fact that a vast majority of students from the most recent two terms when AA 5000 was offered, have done well, despite having little to no programming background prior to the start of the course may be seen as evidence that the choice of teaching materials, methodologies, software, and pace of coverage are suitable for the majority of the students. Of course, these can, and should, be improved continually, taking into account the changes occurring in both industry, and in academia in terms of innovative approaches to teaching statistics and programming.

The lessons learned from data related to AA 5300 are:

1. Provide students with resources that will allow them to maintain fluency or acquire fluency in the programming and statistical concepts that are prerequisites for this course.
2. Increase the use of "automation" libraries that allow the tedious parts of programming to be simplified, so that students can focus more understanding the concepts more deeply and interpreting the results more meaningfully, instead of being bogged down in the programming-related details.

The lessons learned from data related to the MRP are:

1. Overall, over the course of its curriculum, students appear to be acquiring knowledge that helps them professionally, and in several instances, in applying it almost simultaneously in their professional roles.

2. The choice of coursework appears to create confidence and improve perceptions of self-efficacy among students, helping them in learning how to learn, and thus continue their progress in the field of analytics.

3. There are areas that require improvement, specifically in terms of providing students the resources needed to obtain and maintain fluency in analytics-related concepts, techniques, and technologies. These resources should cover various levels of advancement, starting with the on-boarding of the students, and continuing all the way through the MRP, and perhaps even beyond.

6. Closing the Loop: Dissemination and Use of Current Assessment Findings

A. When and how did your program faculty share and discuss these results and findings from this cycle of assessment?

Data were collected by the program director directly, in his role as the instructor of the courses used in this assessment. The other courses associated with this learning outcome will be used in data collection and analysis in the next assessment cycle, since they would be revised during the cycle (AY 2020-2021) as part of the revisions made to the MS Analytics curriculum (which is 33 credit-hours long), since its change from the erstwhile MS Applied Analytics curriculum (which is 36 credit-hours long).

B. How specifically have you decided to use findings to improve teaching and learning in your program? For example, perhaps you've initiated one or more of the following:

Changes to the Curriculum or Pedagogies	• Course content • Teaching techniques • Improvements in technology • Prerequisites	• Course sequence • New courses • Deletion of courses • Changes in frequency or scheduling of course offerings
Changes to the Assessment Plan	• Student learning outcomes • Student artifacts collected • Evaluation process	• Evaluation tools (e.g., rubrics) • Data collection methods • Frequency of data collection

Please describe the actions you are taking as a result of the findings.

A key constraint associated with any changes is that the program has undergone a change in its name (which is nominal, in order to stay visible in the higher education market, based on recommendations made by an education consultant hired by SLU) and its curriculum (reduced to 33 credit-hours from 36, once again to stay current with other analytics and related programs across the US). This constraint requires a re-envisioning of the focus of the program and implementing revisions across several courses. As part of this process, taking into account the data collected thus far, we intend to make the following changes to the curriculum:

- provide additional resources to aid students improve and retain their fluency of concepts related to programming, statistics, and other related aspects of analytics
- integrate these resources in a purposeful way into various courses in the curriculum (e.g., AA 5000, 5221, 5222/5223, 5300, 5750, 5800, 5100, and 5200), and the MRP sequence (AA 5961, 5962, 5963)

Relatedly, it would be useful to prioritize the sequence in which the learning outcomes are assessed. Those that tend to relate to those parts of analytics that change more rapidly, would require more frequent evaluation, to ensure that the curriculum is current and is providing the necessary knowledge and skills to our students to remain competitive in their professions. As such, in the next assessment cycle, too, the current learning outcome will be assessed, taking

into account data from both the current courses and AA 5100, 5200, 5750, and 5800. This will allow us to determine whether any changes are required in those courses to improve upon the change initiated in the current academic year.

If no changes are being made, please explain why.

7. Closing the Loop: Review of Previous Assessment Findings and Changes

A. What is at least one change your program has implemented in recent years as a result of assessment data?

The MS Applied Analytics program underwent changes in the past couple of years (described earlier in this document) due to which, the assessment during this cycle prioritized a specific learning outcome that is of relatively higher importance to our students. In particular, following the experience of teaching AA 5300 in Summer 2019, and of AA 5000 that was taught in Fall 1, 2019, minor changes were made to the learning materials, software used, and evaluative components. These courses have been included, along with the MRP courses as sources of data for assessing the current learning outcome. It appears, based on the results of assessment using the data from these courses, that the revised version of AA 5000 was well received. It remains to be seen how the students who have progressed in the curriculum will perform in their future coursework for which AA 5000 is a pre-requisite.

A minor change in AA 5300, where a library was introduced to reduce the amount of programming needed while fitting predictive models, appears to be received well. In a future revised version of this course, a greater emphasis will be placed on using this library, so that students can focus to a greater degree on the deeper details of predictive modeling, by using the time they have saved through the automation that this program library facilitates. So in the next assessment cycle, these two courses will be included once again, alongside the entire set of other courses, to evaluate the current learning outcome once again, for reasons mentioned in response to the previous question.

B. How has this change/have these changes been assessed?

The changes are being assessed and reported in the current assessment period, as described earlier.

C. What were the findings of the assessment?

Please see part A above.

D. How do you plan to (continue to) use this information moving forward?

Please see part A above.

IMPORTANT: Please submit any assessment tools and/or revised/updated assessment plans along with this report.