Texas State University
Outcomes Report

General Information	
Academic Year:	2021-2022
College:	Business
Department:	Information Systems and Analytics
Program:	Data Analytics and Information Systems
Program Code:	52.13
Outcome Type:	Student Learning (GR)
Degree:	Masters
Coordinator/Contact:	Jaymeen Shah
Status:	Data Entry Closed

Mission Statement

The Master of Science in Data Analytics and Information Systems (MSDAIS) program is a flexible, part-time program focused on preparing students for successful careers in data analytics related professions. The MSDAIS program emphasizes data analytics, information technology, and technical skills required for careers in data analytics.

Evidence of Improvement

The MSDAIS program goal is that during the academic year 80% or more of the students will meet or exceed the standards of scoring 80% or better on each learning outcome. For AY 2021-2022, this goal was achieved with only three assessment data points falling short of the desired 80% mark. The outcome summary provided for the past two years show students are meeting or exceeding the performance standards in most of the courses.

Note: Cell values in the assessment summary table indicate percentage of students in each course meeting or exceeding the performance standards for that learning outcome. If a learning outcome has more than one performance areas, the cell value is the average of the percentage of students in each performance area meeting or exceeding the performance standards.
The most significant performance improvements were evident in learning outcome #3, method 2, and learning outcome #4, method 1. For learning outcome #3, method 2, the percentage of students meeting or exceeding the performance standards increased from 76.7% in 2020-2021 to 90.7% in 2021-2022, and in learning outcome #4, method 1, the percentage of students meeting or exceeding the performance standards increased from 43.3% in 2020-2021 to 88.4% in 2021-2022. These significant improvements were achieved due to improved performance in QMST 5336 – Analytics course. This improvement in student performance was attained by following the action plan instructors developed last year to provide students additional practice exercises/assignments and discuss these exercises/assignments in class. In addition, instructors reviewed key concepts in class by providing in-class exercises and provided additional notes on topics discussed in class.
For learning outcome #2, method 1, the percentage of students meeting or exceeding the performance standards increased from 82.5% in 2020-2021 to 94.2% in 2021-2022. This improvement in student performance was achieved due to improved performance in CIS 5357 – Computing for Data Analytics course. The instructor developed and provided resources for out-of-class review of Python concepts and increased the number of out-of-class assignments focused on application of a concept discussed in class.
Student performance for other learning outcomes were comparable to performance in previous year. The overall average of student performance across all learning outcomes increased slightly from 88.4% in 2020-2021 to 92.1% in 2021-2022.

Action Plan

In AY 2021-2022, the components listed below of learning outcomes #2 and #5 missed the 80% target of exceeding or meeting the expectations. Action plan for these learning outcomes is given below.
(1) Learning Outcome #2 – Demonstrate analytical skills to develop data-driven solutions for problems.
Method 2:
QMST 5335 – Forecasting and Simulation.
The percentage of students meeting or exceeding the performance for learning outcome #2, method 2, was 88.7%. However, the percentage of students meeting or exceeding expectations for *analyzing and using data to simulate a complex system for decision making* was 76.9%. To improve student performance in this subcomponent of method 2:
(a) Modify project for this subcomponent to assign it as individual project instead of team project.
(2) Learning Outcome #5 – Design and implement data management strategies.
Method 1:
CIS 5355 – Database Management Systems.
The percentage of students meeting or exceeding the performance for learning outcome #5, method 1, was 75.6%. The percentage of students meeting or exceeding expectations for the subcomponent *developing conceptual database design for a given scenario* was 64.3% and the percentage of students meeting or exceeding expectations for the subcomponent *implementing relational database schema for a business scenario* was 71.4%. To improve student performance in these subcomponents of method 1:
(a) Devote more class time to conceptual database design topic. Discuss more conceptual database design examples in class and provide additional assignments to develop conceptual database design for a given business scenario.
(b) Provide an additional assignment for using SQL to implement relational database schema for a given business scenario.

(3) Learning Outcome #5 – Design and implement data management strategies.

Method 2:

CIS 5355 – Database Management Systems.

The percentage of students meeting or exceeding the performance for learning outcome #5, method 2, was 83.9%. However, the percentage of students meeting or exceeding expectations for the subcomponent *developing conceptual database design for a given scenario* was 75.0%. To improve student performance in this subcomponent of method 2:

(a) Devote more class time to conceptual database design topic. Discuss more conceptual database design examples in class and provide additional assignments to develop conceptual database design for a given business scenario.

Outcome 1

Category: Student Learning Outcome

Students will demonstrate critical thinking skills necessary to define and solve problems.

The **standards** of performance for the methods below are:

- Scores of 90% correct or better will indicate that the student exceeds expectations
- Scores greater than 80% correct but less than 90% correct will indicate that the student meets expectations
- Scores less than 80% correct will indicate that the student failed to meet expectations.

It is **expected** that 80% of students enrolled in the course during the academic year will meet or exceed the standards on each learning outcome.

Outcome 1 - Method 1

1A. In QMST 5334, Statistical Methods for Business, the assessment technique/rubric for outcome 1 is as follows. Short-answer items in exams will be used to assess students' ability to define problems and apply appropriate statistical techniques. Excellent scores will have correct use of statistical techniques and interpretation of results. Acceptable scores will have some errors in technique used or interpretation of results. Unacceptable scores will have major errors in use of techniques and interpretation of results.

1B. In CIS 5357, Computing for Data Analytics, the assessment technique/rubric for outcome 1 is as follows. An exam problem will require students to define problem and develop code to implement solution for the given problem. Excellent scores will have correctly implemented the solution for the given problem. Acceptable scores will have some error in the code implementation. Unacceptable scores will have major errors and the code may not work for the problem.

Outcome 1 - Method 1 - Result

SUMMARY STATISTICS FOR OUTCOME #1 IN QMST 5334 - Statistical Methods for Business FOR AY 2021-2022.

Performance Area	Performance	Fall 2021		Spring 2022		Total (Fall 2021 + Spring 2022)	
		Raw #	%	Raw #	%	Raw #	%
Define problems	Exceeds	32	50.0%	21	75.0%	53	57.6%
	Meets	28	43.8%	1	3.6%	29	31.5%
	Failed to meet	4	6.2%	6	21.4%	10	10.9%
	Total	**64**	**100**	**28**	**100**	**92**	**100**
Apply appropriate statistical techniques	Exceeds	31	49.0%	21	75.0%	52	56.5%
	Meets	29	45.0%	1	4.0%	30	32.6%
	Failed to meet	4	6.0%	6	21.0%	10	10.9%
	Total	**64**	**100**	**28**	**100**	**92**	**100**

Percentage of MSDAIS students who met or exceeded expectations for *defining problems*: 89.1%.

Percentage of MSDAIS students who met or exceeded expectations for *applying appropriate statistical techniques*: 89.1%.

Explanation of Results: In QMST 5334 - Statistical Methods for Business, more than 80% of the MSDAIS students met or exceeded the standards for defining problems and applying appropriate statistical techniques for method #1 of this learning outcome, thus, exceeding the performance expectation for the year. It is positive that more than 80% of the MSDAIS students successfully defined problems and used appropriate statistical techniques to solve business problems. Combining MSDAIS and Marketing Research and Analysis students in a section seemed to have positive effect on student performance.

SUMMARY STATISTICS FOR OUTCOME #1 IN CIS 5357 - Computing for Data Analytics FOR AY 2021-2022.

Performance Area	Performance	Fall 2021		Spring 2022		Total (Fall 2021 + Spring 2022)	
		Raw #	%	Raw #	%	Raw #	%
Define problem		20	62.5%	10	47.6%	30	56.6%
		8	25.0%	9	42.9%	17	32.1%
		4	12.5%	2	9.5%	6	11.3%
		32	**100**	**21**	**100**	**53**	**100**
Develop code to implement solution for the given problem		20	62.5%	10	47.6%	30	56.6%

	8	25.0%	9	42.9%	17	32.1%
	4	12.5%	2	9.5%	6	11.3%
	32	**100**	**21**	**100**	**32**	**100**

Percentage of MSDAIS students who met or exceeded expectations for *defining problems*: 88.7%.
Percentage of MSDAIS students who met or exceeded expectations for *developing code to implement solution for the given problem*: 88.7%.
Explanation of Results: In CIS 5357 - Computing for Data Analytics, more than 80% of the MSDAIS students met or exceeded the standards for defining problems and developing code to implement solution for the given problem for method #1 of this learning outcome, thus, exceeding the performance expectation for the year. It is positive that more than 80% of the MSDAIS students successfully defined problems and developed code to implement solution for the given problems.
Action Plan:
1. For QMST 5334 - Statistical Methods for Business: (a) Continue to use reading assignments in conjunction with out-of-class assignments as it positively affected student performance.
2. For CIS 5357 - Computing for Data Analytics: (a) Devote additional class time to demonstrate the process of defining problem and then developing code to implement a solution for the defined problem using examples. (b) Additional out-of-class assignments to provide students with more practice in defining business problems and developing code to implement a solution for the defined problems.

Outcome 1 - Method 2

2A. In QMST 5334, Statistical Methods for Business, the assessment technique/rubric for outcome 1 is as follows. A project that will require students to define problem and use appropriate technique(s) to solve the problem. Excellent scores will have correct use of statistical techniques and interpretation of results. Acceptable scores will have some errors in technique used or interpretation of results. Unacceptable scores will have major errors in use of techniques and interpretation of results.
2B. In CIS 5357, Computing for Data Analytics, the assessment technique/rubric for outcome 1 is as follows. An out-of-class assignment will require students to define problem and develop code to implement solution for the problem. Excellent scores will have implemented the solution for the given problem. Acceptable scores will have some error in the code implementation. Unacceptable scores will have major errors and the code may not work for the problem.

Outcome 1 - Method 2 - Result

SUMMARY STATISTICS FOR OUTCOME #1 IN QMST 5334 - Statistical Methods for Business FOR AY 2021-2022.

Performance Area	Performance	Fall 2021		Spring 2022		Total (Fall 2021 + Spring 2022)	
		Raw #	%	Raw #	%	Raw #	%
Define problem	Exceeds	43	67.2%	28	100.0%	71	77.2%
	Meets	14	21.9%	0	0.0%	14	15.2%
	Failed to meet	7	10.9%	0	0.0%	7	7.6%
	Total	**64**	**100**	**28**	**100**	**92**	**100**
Use appropriate technique(s) to solve the problem	Exceeds	42	65.6%	25	89.3%	67	72.8%
	Meets	15	23.5%	1	3.6%	16	17.4%
	Failed to meet	7	10.9%	2	7.1%	9	9.8%
	Total	**64**	**100**	**28**	**100**	**92**	**100**

Percentage of MSDAIS students who met or exceeded expectations for *defining problems*: 92.4%.
Percentage of MSDAIS students who met or exceeded expectations for *applying appropriate statistical techniques*: 90.2%.
Explanation of Results: In QMST 5334 - Statistical Methods for Business, more than 80% of the MSDAIS students met or exceeded the standards for defining problems and applying appropriate statistical techniques for method #2 of this learning outcome, thus, exceeding the performance expectation for the year. It is positive that more than 80% of the MSDAIS students successfully defined problems and used appropriate statistical techniques to solve business problems. Combining MSDAIS and Marketing Research and Analysis students in team seemed to have positive effect on student performance in the areas of defining problem, use of appropriate statistical technique, and project presentation. Students enrolled in MSDAIS and Marketing Research and Analysis have different strengths, which resulted in improved team project performance.

SUMMARY STATISTICS FOR OUTCOME #1 IN CIS 5357 - Computing for Data Analytics FOR AY 2021-2022.

Performance Area	Performance	Fall 2021		Spring 2022		Total (Fall 2021 + Spring 2022)	
		Raw #	%	Raw #	%	Raw #	%
Define problem	Exceeds	29	90.6	12	57.1	41	77.4
	Meets	0	0.0	8	38.1	8	15.1
	Failed to meet	3	9.4	1	4.8	4	7.5
	Total	**32**	**100.0**	**21**	**100**	**53**	**100**
Develop code to implement solution for the given problem	Exceeds	29	90.6	12	57.1	41	77.4
	Meets	0	0.0	8	38.1	8	15.1
	Failed to meet	3	9.4	1	4.8	4	7.5

	Total	**32**	**100**	**21**	**100**	**53**	**100**

Percentage of MSDAIS students who met or exceeded expectations for *defining problems*: 92.5%.
Percentage of MSDAIS students who met or exceeded expectations for *developing code to implement solution for the given problem*: 92.5%.
Explanation of Results: In CIS 5357 - Computing for Data Analytics, more than 80% of the MSDAIS students met or exceeded the standards for defining problems and developing code to implement solution for the given problem for method #2 of this learning outcome, thus, exceeding the performance expectation for the year. It is positive that more than 80% of the MSDAIS students successfully defined problems and developed code to implement solution for the given problems. Students' performance for method #2 was slightly better than for method #1, which indicates students' performance for defining the problem and then developing code to implement solution a solution is better in absence of time pressure (one week for assignment vs. three hours for examination).
Action Plan:
1. For QMST 5334 - Statistical Methods for Business: (a) For team project have teams comprised of students from different graduate programs (e.g., MSDAIS and Marketing Research and Analysis).
2. For CIS 5357 - Computing for Data Analytics: (a) Devote additional class time to demonstrate the process of defining problem and then developing code to implement a solution for the defined problem using examples. (b) Additional out-of-class assignments to provide students with more practice in defining business problems and developing code to implement a solution for the defined problems.

Outcome 2

Category: Student Learning Outcome

Demonstrate analytical skills to develop data-driven solutions for problems.

The **standards** of performance for the methods below are:

- Scores of 90% correct or better will indicate that the student exceeds expectations
- Scores greater than 80% correct but less than 90% correct will indicate that the student meets expectations
- Scores less than 80% correct will indicate that the student failed to meet expectations.

It is **expected** that 80% of students enrolled in the course during the academic year will meet or exceed the standards on each learning outcome.

Outcome 2 - Method 1

1A. In QMST 5336, Analytics, the assessment technique/rubric for outcome 2 is as follows. At least one data-based problem in exams will be used to assess students' ability to identify a problem and apply appropriate analytical methods to solve the problem. Excellent scores will correctly identify a problem and properly apply analytical methods to solve the problem. Acceptable scores will have some errors in identifying a problem or applying analytical methods. Unacceptable scores will have major errors in identifying a problem or applying analytical methods to solve the problem.

1B. In CIS 5357, Computing for Data Analytics, the assessment technique/rubric for outcome 2 is as follows. At least one problem given in exam will assess student's ability to develop and data-driven solution for practical scenarios. Excellent scores will have correctly implemented the data-driven solution for the given problem. Acceptable scores will have some errors in the code implementation. Unacceptable scores will have major errors in implementation and the code may not work for the problem.

Outcome 2 - Method 1 - Result

SUMMARY STATISTICS FOR OUTCOME #2 IN QMST 5336 - Analytics FOR AY 2021-2022.

Performance Area	**Performance**	**Fall 2021**		**Spring 2022**		**Total (Fall 2021 + Spring 2022)**	
		Raw #	**%**	**Raw #**	**%**	**Raw #**	**%**
Identify and apply appropriate analytical methods to solve problems	Exceeds	21	95.5%	9	42.9%	30	69.8%
	Meets	1	4.5%	7	33.3%	8	18.6%
	Failed to meet	0	0.0%	5	23.8%	5	11.6%
	Total	**22**	100	**21**	**100**	**43**	**100**

Percentage of MSDAIS students who met or exceeded expectations for *identifying and applying appropriate analytical methods to solve problems*: 88.4%.
Explanation of Results: In QMST 5336 - Analytics, more than 80% of the MSDAIS students met or exceeded the standards for identifying and applying appropriate analytical methods for method 1 of this learning outcome, thus, achieving the performance expectations for learning outcome #2 for the year. It is positive that more than 80% of the MSDAIS students understand the analytical methods discussed in class and are able to identify and use appropriate analytical methods to solve given real-world scenarios. Providing students detailed notes regarding topics discussed in class, out-of-class assignments, and review of important concepts seemed to have helped in improving student performance.

SUMMARY STATISTICS FOR OUTCOME #2 IN CIS 5357 - Computing for Data Analytics FOR AY 2021-2022.

Performance Area	**Performance**	**Fall 2021**		**Spring 2022**		**Total (Fall 2021 + Spring 2022)**	
		Raw #	**%**	**Raw #**	**%**	**Raw #**	**%**

Develop a data-driven solution for practical scenario	Exceeds	26	81.3%	9	45.0%	35	67.3%
	Meets	5	15.6%	9	45.0%	14	26.9%
	Failed to meet	1	3.1%	2	10.0%	3	5.8%
	Total	**32**	**100**	**20**	**100.0**	**52**	**100**

Percentage of MSDAIS students who met or exceeded expectations for *developing data-driven solution for practical scenario*: 94.2%.
Explanation of Results: In CIS 5357 - Computing for Data Analytics, more than 80% of the MSDAIS students met or exceeded the standards for developing data-driven solution for the given practical scenario for method 1 of this learning outcome, thus, achieving the performance expectations for learning outcome #2 for the year. It is positive that more than 80% of the MSDAIS students successfully developed data-driven solution for the given practical scenario. Students' performance for this learning outcome indicates they have mastered concepts of data-driven application development and are able to develop data-driven application solution within time constraints of an examination. Providing students additional resources to review Python and application development concepts discussed in class and out-of-class assignments to practice data-driven solutions development positively affected student performance.
Action Plan:
1. For QMST 5336 - Analytics: (a) Additional exam questions and assignments will be provided to improve students' understanding of analytical methods and critical thinking. (b) Provide detailed notes and review key concepts about analytical methods discussed in class.
2. For CIS 5357 - Computing for Data Analytics: (a) Provide students additional resources (e.g., videos) to review Python and data-driven solution development concepts. (b) Devote additional time in class to demonstrate and explain how data-driven solutions are developed. (c) Continue using assignments to assess students' understanding of developing data-driven solutions, which will assist in determining what changes, if any, are needed in content coverage and in-class exercises for additional improvement.

Outcome 2 - Method 2

2A. In CIS 5357, Computing for Data Analytics, the assessment technique/rubric for outcome 2 is as follows. An out-of-class project will require students to extract/collect data for a problem, read the data, and implement data-driven solution to provide insights for the problem. Excellent scores will have implemented the solution and provided insights for the given problem. Acceptable scores will have some error in the code implementation for the solution or insights provided. Unacceptable scores will have major errors in the code implementation and insights provided, and the code may not work for the problem.
2B. In QMST 5335, Forecasting & Simulation, the assessment technique/rubric for outcome 2 is as follows. Three projects will require students to develop data-driven solutions for practical problems. First project will require students to use appropriate forecasting methods to develop forecasts for given data. Second project will require students to use simulation for evaluating different scenarios. Third project will require students to analyze and use data to simulate a complex system for decision making. For the first project, excellent scores will have correct selection and implementation of appropriate forecasting method. Acceptable scores will have some errors in the implementation of forecasting method. Unacceptable scores will have major errors in selection and implementation of forecasting method. For the second and third projects, excellent scores will have correctly implemented solution and interpreted results. Acceptable scores will have some errors in interpretation of results. Unacceptable scores will have major errors in the implemented simulation and interpretation of results.

Outcome 2 - Method 2 - Result

SUMMARY STATISTICS FOR OUTCOME #2 IN CIS 5357 - Computing for Data Analytics FOR AY 2021-2022.

Performance Area	**Performance**	**Fall 2021**		**Spring 2022**		**Total (Fall 2021 + Spring 2022)**	
		Raw #	**%**	**Raw #**	**%**	**Raw #**	**%**
Extract/collect data for a problem	Exceeds	27	84.4%	17	80.9%	44	83.0%
	Meets	4	12.5%	4	19.1%	8	15.1%
	Failed to meet	1	3.1%	0	0.0%	1	1.9%
	Total	**32**	**100**	**21**	**100.00**	**53**	**100**
Read data and implement data-driven solution to provide insights for the problem	Exceeds	27	84.4%	17	80.9%	44	83.0%
	Meets	4	12.5%	4	19.1%	8	15.1%
	Failed to meet	1	3.1%	0	0.0%	1	1.9%
	Total	**32**	**100**	**21**	**100.0**	**53**	**100**

Percentage of MSDAIS students who met or exceeded expectations for *extracting data for a given problem*: 98.1%.
Percentage of MSDAIS students who met or exceeded expectations for *reading data and implementing data-driven solution to provide insights for the given problem*: 98.1%.
Explanation of Results: In CIS 5357 - Computing for Data Analytics, significantly more than 80% of the MSDAIS students met or exceeded the standards for extracting and reading data, and implementing data-driven solution to provide insights for a given problem for method 2 of this

learning outcome, thus, achieving the performance expectations for learning outcome #2 for the year. It is positive that almost all MSDAIS students successfully extracted and read data, and implemented data-driven solution to provide insight for the given problem. Students' performance for method 2 of this learning outcome indicates they can extract and read data, and implement data-driven solution to provide insight in absence of time pressure (one week for assignment vs. three hours for examination).

SUMMARY STATISTICS FOR OUTCOME #2 IN QMST 5335 - Forecasting & Simulation FOR AY 2021-2022.

Performance Area	Performance	Fall 2021		Spring 2022		Total (Fall 2021 + Spring 2022)	
		Raw #	%	Raw #	%	Raw #	%
Use appropriate forecasting methods to develop forecasts for given data	Exceeds			32	82.1%	32	82.0%
	Meets			4	10.2%	4	10.3%
	Failed to meet			3	7.7%	3	7.7%
	Total			**39**	**100**	**39**	**100**
Use simulation for evaluating different scenarios	Exceeds			29	74.3%	29	74.3%
	Meets			9	23.1%	9	23.1%
	Failed to meet			1	2.6%	1	2.6%
	Total			**39**	**100**	**39**	**100**
Analyze and use data to simulate a complex system for decision making	Exceeds			18	46.1%	18	46.1%
	Meets			12	30.8%	12	30.8%
	Failed to meet			9	23.1%	9	23.1%
	Total			**39**	**100**	**39**	**100**

Percentage of MSDAIS students who met or exceeded expectations for *using appropriate forecasting methods to develop forecasts for given data*: 92.3%.

Percentage of MSDAIS students who met or exceeded expectations for *using simulation for evaluating different scenarios*: 97.4%.

Percentage of MSDAIS students who met or exceeded expectations for *analyzing and using data to simulate a complex system for decision making* : 76.9%.

Explanation of Results: In QMST 5335 - Forecasting & Simulation, more than 80% of the MSDAIS students met or exceeded the standards for using appropriate forecasting methods to develop forecasts and using simulation for evaluating different scenarios. The performance in these two subcomponents far exceeded the desired target of 80% of students enrolled in the course meeting or exceeding the standards. On the other hand, approximately 77% of the students met or exceeded the expectations for the subcomponent for analyzing and using data to simulate a complex system for decision making for method 2 of this learning outcome; which is slightly below the desired performance target of 80% of students enrolled in the course meeting or exceeding the standards. This performance subcomponent is assessed using the last project given towards the end of the semester; hence, students may be rationing their time and planning their work according to the grade needed on the project to get the desired letter grade. In addition, project 3 is a team project, while the projects for the other performance subcomponents were assessed using individual projects given earlier in the semester. Teamwork might create issues for some teams. These factors could have contributed to the lower than expected performance in the subcomponent for analyzing and using data to simulate a complex system for decision making.

Action Plan:

1. For CIS 5357 - Computing for Data Analytics: (a) Continue using examples and resources used in class for explaining and demonstrating extracting and reading data, and implementing data-driven solution to provide insights for a given problem.
2. For QMST 5335 - Forecasting & Simulation: (a) The project for the performance area subcomponent for analyzing and using data to simulate a complex system for decision making will be assigned as an individual project instead of a team project and it will be assigned earlier to ensure students have more time for completing the project. This project will be modified to ensure it is suitable for an individual student to complete it.

Outcome 3

Category: Student Learning Outcome

Ability to analyze large datasets and develop modeling solutions to support decision making.

The **standards** of performance for the methods below are:

- Scores of 90% correct or better will indicate that the student exceeds expectations
- Scores greater than 80% correct but less than 90% correct will indicate that the student meets expectations
- Scores less than 80% correct will indicate that the student failed to meet expectations.

It is **expected** that 80% of students enrolled in the course during the academic year will meet or exceed the standards on each learning outcome.

Outcome 3 - Method 1

1A. In QMST 5336, Analytics, the assessment technique/rubric for outcome 3 is as follows. At least one problem in exam will be used to assess students' ability of performing prediction using historical data and interpret the result to support decision making. Excellent scores will have correctly implemented prediction and interpreted results to support decision making. Acceptable scores will have some errors in applying prediction techniques or interpretation of results. Unacceptable scores will have major errors in use of prediction methods or interpretation of results for decision making.

1B. In CIS 5367, Machine Learning, the assessment technique/rubric for outcome 3 is as follows. At least one problem in exam will be used to assess students' ability to apply machine learning models for implementing decision systems. Excellent scores will have successfully implemented decision systems using appropriate machine learning models. Acceptable scores will have some errors in implementing the system or using appropriate machine learning models. Unacceptable scores will have major errors in implementation and use of machine learning models for the system.

Outcome 3 - Method 1 - Result

SUMMARY STATISTICS FOR OUTCOME #3 IN QMST 5336 - Analytics FOR AY 2021-2022.

Performance Area	Performance	Fall 2021		Spring 2022		Total (Fall 2021 + Spring 2022)	
		Raw #	%	Raw #	%	Raw #	%
Analyze a dataset and interpret the result to support decision making	Exceeds	21	95.5%	14	66.7%	35	81.4%
	Meets	1	4.5%	5	23.8%	6	14.0%
	Failed to meet	0	0.0%	2	9.5%	2	4.6%
	Total	22	100	**21**	**100**	**43**	**100**

Percentage of MSDAIS students who met or exceeded expectations for *analyzing a dataset and interpret the result to support decision making*: 95.4%.

Explanation of Results: In QMST 5336 - Analytics, more than 80% of the MSDAIS students met or exceeded the standards for analyzing datasets and interpreting results to support decision making for method 1 of this learning outcome, thus, achieving the performance expectations for learning outcome #3 for the year. It is positive that more than 80% of the MSDAIS students were able to analyze datasets and interpret results to support decision making for given real-world scenarios using appropriate analytical techniques. Providing students detailed notes regarding topics discussed in class, practice coding in Python for prediction analysis, out-of-class assignments, and review of important concepts seemed to have helped in improving student performance.

SUMMARY STATISTICS FOR OUTCOME #3 IN CIS 5367 - Machine Learning FOR AY 2021-2022.

Performance Area	Performance	Fall 2021		Spring 2022		Total (Fall 2021 + Spring 2022)	
		Raw #	%	Raw #	%	Raw #	%
Apply machine learning models for implementing decision systems	Exceeds			41	93.2%	41	93.2%
	Meets			2	4.5%	2	4.5%
	Failed to meet			1	2.3%	1	2.3%
	Total			**44**	**100**	**44**	**100**

Percentage of MSDAIS students who met or exceeded expectations for *applying machine learning models for implementing decision systems*: 97.7%.

Explanation of Results: In CIS 5367 - Machine Learning, more than 80% of the MSDAIS students met or exceeded the standards for applying machine learning models for implementing decision systems for the given practical scenario for method 1 of this learning outcome, thus, achieving the desired performance expectations for learning outcome #3 for the year. It is positive that almost all MSDAIS students successfully applied machine learning models to implement decision systems for the given practical scenario. The cloud-based computing environment (Colab from Google) used to develop and implement machine learning projects worked well compared with the use of laptops/desktops in 2021. Students' performance improved from last year even though more machine learning techniques were discussed in class.

Action Plan:

1. For QMST 5336 - Analytics: (a) Additional exam questions and assignments will be provided to enhance students' ability to analyze given dataset and interpret results to support decision making. (b) Provide detailed notes, review key concepts about prediction techniques discussed in class, and provide practice examples for prediction analysis.
2. For CIS 5367 - Machine Learning: (a) Continue using cloud-based computing environment Colab to develop and implement machine learning

projects. This worked well for machine learning due to significant amount of memory and computing power. This will enable deeper discussion about applying machine learning models for implementing decision systems and overcome the memory and computing limitations of personal desktop/laptop computers.

Outcome 3 - Method 2

2A. In QMST 5336, Analytics, the assessment technique/rubric for outcome 3 is as follows. An out-of-class project will require students to analyze dataset(s) using appropriate analytical methods to support data-driven decision making for a specific problem. Excellent scores indicate successfully applying appropriate analytical methods to solve a specific problem based on real-life data. Acceptable scores will have some errors in applying analytical methods to solve a specific problem based on real-life data. Unacceptable scores indicate failure to apply analytical methods to solve a specific problem based on real-life data.

2B. In CIS 5367, Machine Learning, the assessment technique/rubric for outcome 3 is as follows. At least one assignment will be used to assess students' ability to apply machine learning models for implementing decision systems. Excellent scores will have successfully implemented decision systems using appropriate machine learning models. Acceptable scores will have some errors in implementing the system or using appropriate machine learning models. Unacceptable scores will have major errors in implementation and use of machine learning models for the system.

Outcome 3 - Method 2 - Result

SUMMARY STATISTICS FOR OUTCOME #3 IN QMST 5336 - Analytics FOR AY 2021-2022.

Performance Area	Performance	Fall 2021		Spring 2022		Total (Fall 2021 + Spring 2022)	
Analyze data set(s) using appropriate analytical methods to support data-driven decision making for a problem		**Raw #**	**%**	**Raw #**	**%**	**Raw #**	**%**
	Exceeds	21	95.5%	7	33.3%	28	65.1%
	Meets	1	4.5%	10	47.6%	11	25.6%
	Failed to meet	0	0.0%	4	19.1%	4	9.3%
	Total	21	**100**	**21**	**100**	**43**	**100**

Percentage of MSDAIS students who met or exceeded expectations for *analyzing datasets using appropriate analytical methods to support data-driven decision making for a given problem*: 90.7%.

Explanation of Results: In QMST 5336 - Analytics, more than 80% of the MSDAIS students met or exceeded the standards for analyzing datasets using appropriate analytical methods to support data-driven decision making for a given problem for method 2 of this learning outcome, thus, achieving the performance expectations for learning outcome #3 for the year. It is positive that more than 80% of the MSDAIS students were able to analyze datasets for a given problem scenario using appropriate analytical techniques to support data-driven decision making. The performance for method 2 significantly improved because of detailed lecture notes, out-of-class assignments, review of key concepts discussed in class, and additional practice for coding in Python seemed to have helped in improving student performance.

SUMMARY STATISTICS FOR OUTCOME #3 IN CIS 5367 - Machine Learning FOR AY 2021-2022.

Performance Area	Performance	Fall 2021		Spring 2022		Total (Fall 2021 + Spring 2022)	
		Raw #	**%**	**Raw #**	**%**	**Raw #**	**%**
Ability to apply machine learning models for implementing decision systems	Exceeds			38	86.4%	38	86.4%
	Meets			3	6.8%	3	6.8%
	Failed to meet			3	6.8%	3	6.8%
	Total			**44**	**100**	**44**	**100**

Percentage of MSDAIS students who met or exceeded expectations for *applying machine learning models for implementing decision systems*: 93.2%.

Explanation of Results: In CIS 5367 - Machine Learning, more than 80% of the MSDAIS students met or exceeded the standards for applying machine learning models for implementing decision systems for the given practical scenario for method 2 of this learning outcome, thus, achieving the desired performance expectations for learning outcome #3 for the year. It is positive that almost all MSDAIS students successfully applied machine learning models to implement decision systems for the given practical scenario in their project. The cloud-based computing environment (Colab from Google) used to develop and implement machine learning projects worked well compared with the use of laptops/desktops in 2021. Due to Colab's good documentation, ease of use, and high performance computing environment, MSDAIS students learned to develop and train

machine learning models using very large datasets.
Action Plan:
1. For QMST 5336 - Analytics: (a) Additional exam questions and assignments will be provided to enhance students' ability to analyze given dataset using appropriate analytical methods and interpret results to support decision making. (b) Provide more complex project and case study (e.g., use of multivariate regression analysis and categorical variables).
2. For CIS 5367 - Machine Learning: (a) Continue using cloud-based computing environment Colab to develop and implement machine learning projects. This worked well for machine learning due to significant amount of memory and computing power. (b) Use larger and more complex dataset in Machine Learning class to further challenge students in applying machine learning models for implementing decision systems.

Outcome 4

Category: Student Learning Outcome

Apply knowledge and technical skills to perform prescriptive analytics.

The **standards** of performance for the methods below are:

- Scores of 90% correct or better will indicate that the student exceeds expectations
- Scores greater than 80% correct but less than 90% correct will indicate that the student meets expectations
- Scores less than 80% correct will indicate that the student failed to meet expectations.

It is **expected** that 80% of students enrolled in the course during the academic year will meet or exceed the standards on each learning outcome.

Outcome 4 - Method 1

1A. In QMST 5336, Analytics, the assessment technique/rubric for outcome 4 is as follows. At least one problem in exams will be used to assess students' ability to use optimization and/or decision analysis for a given problem. Excellent scores will correctly formulate and solve the problem, as well as properly explain the results. Acceptable scores will have some errors in formulating, solving process, or explaining results. Unacceptable scores will have major errors in formulating, solving process, and explaining results.
1B. In QMST 5332, Optimization, the assessment technique/rubric for outcome 4 is as follows. Several exam questions will assess student's prescriptive analytics skills and knowledge, which includes formulating optimization models (e.g., linear, integer, mixed-integer) and solving optimization models using different tools (e.g., MS Excel, Matlab) for practical scenarios. Excellent scores will have correct formulation, implementation, and interpretation of results. Acceptable scores will have some errors in formulation, implementation, or interpretation of results. Unacceptable scores will have major errors in formulation, implementation, and interpretation of results.

Outcome 4 - Method 1 - Result

SUMMARY STATISTICS FOR OUTCOME #4 IN QMST 5336 - Analytics FOR AY 2021-2022.

Performance Area	Performance	Fall 2021		Spring 2022		Total (Fall 2021 + Spring 2022)	
		Raw #	%	Raw #	%	Raw #	%
Use optimization and/or decision analysis for a scenario	Exceeds	21	95.5%	7	33.3%	28	65.1%
	Meets	1	4.5%	9	42.9%	10	23.3%
	Failed to meet	0	0.0%	5	23.8%	5	11.6%
	Total	**22**	**100**	**21**	**100**	**43**	**100**

Percentage of MSDAIS students who met or exceeded expectations for *using optimization and decision analysis for a given scenario*: 88.4%.
Explanation of Results: In QMST 5336 - Analytics, more than 80% of the MSDAIS students met or exceeded the standards for using optimization and decision analysis for a given scenario for method 1 of this learning outcome, thus, achieving the performance expectations for learning learning outcome #4 for the year. It is positive that more than 80% of the MSDAIS students successfully used optimization and decision analysis for a given scenario and correctly interpreted results. Significant improvement in student performance for method 1 of this learning outcome was achieved by providing students with detailed lecture notes, devoting more class time to discuss these topics, giving additional assignments, and reviewing key concepts to ensure students understand the difficult concepts and are well prepared for this assessment.

SUMMARY STATISTICS FOR OUTCOME #4 IN QMST 5332 - Optimization FOR AY 2021-2022.

Performance Area	Performance	Fall 2021		Spring 2022		Total (Fall 2021 + Spring 2022)	
		Raw #	%	Raw #	%	Raw #	%
Apply prescriptive analytics skills and knowledge	Exceeds	22	53.7%			22	53.7%
	Meets	14	34.1%			14	34.1%
	Failed to meet	5	12.2%			5	12.2%
	Total	**41**	**100**			**41**	**100**

Percentage of MSDAIS students who met or exceeded expectations for *applying prescriptive analytics skills and knowledge*: 87.8%.
Explanation of Results: In QMST 5332 - Optimization, more than 80% of the MSDAIS students met or exceeded the standards for applying

prescriptive analytics skills and knowledge for a given scenario for method 1 of this learning outcome, thus, achieving the performance expectations for learning learning outcome #4 for the year. It is positive that more than 80% of the MSDAIS students successfully applied prescriptive analytics skills and knowledge for given scenarios.

Action Plan:

1. For QMST 5336 - Analytics: (a) Provide detailed notes and additional assignments to enhance students' comprehension of the use of optimization and decision analysis for a given scenario. (b) Devote additional class time to review key optimization and decision analysis concepts.
2. For QMST 5332 - Optimization: (a) Use current approach with minor or no changes.

Outcome 4 - Method 2

2A. In QMST 5336, Analytics, the assessment technique/rubric for outcome 4 is as follows. An out-of-class project will be used to assess students' ability to use appropriate prescriptive analytics to support data-driven decision making in a given scenario. Excellent scores will demonstrate strong capacity of using appropriate prescriptive analytics to support real-life decision making. Acceptable scores will have some errors in performing prescriptive analytics or interpreting results to support decision making. Unacceptable scores will have major errors in performing prescriptive analytics or interpreting results in decision making.

2B. In QMST 5332, Optimization, the assessment technique/rubric for outcome 4 is as follows. A project will assess student's ability to apply prescriptive analytics skills and knowledge to analyze practical optimization problems and their solution concepts. Excellent scores will have correct formulation, analysis, and interpretation of problems and concepts. Acceptable scores will have some errors in formulation, analysis, or interpretation of problems and concepts. Unacceptable scores will have major errors in formulation, analysis, and interpretation of problems and concepts.

Outcome 4 - Method 2 - Result

SUMMARY STATISTICS FOR OUTCOME #4 IN QMST 5336 - Analytics FOR AY 2021-2022.

Performance Area	Performance	Fall 2021		Spring 2022		Total (Fall 2021 + Spring 2022)	
Use appropriate prescriptive analytics to support data-driven decision making for a scenario		**Raw #**	**%**	**Raw #**	**%**	**Raw #**	**%**
	Exceeds	21	95.5%	11	52.4%	32	74.4%
	Meets	1	4.5%	10	47.6%	11	25.6%
	Failed to meet	0	0.0%	0	0.0%	0	0.0%
	Total	**22**	**100**	**21**	**100**	**43**	**100**

Percentage of MSDAIS students who met or exceeded expectations for *using appropriate prescriptive analytics to support data-driven decision making for a scenario*: 100.0%.

Explanation of Results: In QMST 5336 - Analytics, more than 80% of the MSDAIS students met or exceeded the standards for using appropriate prescriptive analytics to support data-driven decision making for a given scenario for method 2 of this learning outcome, thus, achieving the performance expectations for learning learning outcome #4 for the year. It is positive that more than 80% of the MSDAIS students successfully used prescriptive analytics to support data-driven decision making for a given scenario. Improvement in student performance for method 2 of this learning outcome was achieved by providing students with detailed project guidelines, regular meetings with students to check and discuss regarding the semester project, and ensuring team members are actively contributing to the semester team project for applying appropriate prescriptive analytics to make data-driven decisions for a scenario.

SUMMARY STATISTICS FOR OUTCOME #4 IN QMST 5332 - Optimization FOR AY 2021-2022.

Performance Area	Performance	Fall 2021		Spring 2022		Total (Fall 2021 + Spring 2022)	
		Raw #	**%**	**Raw #**	**%**	**Raw #**	**%**
Ability to apply prescriptive analytics skills and knowledge to analyze practical optimization problems and their solution concepts	Exceeds	26	63.4%			26	63.4%
	Meets	15	36.6%			15	36.6%
	Failed to meet	0	0.0%			0	0.0%
	Total	**41**	**100**			**41**	**100**

Percentage of MSDAIS students who met or exceeded expectations for their *ability to apply prescriptive skills and knowledge to analyze practical optimization problems and solution concepts for scenarios*: 100.0%.

Explanation of Results: In QMST 5332 - Optimization, more than 80% of the MSDAIS students met or exceeded the standards for applying prescriptive analytics skills and knowledge to analyze practical optimization problems and solution concepts for given scenarios for method 2 of this learning outcome, thus, achieving the performance expectations for learning learning outcome #4 for the year. It is positive that more than 80% of the MSDAIS students successfully applied prescriptive analytics skills and knowledge to analyze practical optimization problems and solution concepts for given scenarios.

Action Plan:

1. For QMST 5336 - Analytics: (a) Provide detailed detailed project guidelines and schedule regular meetings with project teams to discuss the project and check project progress. (b) Consider adding simulation component to the semester project.
2. For QMST 5332 - Optimization: (a) Use current approach with minor or no changes.

Outcome 5

Category: Student Learning Outcome

Design and implement data management strategies.

The **standards** of performance for the methods below are:

- Scores of 90% correct or better will indicate that the student exceeds expectations
- Scores greater than 80% correct but less than 90% correct will indicate that the student meets expectations
- Scores less than 80% correct will indicate that the student failed to meet expectations.

It is **expected** that 80% of students enrolled in the course during the academic year will meet or exceed the standards on each learning outcome.

Outcome 5 - Method 1

1A. In CIS 5355, Database Management Systems, the assessment technique/rubric for outcome 5 is as follows. CIS 5355 will use exam-embedded questions. Two components assessed include ability to design and implement database and query database to retrieve data for a business scenario. For the first component, at least one exam question will be used to assess students' ability to develop conceptual database design and implement a relational database schema for given business data management requirements. For the second component, several exam questions will require students to write Structure Query Language (SQL) statements to generate required business information. For the first component, excellent scores will have correct conceptual database design and implementation of database schema. Acceptable scores will have some errors in the conceptual database design or implementation of relational schema. Unacceptable scores will have major errors in database design and implementation of relational schema. For the second component, excellent scores will have correct SQL statements that generates required business information. Acceptable scores will have some errors in the SQL statements. Unacceptable scores will have major errors in the SQL statements that do not execute or generates incorrect information.

1B. In CIS 5364, Data Warehousing, the assessment technique/rubric for outcome 5 is as follows. At least one exam question will be used to assess students' ability to develop data warehouse design for given business data analysis requirements. Excellent scores will have correct data warehouse design to support data analysis requirements. Acceptable scores will have some errors in the data warehouse design. Unacceptable scores will have major errors in the data warehouse design which causes data management and analysis issues.

Outcome 5 - Method 1 - Result

SUMMARY STATISTICS FOR OUTCOME #5 IN CIS 5355 - Database Management Systems FOR AY 2021-2022.

Performance Area	Performance	Fall 2021		Spring 2022		Total (Fall 2021 + Spring 2022)	
		Raw #	%	Raw #	%	Raw #	%
Develop conceptual database design for a scenario	Exceeds	6	17.7%	9	40.9%	15	26.8%
	Meets	12	35.3%	9	40.9%	21	37.5%
	Failed to meet	16	47.0%	4	18.2%	20	35.7%
	Total	**34**	**100**	**22**	**100.0**	**56**	**100**
Implement a relational database schema for a business scenario	Exceeds	13	38.2%	9	40.9%	22	39.3%
	Meets	9	26.5%	9	40.9%	18	32.1%
	Failed to meet	12	35.3%	4	18.2%	16	28.6%
	Total	**34**	**100**	**22**	**100**	**56**	**100**

Write Structured Query Language statements to generate required information for a scenario	Exceeds	29	85.3%	7	31.8%	36	64.3%
	Meets	3	8.8%	12	54.6%	15	26.8%
	Failed to meet	2	5.9%	3	13.6%	5	8.9%
	Total	**34**	**100**	**22**	**100.0**	**56**	**100**

Percentage of MSDAIS students who met or exceeded expectations for *developing conceptual database design for a given scenario*: 64.3%.
Percentage of MSDAIS students who met or exceeded expectations for *implementing relational database schema for a business scenario*: 71.4%.
Percentage of MSDAIS students who met or exceeded expectations for *writing Structured Query Language statements to generate required information for a scenario*: 91.1%.
Explanation of Results: In CIS 5355 - Database Management Systems, for method 1, more than 80% of the MSDAIS students met or exceeded the standards for writing Structured Query Language statements to generate required information for a scenario. On the other hand, 64.3% of MSDAIS students met or exceeded the standards for developing conceptual database design for a given scenario and 71.4% of students met or exceeded standards for implementing relational database schema for a business scenario. For these two performance area subcomponents, results were below the desired target of at least 80% of MSDAIS students enrolled in the course meeting or exceeding the standards. It was found that students found conceptual database design and implementing database schema for a business scenario to be relatively difficult. Instructors plan to devote more class time on these topics and provide additional out-of-class practice exercises to improve students' performance in these subcomponents.

SUMMARY STATISTICS FOR OUTCOME #5 IN CIS 5364 - Data Warehousing FOR AY 2021-2022.

Performance Area	**Performance**	**Fall 2021**		**Spring 2022**		**Total (Fall 2021 + Spring 2022)**	
		Raw #	**%**	**Raw #**	**%**	**Raw #**	**%**
Develop data warehouse design for a scenario	Exceeds			33	70.2%	33	70.2%
	Meets			14	29.8%	14	29.8%
	Failed to meet			0	0.0%	0	0.0%
	Total			**47**	**100**	**47**	**100**

Percentage of MSDAIS students who met or exceeded expectations for their ability to *develop data warehouse design for a given scenario*: 100.0%.
In CIS 5364 - Data Warehousing, more than 80% of the MSDAIS students met or exceeded the standards for their ability to develop data warehouse design for a given scenario for method 1 of this learning outcome, thus, achieving the performance expectations for learning learning outcome #5 for the year. It is positive that more than 80% of the MSDAIS students successfully developed data warehouse design for given scenarios. The use of SAP BW/4HANA for implementing data warehouse design enhanced students' understanding of data warehouse design and implementation.
Action Plan:
For CIS 5355 - Database Management Systems: (a) Devote more time in class to explain concepts and do in-class exercises for conceptual database design and writing SQL statements to implement relational database schema for a given scenario. (b) Provide additional out-of-class exercises to improve students' understanding and performance in developing conceptual database design and using SQL for implementing relational database schema.
For CIS 5364 - Data Warehousing: (a) Continue to use detailed slide-set and in-class examples to ensure students understand data warehouse design concepts and can design data warehouse for a given scenario.

Outcome 5 - Method 2

2A. In CIS 5355, Database Management Systems, the assessment technique/rubric for outcome 5 is as follows. Two components assessed include ability to design and implement database and query database to retrieve data for a business scenario. For the first component, at least one out-of-class assignment will be used to assess students' ability to develop conceptual database design and implement a relational database schema for given business data management requirements. For the second component, several assignment questions will require students to write Structure Query Language (SQL) statements to generate required business information. For the first component, excellent scores will have correct conceptual database design and implementation of database schema. Acceptable scores will have some errors in the conceptual database design or implementation of relational schema. Unacceptable scores will have major errors in database design and implementation of relational schema. For the second component, excellent scores will have correct SQL statements that generates required business information. Acceptable scores will have some errors in the SQL statements. Unacceptable scores will have major errors in the SQL statements that do not execute or generates incorrect information.
2B. In CIS 5364, Data Warehousing, the assessment technique/rubric for outcome 5 is as follows. One assignment question will be used to assess students' ability to develop data warehouse design for given business data analysis requirements. Excellent scores will have correct data warehouse design to support data analysis requirements. Acceptable scores will have some errors in the data warehouse design. Unacceptable scores will have major errors in the data warehouse design which causes data management and analysis issues.

Outcome 5 - Method 2 - Result

SUMMARY STATISTICS FOR OUTCOME #5 IN CIS 5355 - Database Management Systems FOR AY 2021-2022.

Performance Area	Performance	Fall 2021		Spring 2022		Total (Fall 2021 + Spring 2022)	
		Raw #	%	Raw #	%	Raw #	%
Develop conceptual database design for a scenario	Exceeds	11	32.4%	8	36.4%	19	33.9%
	Meets	11	32.4%	12	54.5%	23	41.1%
	Failed to meet	12	35.2%	2	9.1%	14	25.0%
	Total	**34**	**100**	**22**	**100**	**56**	**100**
Implement a relational database schema for a business scenario	Exceeds	14	41.2%	22	100.0%	36	64.3%
	Meets	9	26.5%	0	0.0%	9	16.1%
	Failed to meet	11	32.3%	0	0.0%	11	19.6%
	Total	**34**	**100**	**22**	**100**	**56**	**100**
Write Structured Query Language statements to generate required information for a scenario	Exceeds	34	100.0%	20	90.9%	54	96.4%
	Meets	0	0.0%	0	0.0%	0	0.0%
	Failed to meet	0	0.0%	2	9.1%	2	3.6%
	Total	**34**	**100**	**22**	**100**	**56**	**100**

Percentage of MSDAIS students who met or exceeded expectations for *developing conceptual database design for a given scenario*: 75.0%.
Percentage of MSDAIS students who met or exceeded expectations for *implementing relational database schema for a business scenario*: 80.4%.
Percentage of MSDAIS students who met or exceeded expectations for *writing Structured Query Language statements to generate required information for a scenario*: 96.4%.

Explanation of Results: In CIS 5355 - Database Management Systems, for method 2, more than 80% of the MSDAIS students met or exceeded the standards for subcomponents implementing relational database schema for a business scenario and writing Structured Query Language statements to generate required information for a scenario. On the other hand, 75% of MSDAIS students met or exceeded the standards for developing conceptual database design for a given scenario . For this performance area subcomponent, result was below the desired target of at least 80% of MSDAIS students enrolled in the course meeting or exceeding the standards. Instructors plan to devote more class time on conceptual database design and SQL for implementing relational database schema and provide additional out-of-class practice exercises to improve students' performance in these subcomponents. Additional time spent on these subcomponents and exercises provided this year resulted in improvement in student performance in implementing relational database schema for a given business scenario.

SUMMARY STATISTICS FOR OUTCOME #5 IN CIS 5364 - Data Warehousing FOR AY 2021-2022.

Performance Area	Performance	Fall 2021		Spring 2022		Total (Fall 2021 + Spring 2022)	
		Raw #	%	Raw #	%	Raw #	%
Develop data warehouse design for a scenario	Exceeds			30	63.8%	30	63.8%
	Meets			16	34.0%	16	34.0%
	Failed to meet			1	2.2%	1	2.2%
	Total			**47**	**100**	**47**	**100**

Percentage of MSDAIS students who met or exceeded expectations for their ability to *develop data warehouse design for a given scenario*: 97.8%.
Explanation of Results: In CIS 5364 - Data Warehousing, more than 80% of the MSDAIS students met or exceeded the standards for their ability to develop data warehouse design for a given scenario for method 2 of this learning outcome, thus, achieving the performance expectations for learning learning outcome #5 for the year. It is positive that more than 80% of the MSDAIS students successfully developed data warehouse design for given scenarios. The use of SAP BW/4HANA for implementing data warehouse design enhanced students' understanding of data warehouse

design and implementation.
Action Plan:
For CIS 5355 - Database Management Systems: (a) Devote more time in class to explain concepts and do in-class exercises for conceptual database design and writing SQL statements to implement relational database schema for a given scenario. (b) Provide additional out-of-class exercises to improve students' understanding and performance in developing conceptual database design and using SQL for implementing relational database schema.
For CIS 5364 - Data Warehousing: (a) Continue to use detailed slide-set and in-class examples to ensure students understand data warehouse design concepts and can design data warehouse for a given scenario.

Outcome 6

Goal: 1. Promote the success of all students.
Initiative: 1.3 Increase student retention and graduation rates.
The academic program will promote and realize gains in student success.

Outcome 6 - Method 1

Student retention success will be measured by observing one year retention rates of students enrolled in the academic program from their first to second year. Data will be obtained from the university's certified enrollment records at the end of the fall semester. Rates of retention success will be expected to be at or above the university average for this level of program.

Outcome 6 - Method 1 - Result

For 2020-2021, the retention percentage for this program was approximately 98.5%. One student out of 66 students did not return to take classes.

Outcome 6 - Method 2

Student graduation success will be measured by observing the number of graduates from the academic program in during the fall, spring, and summer semesters and comparing the number of graduates to the number of students enrolled in the program. Data will be obtained from the university's certified enrollment records for the fall, spring, and summer semesters. The number of graduates is expected to be at or above the university rate of graduation for this level of program.

Outcome 6 - Method 2 - Result

Because the MSDAIS is a new program, no graduation data is available from Institutional Research. The number of students enrolled in the MSDAIS program in Fall 2021 was 74. Twelve MSDAIS students graduated in Fall 2021 and 16 students graduated in Spring 2022. Approximately 37% of MSDAIS students graduated in 2021-2022. As time goes by, graduation rates will be available for analysis.

Outcome 7

Goal: 4. Provide the necessary services, resources, and infrastructure to support the university's strategic direction.
Initiative: 4.9 Provide a diverse and inclusive environment of support to achieve the highest level of performance for all member of the campus community.
The academic program will promote and realize diversity among its student population.

Outcome 7 - Method 1

Student gender diversity will be measured by reviewing the number and percentage of male and female students enrolled in the academic program during the fall, spring, and summer semesters. Data will be obtained from the university's certified enrollment records at the end of the fall semester. Student gender diversity will be expected to be balanced (50/50).

Outcome 7 - Method 1 - Result

Because the MSDAIS program is only two years in existence, only two years of data are available for analysis. In AY 2020 there were 15 female (75%) and 5 male (25%) students enrolled in the program. In AY2021, strong growth in the program yielded 44 female (67%) and 22 male (33%) students. For these two years, the university's ratio was 68% female and 32% male. As time goes by, more years of data will be available for analysis.

Outcome 7 - Method 2

Student racial and ethnic diversity will be measured by observing race and ethnicity of students enrolled in the academic program during the fall, spring, and summer semesters. Data will be obtained from the university's certified enrollment records at the end of the fall semester. Student racial and ethnic diversity will be expected to mirror percentages in the population of the state of Texas.

Outcome 7 - Method 2 - Result

Two years of data exist for this new program. In AY2020, 10% of students were Asian, 5% Black, 10% Hispanic, 70% International, and 5% White. In AY2021, 14% were Asian, 9% Black, 12% Hispanic, 2% Multi-racial, 41% International, and 20% White. At the university level masters students in AY2021 were 3% Asian, 9% Black, 25% Hispanic, 2% Multi-racial, 7% International, and 53% White. These percentages do not reflect the State of Texas.

Approval History	
Approval History Event	**Approver**
Outcomes Approved Level 1	Alexander McLeod (a_m919)
Outcomes Approved Level 2	Sanjay Ramchander (s_r828)
Outcomes Audit Report Submitted	Diego Vacaflores Rivero (dv13)
Results Approved Level 1	Alexander McLeod (a_m919)
Results Approved Level 2	Sanjay Ramchander (s_r828)
Results Audit Report Submitted	Diego Vacaflores Rivero (dv13)