Data Science and Applied Statistics MS (MDSAS)

Program Mission Statement

Mission Statement (Full Description):
To produce graduates who are proficient in statistical methods while at the same time are trained in topics such as accessing and querying databases, preprocessing data, the use of SAS and other statistical software, and data mining that are necessary tools of today's data analysts and will prepare our students to go directly into the workforce as data analysts.

Does your program offer courses at an off-campus instructional site (not at SMU Dallas campus)?:
No

Does your program offer courses through distance education technology (e.g., asynchronous, synchronous, or both)?:
No

During which academic year were students first enrolled in this program?:
Prior to AY2021-2022

Progress:
Complete

Software Skills

Step 1A: SLO Number:
1

Step 1C: SLO Statement (Full Description):
Students will gain proficiency in statistical computing and database query. Graduates will be able to use major statistical software, i.e. SAS, Python, and R.

Step 2A: Measure:
SAS, Inc. regularly offers certification exams as a way for statistical programmers and data analysts to credential themselves in the use of SAS. Such certifications are positive additions to a student's resume. MASDA students will sit for the SAS base programming at the conclusion of STAT 6307.

Attached Files
Assessment 2023_2024 SAS Exam results.xlsx

Step 2B: Type of Measure (check all that apply):
Objective Quiz or Exam

Step 2C: Is Measure direct or indirect?:
Direct

Step 3A: Target for Measure:
At least 70% of the students will pass these exams on the first or second attempt.

Step 4A: Was the target met for this Measure?:
Met

Step 4B: Results and Findings for this Measure:
Out of five MASDA students who took the SAS exam in Fall 2023, four passed. (See supporting documentation.) This yields an 80% pass rate, which met our minimum goal of 70%. Last year we fell short (60%), so this increase in performance is encouraging. However, we should keep in mind that this relatively small sample size of 5 can result in higher sampling error than in the past. The upcoming academic year (2024-2025) will see a larger class size in STAT 6307 because of increasing MASDA numbers so more stable information will be available in next year's assessment report.

Step 4C: Interpretation of Results:
As stated above, out of five MASDA students who took the SAS exam, four passed. This yields an 80% pass rate, while our goal is 70%. This goal achievement is encouraging, especially since there was a change in instructor for this this class. Last year, we did not meet the goal (only 60%), but in the previous year, 9 out of 11 (81%) passed the exam. As mentioned, the academic year 2024-2025 will have a larger sample size which will result in more accurate measurements.

It is noteworthy that in this academic year, the course was taught by a different instructor who did use the same course structure as last year's instructor, so no change has taken place in the delivery of the class. To expand on that, given the high success rate in recent years (except for last year), there was no obviously clear reason to make any significant changes yet so no action plan was in place.

Step 5A: Use of Results for Seeking Improvement (Action Plan):
As stated above, out of five MASDA students who took the SAS exam, four passed. This yields an 80% pass rate, while our goal is 70%. This goal achievement is encouraging, especially since there was a change in instructor for this this class. Last year, we did not meet the goal (only 60%), but in the previous year, 9 out of 11 (81%) passed the exam. As mentioned, the academic year 2024-2025 will have a larger sample size which will result in more accurate measurements.
In this academic year, the course was taught by a different instructor who used the same course structure as last year's instructor, so no change has taken place in the delivery of the class. To expand on that, given the high success rate in recent years (except for last year), there was no obviously clear reason to make changes yet so no action plan was in place.

For these reasons along with the fact that we met the goal again this year, no changes will take place in this upcoming academic year. If we see pass rates fall below 80%, we will revisit our stance on this matter.

Step 5B: Type of Action:
No action - New/low-enrolled program,Additional emphasis or time on content,Additional activities or assignments,Redesign of activities or assignments,Course redesign,Curriculum revision,Other

Step 5C: Dialogue Participants (check all that apply):
Administrator,Faculty

Step 5D: Evidence of Dialogue:
Results of the SAS certification exam will be discussed (between the program director and assistant program director) in early fall semester. Although we met our goal, ideas about how to improve scores will be a focus. Discussions may even take place regarding the appropriateness of continuing to use the SAS certification exam as a final exam. If it is the case that changes are made to this assessment method, it will be communicated, recorded, and the corresponding dialogue will be documented for next year's (2024-2025) assessment.
Attached is evidence of dialogue in November, 2023 regarding scheduling assessment meetings between faculty members who are involved with MDSAS instruction and our department assessment officer, Monnie McGee. (See attached document below.)
As mentioned above, additional dialogue specific to this PLO will take place (and will be documented, recorded, and saved) when we meet with Dr. South in early fall, 2024.

Attached Files
Evidence of dialogue_001.pdf

Step 5E: Type of other Improvements (check all that apply):
Other

Step 5F: Other Improvements (Full Description):
No changes were made last year. Going forward, we may use a different measuring tool other than the SAS certification exam. There is even ongoing discussion about dropping SAS as a software package altogether and instead adding some additional/advanced type of Python component in its place. The following text (from May, 2022) from an email between Charles South, Steve Robertson, and Chul Moon is evidence of this exchange.
"I (Chul Moon) agree [that we need to add] more DS (data science) aspects to MASDA. I recently read the article that many companies using R are now transitioning to Python. It reminds me of the past trend that companies transitioned to R/Python from SAS a few years ago. My wife recently interviewed for senior data scientist positions and told me that most companies require Python and SQL nowadays and R is not welcomed. Based on my experience with Python, I don't think Python is superior to R. However, it looks like there is an issue with code sharing in R when

most coworkers are only using Python in companies. It would be great if we consider retiring SAS and replacing it with Python for the MASDA program."

Step 6A: Status Update on Action(s) Identified in the Previous Assessment Cycle (Full Description):
The action plan was to proceed as in most previous years due to high pass rates while continuing to discuss replacement of the SAS exam by either a new measuring assessment (in SAS) or even by considering software tools in Python.

Step 6B: Status Update on Previously Identified Action Plan(s):
In progress

Progress:
Complete

Statistical Consulting

Step 1A: SLO Number:
2

Step 1C: SLO Statement (Full Description):
Student will effectively function as statistical consultants. Graduates will be able to communicate with (possibly nonstatistical) clients, appropriately analyze their data, prepare a written report, and present their findings to the client within the time frame specified by the client.

Step 2A: Measure:
Consulting project in STAT 6366 or STAT 6367: These courses provide students with apprenticeship training in statistical consulting on real projects under the supervision of an experienced consultant. In this course, students will meet with clients, determine and perform appropriate analyses, and will present the results in written and oral form to the clients.

Step 2B: Type of Measure (check all that apply):
Presentation ,Written paper/project

Step 2C: Is Measure direct or indirect?:
Direct

Step 3A: Target for Measure:
90% of the students will receive a grade of A on their analyses of a client-driven data analysis project and the formal presentation of these results from the analyses.

Step 4A: Was the target met for this Measure?:

Step 4B: Results and Findings for this Measure:

Of two MASDA students, the project percentage grades were 88 and 88, meaning that neither of the two students acheived the goal of 90%. Last year, only one of five (20%) scored an "A". Since the goal is 90%, both of the last two years' performances are well below the target. On a positive note, the two scores of 88% are very close to the target. Also, only two scores constitute a very small sample size making this estimation prone to sampling error and minimizing the accuracy of our conclusion.

Attached Files
Assessment 2023_2024 STAT 6366 Consulting Project grades.xlsx

Step 4C: Interpretation of Results:
As previous assessment reports reveal, this has been a low-performing measure in the past. The instructor (Dr. Charles South) is a thorough, high-quality instructor with very high standards, and getting an A on this assignment is challenging. This measure has been a problem point in the past, especially during COVID when courses were taught online. The past two years the course was fully in person, so on-line modality of teaching could not have been a factor for these two years. However, sample size may have been a factor.
We will meet in early fall with Dr. South to discuss ways to effectively put things into place that might improve these scores. Again, on a positive note, it is important to recognize that the two students who did the project this academic year both scored 88%, which is not bad and in fact, very close to meeting the goal.

Step 5A: Use of Results for Seeking Improvement (Action Plan):
Regardless of the very small sample size this year, because previous years have also resulted in unmet goals in this area, we definitely plan to continue to consider action plans.
During the meeting with Dr. South in early fall, we will revisit our target measures and our goals. One thing to consider is the use of a rubric to mark important features of the assessment so that we do not necessarily have to rely completely on the project grade; this way we can determine the areas in which students are lacking in order to create activities in the course to address those issues. Then, when the final project comes around, students are better prepared to score highly on the various rubrics.

Step 5B: Type of Action:
Additional emphasis or time on content,Faculty involvement

Step 5C: Dialogue Participants (check all that apply):
Administrator,Faculty,Staff

Step 5D: Evidence of Dialogue:
Attached is evidence of dialogue in November, 2023 regarding scheduling assessment meetings between faculty members who are involved with MDSAS instruction and our department assessment officer, Monnie McGee. (See attached document below.)
Additional dialogue specific to this PLO will take place (and will be documented, recorded, and saved) when we meet with Dr. South in early fall, 2024.

Attached Files
Evidence of dialogue_001.pdf

Step 5E: Type of other Improvements (check all that apply):
Other

Step 5F: Other Improvements (Full Description):
See #5a and 5b for current action plan.

Step 6A: Status Update on Action(s) Identified in the Previous Assessment Cycle (Full Description):
Since previous years have also resulted in unmet goals in this area, we need to continue to consider action plans. See #5a and 5b.

Step 6B: Status Update on Previously Identified Action Plan(s):
In progress

Progress:
Complete

Statistical Methods

Step 1A: SLO Number:
3

Step 1C: SLO Statement (Full Description):
Student will appropriately use statistical methods. Graduates will be equipped with a wide range of statistical analysis tools/methods for analyzing data and drawing conclusions.

Step 2A: Measure:
During the spring semester each first-year MASDA student takes STAT 6302. In this class each student will complete a class project involving collecting and analyzing data. This project will be graded according to the following rubric: Data Approval (5 pts), Research Question (3 pts), Depth of Analysis (5 pts), Reproducibility (5 pts), Research Paper* (50 pts), Oral Presentation** (36 pts).

Step 2B: Type of Measure (check all that apply):
Presentation ,Written paper/project

Step 2C: Is Measure direct or indirect?:
Direct

Step 3A: Target for Measure:

80% of the students will produce a class project that is considered to represent applied master's level performance, defined as scoring an 85% out of the 104 possible points on the project (see attached rubric).

Step 4A: Was the target met for this Measure?:

Step 4B: Results and Findings for this Measure:
Of the eleven students taking 6302, 5 students had scores above 85%. (See attached document for details, along with the rubric.) This 5/11 ratio is 45%, which is well below our 80% goal. This is a little surprising, especially given last year's very strong results (although a very small sample size.) Specifically, last year, of the three students taking 6302, all three (100%) students had project grades higher than 85%, which easily surpassed our goal of 80%.

Attached Files
Assessment 2023_2024 STAT 6302 Project.xlsx
STAT 6366 Final Project Rubric.pdf

Step 4C: Interpretation of Results:
As mentioned above, of the 11 students taking 6302, 5 had project grades higher than 85%. This equates to 45%, well below our goal of 85%. Last year (2022-2023), 100% of the three students had a project grade higher than 85%, so it is a concern that it dropped so much. The previous year (2021-2022), out of 5 students, four (80%) met the goal, which was right at the target measure. In the previous year to that (2020-2021), out of 12 students, six (50%) met the goal. With such fluctuation, and fortunately many of the results being very positive, it may be a valid conclusion that the results are heavily influenced by the relative strength of the particular individuals in the class which is difficult to control. It should also be pointed out that this particular measure is a challenging one- just because a student does not achieve an 85% on their project is not a sign of "failure." This course is deep and intense, and the very effective and thorough instructor (Dr. South) is known to grade cautiously and even strictly. For these reasons and the fact that only one score was in the 70s, not achieving this ambitious goal for this measure is not necessarily a sign for immediate alarm. Until this year, the last three years were ones in which we saw three consecutive years of improvement, indicating previous action plans were successful.

Step 5A: Use of Results for Seeking Improvement (Action Plan):
As mentioned above, no action plan was considered necessary last year, since the goal had been met and had been improved from the previous year. In fact, there had been three consecutive years of improvement, indicating previous action plans were successful. We had considered raising the goal from 80% to 90% (of students scoring higher than 85%), as students have improved each year but we decided against that. Another idea we considered was to move the assessment for this PLO from Stat 6302, a first-year course, to a course later in the program (such as 6309- see details in a later section) but we decided against that due to the crucial relevance of 6302 to the students' future basic skillsets for various jobs.

Given the decrease in performance, this will be a topic of discussion in our assessment meetings in early fall, 2024. Specifically, we will discuss what we feel was the reason for the decline and how we may do things differently in the next academic year to bounce back to previous levels.

Step 5B: Type of Action:
Other

Step 5C: Dialogue Participants (check all that apply):
Faculty,Staff

Step 5D: Evidence of Dialogue:
Given last year's very positive results (100%), we did not feel a need to hold dialogue around this PLO. However, with the decline, these latest results will be discussed in our assessment meeting(s) in Fall, 2024. We will record, document, and provide the evidence of the dialogue.

Step 5E: Type of other Improvements (check all that apply):
Other

Step 5F: Other Improvements (Full Description):
To give more detail about a comment above, dating back to last year in an assessment meeting, there has been discussion of replacing 6302 as the course for assessment with 6309. The primary reason this thought came up was that there has been a recognized need to update the program curriculum to stay current and relevant, which will in turn help increase enrollment. The following paragraph is an email from Charles South to Chul Moon and Steve Robertson stating that fact:
"I'd love to get together at some point over the summer and do a deep dive together to investigate overlap between 6309 and 6302, and our other MASDA courses as well. I really think we need to push more to a "data science" angle, where we give them more Python/R and SQL/database management in order to stay competitive as a program. I'm not sure whether the smaller cohorts we are currently experiencing are due to pandemic after-effects, the political environment as it relates to students getting (or not getting!) visas, the lack of the words "data science" in our degree title, or something else. But, we need to be able to pivot quickly!"
A related note here is that we have followed up on the above idea for improvement and we changed our name from MASDA (Master's of Applied Statistics and Data Analytics) to MDSAS (Master's of Data Science and Applied Statistics.) This was approved in January 2024.
At this time, no changes have been made as far as substituting or modifying the currently existing measure for this PLO. This will be discussed in our fall 2024 assessment meetings. We will record, document, and provide the evidence of the dialogue.

Step 6A: Status Update on Action(s) Identified in the Previous Assessment Cycle (Full Description):
No changes were necessary in the previous cycle due to the target being met. As mentioned in 5F, there is discussion of making various changes, such as replacing 6302 measures with 6309 measures, but that is in early discussion stages.

Step 6B: Status Update on Previously Identified Action Plan(s):
In progress

Progress:
Complete

Statistical ethics

Step 1A: SLO Number:
4

Step 1C: SLO Statement (Full Description):
Students will know the fundamental principles of statistical ethics.

Step 2A: Measure:
Nine hours of lecture time in the Statistical Consulting class (STAT 6366) are devoted to ethics, and in particular data ethics. An exam will be given over the material covered in class.

Step 2B: Type of Measure (check all that apply):
Objective Quiz or Exam

Step 2C: Is Measure direct or indirect?:
Direct

Step 3A: Target for Measure:
90% of students will earn a score of B or better on the Ethics exam.

Step 4A: Was the target met for this Measure?:
Met

Step 4B: Results and Findings for this Measure:
Of the two MASDA students who took Statistical Consulting, the percentage grades on the ethics exam were 92 and 85. (See attachment.) Since at least 90% (actually 100%) of these grades were at or better than a grade of "B", the goal was met.

Attached Files
Assessment 2023_2024 STAT 6366 Ethics.xlsx

Step 4C: Interpretation of Results:
It appears that the ethics component of the Statistical Consulting course is very much performing as expected. The ethics portion of the class is an unusually "soft skills" topic, and naturally students score take advantage of the opportunity to score highly in this area to maximize their overall course grade. Because this has been the trend in recent years (in the last two years, out of

5 and 16, respectively, MASDA students who took the ethics exam, 5 and 15, respectively, scored a B or better), no action plan was developed last year. That will be the plan going forward for next year, as well.

Step 5A: Use of Results for Seeking Improvement (Action Plan):
As stated above, of the two MASDA students who took Statistical Consulting, the percentage grades on the ethics exam were 92 and 85. Since at least 90% (actually 100%) of these grades are at or above the "B" mark, the goal was met.
Given these findings regarding ethics and the fact that ethics is an extremely relevant topic for data scientists who handle important and confidential data, we plan to raise the target from at least 90% to 100% (being required to make at least a B) in the near future. This will be discussed in assessment meetings in early fall.

Step 5B: Type of Action:
Other

Step 5C: Dialogue Participants (check all that apply):
Faculty,Staff

Step 5D: Evidence of Dialogue:
Attached is evidence of dialogue in November, 2023 regarding scheduling assessment meetings between faculty members who are involved with MDSAS instruction and our department assessment officer, Monnie McGee. (See attached document below.)
The results related to this PLO from this academic year will be discussed in our assessment meetings with Charles South in early Fall 2024, and we will discuss possible changes and will document and save this evidence of dialogue for assessment of next academic year.

Attached Files
Evidence of dialogue_001.pdf

Step 5E: Type of other Improvements (check all that apply):
Other

Step 5F: Other Improvements (Full Description):
No "other improvements" were necessary for the ethics measure. (See comments above.)

Step 6A: Status Update on Action(s) Identified in the Previous Assessment Cycle (Full Description):
For this past academic year, no program improvements were necessary for the ethics measure.

Step 6B: Status Update on Previously Identified Action Plan(s):
Not applicable for this cycle (explain in Step 6A)

Progress:

Complete

Employment

Step 1A: PG Number:
1

Step 1C: PG Statement (Full Description):
Students graduating from the program enter the workforce as data analysts (or related job category), or will be admitted to graduate studies in a quantitative discipline.

Step 2A: Measure:
We track the percentage of current graduates who have been employed or are planning to continue their studies in a Ph.D program.

Step 2B: Is Measure direct or indirect?:
Direct

Step 3A: Target for Measure:
50% of students who have a job offer as a data analyst (or related) or have been accepted to further related graduate studies by the date of graduation.

Step 4A: Was the target met for this Measure?:
Met

Step 4B: Results and Findings for this Measure:
Of the three graduating students this past year (academic year 2023-2024), all three (100%) had secured employment by their graduation dates. Since we do track this as well, another student (who has not yet graduated) went to medical school. These very encouraging results surpass the goal of 50%, so this measure was easily met this year. (See supporting documentation.)

Attached Files
Assessment 2023_2024 Job placement.xlsx

Step 4C: Interpretation of Results:
This is a continued very encouraging sign for the MASDA program, as this measure is a true test of the quality of the program since it is a reflection of the opinion of outside employers. In fact, a recent trend is that I have more demand from inquiring employers than I have supply of available graduates to supply them with. We engage often with employers to build relationships and to inquire what types of courses should be a focus in our curriculum. In addition to relevance of curriculum, another key reason we are very successful in this area is that our network of graduates actively seek our new graduates for employment. (Note: last year, the one international student graduate who was still looking for employment was hired by a DFW marketing firm soon

after this report was generated, meaning that we are at 100% placement rate for the past two years' graduates.)

Step 5A: Use of Results for Seeking Improvement (Action Plan):
No action plan is necessary because of the positive results above.

Step 5B: Dialogue Participants (check all that apply):
Administrator ,Faculty,Staff,Student

Step 5C: Evidence of Dialogue:
Dialogue around employment status of our students is an ongoing and usually informal type basis- discussions occur whenever the student informs us of communication between them and the employer. It can be an impromptu visit in the office, phone call, or email. Since our recent software migration from WEAVE when we were not accustomed to providing this "evidence of dialogue," we are still determining best practices to implement, track, and record this measure. We will address this issue in AY 2024-2025.

Step 5D: Type of other Improvements (check all that apply):
Other

Step 5E: Other Improvements (Full Description):
NA

Step 6A: Status Update on Action(s) Identified in the Previous Assessment Cycle (Full Description):
Last year, our goal was met so no action plans were felt necessary to implement. Because employment has not been a problem for students graduating from the MASDA program for several years, we will focus on a different PO for AY 2024-25.

Step 6B: Status Update on Previously Identified Action Plan(s):
Fully implemented

Progress:
Complete