**David Eccles School of Business**

**2020 AACSB Accreditation Appendix to Report**

**Appendix A: LEARNING AND TEACHING**

UNDERGRADUATE DETAIL

| **Learning Objectives**  What did we assess | **Sample**  Who did we assess? When? Where? | **Methods**  How did we assess? (attach rubrics) | **Findings/**  **Evidence**  What did we find out? | **Interpretation/ Action Items**  What are we going to do about it? |
| --- | --- | --- | --- | --- |
| 1. ***Essential Business Knowledge***: Students will develop a thorough understanding of the functional areas of business. | Seniors in STRAT 5700, Summer 2017 (127 students)/Fall 2017 (254)/Spring 2019 (148) | ETS Subject Exam | Depending on the term, between 48 and 69% of students scored above the median. Our goal is to have at least 65% above the median consistently. | We were not satisfied with our performance relative to the median. In particular, we were concerned that our students did not retain knowledge learned in earlier courses and were not able to apply that knowledge holistically and contextually. Significant revision of undergraduate core curriculum implemented beginning in Fall 2019, impacting all areas tested in the ETS exam. |
| 1. ***Problem Solving Skills***: Apply foundational business knowledge through utilization of quantitative, analytical, and critical skills. | Seniors in STRAT 5700, Summer 2017 (127 students)/Fall 2017 (254)/Spring 2019 (148) | ETS Exam – Quantitative Business Analysis Subscore | We ranked between 40th and 55th percentile and students got between 35 and 40% of questions correct. Our goal is at least 50% correct. | While percentile was relatively high, we would still like our students to demonstrate stronger quantitative skills. Introduced new first year, two semester course in Frameworks for Business Problems to introduce key analytic skills in applied format. |
| Freshman in BUS 3995, Fall 2017 (294 students) /Fall 2019 (483) | CLA+ Exam | We ranked in the 83rd to 84th percentile and 57% to 61% of students scored proficient or above. | As we began to explore ways to enhance problem framing and solving skills through our curriculum, we sought to establish a baseline for current critical thinking skills prior to the curriculum changes. However, this test only administered to students in our Business Scholars program, who had early exposure to critical thinking modules, In order to ensure this learning for all students, the new curriculum moves these modules from select course to a first year core course taken by all students. We will also administer the test to seniors in the future to measure retention of these skills. |
| 1. ***Effective Communication***: An ability to write and speak clearly and to work within group settings to effectively accomplish personal and professional goals. | Seniors in STRAT 5700 and 5701, Fall 2016 (30 and 13 students respectively) / Spring 2017 (32 and 18) / Summer 2018 (53 and 0) | Case papers assessed against rubric | **STRAT 5700**:  Excellent: 42% - 55%  Adequate: 31% - 42%  Inadequate: 14% - 15%  **STRAT 5701**:  Excellent: 72%  Adequate: 24%  Inadequate: 4% | Written communication skills are not satisfactory. New core curriculum courses have been designed around cases, requiring more written work than had previously been assigned, particularly early in the curriculum. We are also teaching data visualization and presentations to enhance communication skills and methods. |
| 1. ***Entrepreneurial and Strategic Mindset***: Foster the capability to employ innovative and entrepreneurial mindset and skills as appropriate. | New metric in planning as a part of new strategic plan  Has not been measured yet. | Will identify appropriate tool. |  | Created new first year course – Value, Impact, Business, and Entrepreneurship – to begin fostering this mindset. Subsequent core material in all business disciplines will be taught in an integrated semester to enhance holistic, strategic understanding. |
| 1. ***Engaged Citizenship***: Prepare students to be ethically and globally aware citizens. | Seniors in STRAT 5700, Summer 2017 (127 students)/Fall 2017 (254)/Spring 2019 (148) | ETS Exam – Business and Society subscores | We ranked between 3rd and 26th percentile and students got between 43 and 45% questions correct. | Created new first year course – Value, Impact, Business, and Entrepreneurship – to begin fostering this mindset. Subsequent core material in all business disciplines will be taught in an integrated semester to enhance holistic, strategic understanding.  We would like students to have a greater understanding of the legal, social, and cultural contexts within which businesses operate. We are engaged in ongoing evaluation of content in core courses including BUS 38xx, BUS 39xx, STRAT 3410, and Global Perspectives requirements. |

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| --- | --- | --- | --- |
| **2016-17 STRAT 5700 (62 students)** | **Excellent** | **Adequate** | **Inadequate** |
| Main Idea | 77.4% | 9.7% | 12.9% |
| Systematic application of concepts | 24.2% | 46.8% | 29.0% |
| Key ideas emphasized | 88.7% | 9.7% | 1.6% |
| Use of supporting evidence | 41.9% | 51.6% | 6.5% |
| Style/Grammar | 38.7% | 48.4% | 12.9% |
| **Overall (weighted)** | **42.3%** | **42.5%** | **15.2%** |
| **2016-17 STRAT 5701 (31 students)** | **Excellent** | **Adequate** | **Inadequate** |
| Main Idea | 90.3% | 3.2% | 6.5% |
| Systematic application of concepts | 58.1% | 32.3% | 9.7% |
| Key ideas emphasized | 100.0% | 0.0% | 0.0% |
| Use of supporting evidence | 71.0% | 29.0% | 0.0% |
| Style/Grammar | 77.4% | 22.6% | 0.0% |
| **Overall (weighted)** | **71.8%** | **24.5%** | **3.8%** |
| **2018-19 STRAT 5700 (53 students)** | **Excellent** | **Adequate** | **Inadequate** |
| Main Idea | 41.5% | 43.4% | 15.1% |
| Systematic application of concepts | 57.0% | 22.0% | 20.0% |
| Key ideas emphasized | 64.2% | 24.5% | 11.3% |
| Use of supporting evidence | 56.6% | 35.8% | 7.5% |
| Style/Grammar | 50.9% | 35.8% | 13.2% |
| **Overall (weighted)** | **55.2%** | **30.9%** | **13.6%** |

**Rubric for Evaluating Writing Papers in STRAT 5700/01**

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| --- | --- | --- |
| 1A: Main idea clearly stated at the beginning of the paper. | 1B: Paper appears to have a main idea, but it is either not clearly stated or not stated in the opening of the paper. | 1C: Paper either had no main idea or it takes some work for the reader to find it. |
| 2A: Concepts applied systematically. | 2B: Concepts applied but application needs more development or application could be more systematic. | 2C: Concepts either not applied or barely applied (or incorrect concepts applied) or the paper deals with peripheral issues. |
| 3A: Main ideas and key supporting ideas highlighted or emphasized by formatting (e.g. bold or underlined). | 3B: Main idea highlighted but key supporting ideas are not emphasized (or too many supporting ideas are emphasized). | 3C: Main idea is not emphasized. |
| 4A: Evidence is used that clearly supports main points.  Exhibits or appendices organize ideas or evidence in a compelling way. | 4B: Evidence used does not strongly support main ideas.  Exhibits or appendices do not clearly support main points. | 4C: No evidence is used to support main idea or evidence used does not support idea.  No exhibits or appendices. |
| 5A: Style and grammar: paper is written in a compelling style with no more than minor typos.  No passive voice.  Recommendations made in first person. NO BULLET POINTS or lists.  Essay-style only. | 5B: Style and grammar have no serious errors and few minor problems. | 5C: Paper has major grammatical problems, numerous typos, uses passive voice, or is not clearly structured. PO uses bullet points or lists. |
| 6A: Paper is highly effective, well written, and compelling.  It deals with core issues and skillfully employs course concepts to make its arguments.  Overall quality is above average to excellent. | 6B:  Paper is effective.  It deals with core issues and applies important course concepts in a somewhat persuasive way. Overall quality is average to good. | 6C:  Paper is not effective or persuasive.  It does not deal with the core issues of the case or it does not adequately use course concepts to make it case.  Overall quality is below average to average. |

**ETS Summary Scores**

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| --- | --- | --- | --- | --- | --- |
| **Subject Scores - % Correct (U of U)** | **2009** | **2013** | **Su2017** | **F2017** | **S2019** |
| Accounting | 58 | 54 | 46 | 48 | 50 |
| Economics | 57 | 50 | 41 | 43 | 45 |
| Management | 67 | 60 | 57 | 61 | 66 |
| Quantitative Business Analysis | 52 | 46 | 35 | 36 | 40 |
| Finance | 68 | 58 | 49 | 54 | 52 |
| Marketing | 60 | 59 | 50 | 51 | 58 |
| Legal and Social Environment | 52 | 57 | 45 | 45 | 43 |
| Information Systems | 67 | 62 | 53 | 53 | 55 |
| International Issues | 68 | 57 | 41 | 42 | 44 |

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| **mean** | **2013** | **Su2017** | **F2017** | **S2019** |
| Individual Score - U of U | 152.6 | 150.7 | 153.5 | 157 |
| % above national Median | 69.0% | 48.0% | 56.7% | 69% |

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| --- | --- | --- | --- | --- |
| **Spring 2019 Subject Scores - mean % correct** | **UofU** | **National** | **UofU percentile** | **%tile change from 2013** |
| Accounting | 50 | 43.9 | 76 | -15 |
| Economics | 45 | 44.2 | 51 | -31 |
| Management | 66 | 57.0 | 92 | 33 |
| Quantitative Business Analysis | 40 | 40.6 | 40 | -49 |
| Finance | 52 | 42.7 | 90 | -8 |
| Marketing | 58 | 55.0 | 59 | -6 |
| Legal and Social Environment | 43 | 55.4 | 3 | -47 |
| Information Systems | 55 | 48.4 | 81 | -16 |
| International Issues | 44 | 52.7 | 10 | -59 |

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| **Fall 2017 Subject Scores - mean % correct** | **UofU** | **National** | **UofU percentile** | **change from 2013** |
| Accounting | 48 | 43.2 | 79 | -12 |
| Economics | 43 | 40.6 | 61 | -21 |
| Management | 61 | 61.5 | 38 | -21 |
| Quantitative Business Analysis | 36 | 34.0 | 61 | -28 |
| Finance | 54 | 43.3 | 97 | -1 |
| Marketing | 51 | 50.2 | 43 | -22 |
| Legal and Social Environment | 45 | 46.8 | 26 | -24 |
| Information Systems | 53 | 51.5 | 54 | -43 |
| International Issues | 42 | 40.0 | 56 | -13 |

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| --- | --- | --- | --- | --- |
| **Summer 2017 Subject Scores - mean % correct** | **UofU** | **National** | **UofU percentile** | **change from 2013** |
| Accounting | 46 | 43.2 | 65 | -26 |
| Economics | 41 | 40.6 | 43 | -39 |
| Management | 57 | 61.5 | 23 | -36 |
| Quantitative Business Analysis | 35 | 34.0 | 55 | -34 |
| Finance | 49 | 43.3 | 83 | -15 |
| Marketing | 50 | 50.2 | 36 | -29 |
| Legal and Social Environment | 45 | 46.8 | 26 | -24 |
| Information Systems | 53 | 51.5 | 54 | -43 |
| International Issues | 41 | 40.0 | 48 | -21 |

MASTER OF SCIENCE IN FINANCE DETAIL

|  | **Learning Objectives**  *What did we assess?* | **Sample**  *Who did we assess? When? Where?* | **Methods**  *How did we assess? (attach rubrics)* | **Findings/Evidence**  *What did we find out?* | **Interpretation/Action Items**  *What are we going to do about it?* |
| --- | --- | --- | --- | --- | --- |
| Measure 1 | Students will apply knowledge on prevailing financial theory to solve problems in corporate finance, investments and portfolio management, and financial statement analysis on a comprehensive exam. | 30 graduating students. Date: Nov 2017. Location: CRCC 115. | Students took a multiple choice exam that included questions on finance subjects. | Spring 2016 Exit Exam Results indicated a deficiency in basic corporate and investment finance preparation. This exam revealed the same. However, many students were legacy students who had not taken updated core. | Corporate and investment finance courses were added to the core curriculum. Exit exam re-written to be used as primary assessment tool. Divided up into five – 10 question modules focused on corporate and investment finance, Excel, financial statement analysis, and statistics, consistent with updated core curriculum. |
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| Measure 2 | Students will apply knowledge on prevailing financial theory to solve problems in corporate finance, investments and portfolio management, and financial statement analysis on a comprehensive exam. | 35 graduating students. Date: October 2018. Location: CRCC 205. | Students took a multiple choice exam that included questions on finance subjects. | Spring 2018 Exit Exam Results indicated improvement and more than 80% of students met or exceeded expectations. | The core curriculum and assessment will remain the same. However, we will continue to update the exam to reflect the core curriculum. Exam questions are provided by faculty. |
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| Measure 1 | Students will graduate at an advanced intermediate level in Excel. | 38 graduating students. Date: 30 March 2018, 20 April 2018. SFEBB 5180. | Students took a multiple choice exam that included specific questions on excel. | Students demonstrated proficiency in Excel at an advanced intermediate level. | Exit exam re-written to include a formal section on Excel with questions provided exclusively by faculty. |
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| Measure 2 | Students will graduate at an advanced intermediate level in Excel. | 38 graduating students. Date: 30 March 2018, 20 April 2018. SFEBB 5180. | Students took a multiple choice exam that includes specific questions on excel. | Students demonstrated proficiency in Excel at an advanced intermediate level. | As students demonstrated proficiency in Excel, the curriculum and assessment will remain the same. |
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| Measure 1 | Students will portray professional preparation in a mock job interview conducted by MSF Career Services personnel. | 9 students. Spring 2017. Career services office. | Students were interviewed by MSF Career Services personnel using the attached rubric. | Professional preparation was not up to program standards. Program growth resulted in a student load that was too large for a single career coach. | Began the process to hire a new career coach and separate student coaching and corporate outreach responsibilities. |
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| Measure 2 | Students will portray professional preparation in a mock job interview conducted by MSF Career Services personnel. | 7 students. Spring 2018. Career services office. | Students were interviewed by MSF Career Services personnel using the attached rubric. | Professional preparation was not up to program standards. Program growth resulted in a student load that was too much for a single career coach. | In March 2019, we hired an additional career services team member to help students with their resumes and interview preparation and moved existing staff member to corporate outreach. |
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Objective 1

Benchmark: 80% of students should meet or exceed expectations.

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| **Investments/Corporate Finance** | | | | |
| **Expectations** |  | **2017** |  | **2018** |
| Exceeded Expectations (90 to 100%) | 0 | 0% | 11 | 31% |
| Met Expectations (60 to 89%) | 12 | 43% | 19 | 54% |
| Did not Meet (Below 60%) | 16 | 57% | 5 | 14% |
| **Total** | **28** | **100%** | **35** | **100%** |

Objective 2

Benchmark: 80% of students should meet or exceed expectations.

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| **Excel** | | | | |
| **Expectations** |  | **2017** |  | **2018** |
| Exceeded Expectations (90 to 100%) | 10 | 36% | 18 | 51% |
| Met Expectations (60 to 89%) | 14 | 50% | 12 | 34% |
| Did not Meet (Below 60%) | 4 | 14% | 5 | 14% |
| **Total** | **28** | **100%** | **34** | **100%** |

Objective 3

Rubric:

**Mock Exit Interview**

Score each question 1-5.

1) Tell me about yourself

2) What are the 3 most important skills that you believe you would bring to our company if we hired you?

3) Tell me about a difficult decision you have made.

4) Describe a work situation where you have had to take a risk

5) What is your biggest accomplishment?

6) Tell me about a time when you motivated others?

7) Give an example of a successful project that you were part of. What was your role?

8) Why should we hire you?

Practice Interview Scoring guideline:

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| --- | --- | --- |
| 5 | 3 | 1 |
| 1) Chronological, easy to follow structure/flow | Moderate details  Mentions few or no skills  Flow and timing can be improved | Lacks detail |
| 2) Evidence of research on company cites details that are not obvious  Displays interests and establishes personal fit with company values/culture | Provides obvious surface level company knowledge  Identifies a few ways they connect with the company  Fails to provide evidence detailing the connection | Generally unknowledgeable about the company  May provide inaccurate information or details |
| 3-7) Provides specific relevant examples  Uses START model (Situation, Task, Action Result Takeaway) | START Model Incomplete  Some details provided | Fails to provide a specific example  Response is only loosely applicable to the question |

Benchmark: 80% of students should meet or exceed expectations.

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| **Mock Interview** | **2017** | | **2018** | |
| Exceeded Expectations (100%) | 0 | 0% | 0 | 0% |
| Met Expectations (90-99%) | 4 | 57% | 5 | 56% |
| Did Not Meet Expectations (Below 90%) | 3 | 43% | 4 | 44% |
| **Total** | **7** | **100%** | **9** | **100%** |

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| **MSF Program Curriculum Map** | | | |  |  | |
| Goals - Students will be: | Goal 1 - Problem Solvers | Goal 2 - Technologically Proficient | Goal 3 - Prepared to compete for a job in finance |  |  | |
| Objectives | Objective 1 - Students will apply knowledge on prevailing financial theory to solve problems in corporate finance, investments and portfolio management, and financial statements analysis on a comprehensive exam. | Objective 1 - Students will graduate at an advanced intermediate level in Excel. | Objective 1 - Students will portray professional preparation in a mock job interview conducted by MSF Career Services personnel. |  |  | |
| **Core** | | | |  |  | |
| Reading & Interpreting Financial Statements | I | R |  | Key: |  |
| Financial Application of Statistical Models | I | R |  | I | Introduced |
| Introduction to Financial Programing | I |  |  | R | Reinforced |
| Financial Modeling | M | M | R | M | Mastered |
| Advanced Corporate Finance | R | R |  |  |  | |
| Investments & Portfolio Management | R | R |  |  |  | |
| Intermediate Excel (Co-Req) | I, R | I | R |  |  | |
| **Elective** | | | |  |  | |
| Derivatives & Risk Management | R | R |  |  |  | |
| CFA I | R |  | R |  |  | |
| CFA II | R |  | R |  |  | |
| Business Valuation & Analysis | R |  |  |  |  | |
| International Finance | R |  |  |  |  | |
| Venture Capital | I |  |  |  |  | |
| VBA | I | R |  |  |  | |
| Mergers & Acquisitions | R | R |  |  |  | |
| Financial Markets Lab | R | R |  |  |  | |
| Project Consulting | M | R | M |  |  | |
| Fixed Income Investing | M | R | R |  |  | |
| University Growth Fund | R | R | R |  |  | |
| Impact Fund | R |  | R |  |  | |
| Financial Engineering | R | R |  |  |  | |
| Finance Professional Lecture Series | I |  | I |  |  | |
| Finance Consulting | R |  | R |  |  | |
| Private Equity | R |  |  |  |  | |
| Real Estate Investment Trusts | R |  |  |  |  | |
| Cases in Financial Strategy | R |  |  |  |  | |
| Principles of Security Trading | R |  |  |  |  | |
| Due Diligence Process | R |  |  |  |  | |

MASTER OF HEALTHCARE ADMINISTRATION DETAIL

| **Learning Objective**  **MHA Competency Domains** | **Sample** | **Method** | **Findings** | **Interpretation/Action Item** |
| --- | --- | --- | --- | --- |
| ***Strategic and Critical Thinking***: Students will use critical thinking to discern among alternatives and devise recommendations to reach organization goals and strategic objectives. | **Who:** MHA Students  **When:** Entry to the program; midpoint (after internship completion); Graduation | **How:** Qualtrics survey evaluating competency domains.  (3) Self-evaluations (Appendix A)  (1) Preceptor evaluation (Appendix A)  Internship Coursework  (syllabus Appendix A) | Across all evaluation points strategic and critical thinking was one of the lowest rated domains. | In 2016 we added a capstone course and a healthcare strategic management course to improve student learning outcomes. The capstone course provides students with an opportunity to complete a project for a healthcare organization. Our strategy course expands on strategic mgmt. concepts students are introduced to in early course work and during their internship. Both the capstone and strategy course are positioned in the students final year of the program. |
| ***Relationship Management and Team Work***: Students will demonstrate the ability to engage in and manage positive relationships with individuals and teams both as leader and member. | **Who:** MHA Students  **When:** Entry to the program; midpoint (after internship completion); Graduation | **How:** Qualtrics survey evaluating competency domains.  (3) Self-evaluations  (1) Preceptor evaluation  Internship Coursework | Across all evaluation points Relationship management and teamwork were one of the highest rated domains. |  |
| ***Leadership and Ethics***: Students will demonstrate emotional intelligence and the ability to utilize principal based leadership in decision-making. | **Who:** MHA Students  **When:** Entry to the program; midpoint (after internship completion); Graduation | **How:** Qualtrics survey evaluating competency domains.  (3) Self-evaluations  (1) Preceptor evaluation  Internship Coursework | Across all evaluation points relationship management and teamwork were one of the highest rated domains. |  |
| ***Business Knowledge and Skills***: Students will understand the fundamental principles of a healthcare organization and will be able to navigate the industry based on knowledge of governance structures, funding mechanisms, and health policy and economics. | **Who:** MHA Students  **When:** Entry to the program; midpoint (after internship completion); Graduation | **How:** Qualtrics survey evaluating competency domains.  (3) Self-evaluations  (1) Preceptor evaluation  Internship Coursework | Across all evaluation points business knowledge and skills were rated one of the lowest domains. | We’ve added additional healthcare accounting and finance, healthcare operations and healthcare analytics courses to our programs of study to improve student outcomes in business knowledge and skills. |
| ***Communication***: Students will demonstrate their ability to speak and write clearly through the delivery of cogent business presentations. | **Who:** MHA Students  **When:** Entry to the program; midpoint (after internship completion); Graduation | **How:** Qualtrics survey evaluating competency domains.  (3) Self-evaluations  (1) Preceptor evaluation  Internship Coursework | Across all evaluation points communication was rated one of the highest domains. |  |

MASTER OF SCIENCE IN BUSINESS ANALYTICS DETAIL

| **Learning Objectives**  What did we assess | **Sample**  Who did we assess? When? Where? | **Methods**  How did we assess? (attach rubrics) | **Findings/**  **Evidence**  What did we find out? | **Interpretation/ Action Items**  What are we going to do about it? |
| --- | --- | --- | --- | --- |
| Understand information technology and statistics/quantitative methods in a business setting. | Graduating MSBA students. Qualtrics. | Student exit surveys via Qualtrics and an internally developed aCAP exam simulator. | Some concerns from students about course overlap as well as insufficient coverage of certain key topical areas. | Students: We held a town hall meeting with students in Spring of 2019 to discuss areas of improvement with students. Feedback has been shared with the MSBA faculty. Course adjustments are underway to address primary issues. We are also framing out a program structure based on the student and faculty feedback to rectify content shortfalls.  Faculty: Coordination underway with faculty and the curriculum committee to address course overlap issues and to discuss how to also address knowledge gap areas. |
| Knowledge of the impact of data analytics on business practices, including data creation, data sharing, data analytics, data mining, data reporting, and storage between and across organizations including related ethical issues. | Graduating MSBA students. Qualtrics.  MSBA faculty meeting (August 2018 and March 2019)  MSBA Advisory Board (2018 Meetings) | Student exit surveys and an internally developed aCAP exam simulator.  Qualitative data collected via faculty meeting.  Qualitative data collected from MSBA advisory board. | Employers, students, and faculty all agree that business context is key for an MSBA program. Non business undergrads especially need business context in a grad program.  Our faculty use different approaches to introducing business context. | Students: We held a town hall meeting with students in Spring of 2019 to discuss areas of improvement with students. Feedback has been shared with the MSBA faculty. We are also continuing to modify our program structure to better integrate business and analytics concepts based on student and faculty feedback.  We have pulled faculty together twice to share best practices and course outlines. Additional meetings will be forthcoming. |
| Mastery of the seven aCAP knowledge domains | Incoming and graduating MSBA students. Every semester. CANVAS (program resources and career development class). | An internally developed aCAP exam simulator using the INFORMS study guide and faculty input. | Timing of delivery and user engagement is a concern. Course curriculum needs to better align with content areas assessed by the aCAP exam. | A content matrix was developed from the INFORMS analytic body of knowledge and MSBA faculty were polled to indicate the extent to which their classes align with the expected content. Excessive content overlap and coordination issues were found (i.e. repetitive data sets). We have been engaging faculty and our curriculum committee in making updates to classes as needed to address these issues. |

| **MSBA -- Course Overlap Analysis (Content Matrix)** |  | **INSTRUCTIONS:** Enter "Y" for the topics covered in your class. If you do not cover the material, please leave the cell blank.  **Example** | **IS 6487** | **IS 6489** | **IS 6420** | **IS 6482** | **IS 6493** | **IS 6491** | **IS 6496** | **MKTG 6600** | **MKTG 6310** | **MKTG 6620** | **OIS 6610** | **OIS 6611** |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Domain I Business Problem (Question) Framing** |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Obtain or receive problem statement and usability requirements |  |  |  |  | **Y** |  |  | **Y** |  |  |  |  |  |  |
|  | Business Process Modeling or Mapping (BPM) | **Y** |  |  |  |  |  |  |  |  |  |  |  |  |
| Identify stakeholders |  |  |  |  | **Y** |  |  | **Y** |  |  |  |  |  |  |
| Determine if the problem is amenable to an analytics solution |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | Ethics (HIPAA, IRB, Etc.) |  |  |  |  |  |  |  |  | **Y** |  |  |  |  |
|  | Influence diagrams | **Y** |  |  |  |  |  |  |  |  |  |  |  |  |
| Refine the problem statement and delineate constraints |  |  |  |  | **Y** |  |  | **Y** |  |  |  |  |  |  |
|  | Scientific Method |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | IMRaD |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | Research Methods | **Y** |  |  |  |  |  |  |  |  |  |  |  |  |
|  | Hypothesis testing (also type I and type II error) | **Y** | **Y** | **Y** |  | **Y** |  |  |  | **Y** |  |  |  |  |
|  | Independent and Dependent Variables |  | **Y** | **Y** |  | **Y** |  |  |  | **Y** |  | **Y** |  |  |
|  | Dummy variables | **Y** | **Y** | **Y** |  | **Y** |  |  |  |  |  | **Y** |  |  |
|  | Experimental Controls |  | **Y** |  |  |  |  |  |  |  |  |  |  |  |
|  | Extraneous Variables |  |  |  |  |  | **Y** |  |  |  |  |  |  |  |
|  | Moderator Variables |  |  |  |  |  |  |  |  | **Y** |  |  |  |  |
|  | Mediator Variables |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | Experimental granularity |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | Ambiguity, reference point effects, etc. |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | Repeated measures |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | Sources of Bias |  |  | **Y** |  |  |  |  |  |  |  | **Y** |  |  |
|  | confounding |  |  | **Y** |  |  | **Y** |  |  |  |  |  |  |  |
|  | nonindependence |  |  | **Y** |  |  |  |  |  |  |  |  |  |  |
|  | normality |  |  | **Y** |  |  |  |  |  |  |  |  |  |  |
|  | Statistical Power |  | **Y** |  |  |  |  |  |  |  |  |  |  |  |
|  | Threats to Validity (Internal and External) |  |  |  |  |  |  |  |  | **Y** |  | **Y** |  |  |
|  | Reliability |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | Precision versus accuracy |  |  |  |  | **Y** |  |  |  |  |  | **Y** |  |  |
| Define an initial set of business benefits |  |  |  |  |  |  |  |  |  | **Y** |  | **Y** |  |  |
| Obtain stakeholder agreement on the problem |  |  |  |  | **Y** |  |  | **Y** |  |  |  |  |  |  |
|  | Project Management |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | Software Engineering Process (Waterfall, RAD, Incremental, Spiral, Agile) |  |  |  | **Y** |  |  |  |  |  |  |  |  |  |
| **Domain II Analytics Problem Framing** |  |  |  |  |  |  |  |  |  | **Y** |  |  |  |  |
| Reformulate the problem statement as an analytics problem |  |  |  |  |  |  |  | **Y** |  |  |  | **Y** |  |  |
|  | Methods of Requirement Decomposition: Quality Function Deployment (QFD) |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | Kano's Requirements Model |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Develop a proposed set of drivers and relationships to outputs |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | Anchoring (Kahneman) |  |  |  |  |  |  |  |  |  |  |  |  |  |
| State the set of assumptions related to the problem |  |  |  |  |  |  |  | **Y** |  |  |  |  |  |  |
| Define key metrics of success |  |  |  |  |  |  |  |  |  |  |  | **Y** |  |  |
|  | (Drucker, Pearson's Law, Hawthorne Effect) |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Obtain stakeholder agreement |  |  |  |  |  |  |  | **Y** |  |  |  |  |  |  |
| **Domain III Data** |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Identify and prioritize data needs and sources |  |  |  |  | **Y** |  |  | **Y** |  | **Y** |  | **Y** |  |  |
|  | Methodology: Economic Man (Economics) |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | Conjoint measurement or analysis & utility functions |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | Subjective probability |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Identify means of data collection and acquisition (acquire data) |  |  |  |  | **Y** |  |  | **Y** |  |  |  |  |  |  |
|  | Psychometrics (writing good questions) |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | determining the questions to be asked |  |  |  |  | **Y** |  |  |  |  |  |  |  |  |
|  | relational vs. non-relational databases |  |  |  | **Y** |  |  |  |  |  |  |  |  |  |
|  | Data warehousing |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | ETL Processes |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | Sample design (random, convenience, etc.) |  |  |  |  |  |  |  |  | **Y** |  |  |  |  |
|  | Sampling bias |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | Sample plan |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | Sampling: Population vs. sample |  |  | **Y** |  |  |  |  |  | **Y** |  |  |  |  |
|  | Surveys: Sampling frame, modality, sample size, response rate, pilot testing, weighting |  |  |  |  |  |  |  |  | **Y** |  |  |  |  |
|  | Human subject recruitment and response rate issues |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | Data types: quantitative/continuous (discrete, cross-sectional, time-series, interval, ratio) vs. categorical/discrete/qualitative (nominal, ordinal, binary/dichotomous) |  |  | **Y** |  | **Y** |  | **Y** |  |  |  | **Y** |  |  |
|  | Decision trees |  |  |  |  | **Y** |  |  |  |  |  |  |  |  |
|  | Scales vs. indexes |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | Randomization |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | Randomized Controlled Trials (RCTs) |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | control groups |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | parameterized functions |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | time-series methods |  |  |  |  |  |  |  |  |  |  |  |  | **Y** |
|  | semantic differential scales |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | Likert Scales |  |  |  |  |  |  |  |  | **Y** |  |  |  |  |
|  | Rank-order scales |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Determine how & why to harmonize, rescale, clean and share data |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | SQL |  |  |  | **Y** |  |  |  |  |  |  |  |  |  |
|  | Data transformation |  |  | **Y** | **Y** |  |  | **Y** |  |  |  |  |  |  |
|  | Fast Fourier Transforms and Discrete wavelet transforms |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | Coordinate transformations |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | Box-Cox Transformations |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | monotonic transformation |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | Missing data: data imputation (random sampling, Monte Carlo Markov Chain, mean, regression, statistical distribution methods) |  |  | **Y** |  | **Y** |  |  |  |  |  |  |  |  |
|  | crude vs. adjusted effects |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | Data de-duplication methods |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | Data format conversion (binary data) |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | Outliers |  |  | **Y** |  | **Y** |  |  |  |  |  | **Y** |  |  |
|  | Spurious distributions |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | Suspicious interrelationships |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | OLAP data marts / cubes |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | Pivot tables |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | Fact tables |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | Dimension tables |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | Data cleaning: errors, missing values (NMAR, MAR, MCAR), outliers |  |  | **Y** |  |  |  |  |  |  |  |  |  |  |
|  | Data transformation: binning, smoothing, fitting /mathematical transformation (normalization(min-max, Z-score, decimal scaling)), data reduction (principal component analysis (PCA), data sampling) |  |  | **Y** |  | **Y** |  | **Y** |  |  |  | **Y** |  |  |
| Identify ways of discovering relationships in the data |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | Counting (permutations and combinations) |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | Relational algebra projection and selection |  |  |  | **Y** |  |  |  |  |  |  |  |  |  |
|  | Gaussian or median filtering |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | Cumulative density functions |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | Principle component analysis or factor analysis |  |  |  |  |  |  |  |  |  |  | **Y** |  |  |
|  | term frequency-inverse document frequency |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | feature hashing |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | Response Surface Methodology (RSM) |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | Sensitivity analysis (tolerance) and wrapper methods |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | self-organizing maps and Bayes nets |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | sampling and estimation |  |  | **Y** |  |  |  |  |  |  |  |  |  |  |
|  | Bivariate Statistics: cross-tabulations, t-test, chi-square test, correlation, significance, etc. |  |  | **Y** |  | **Y** |  |  |  |  |  |  |  | **Some** |
|  | Significance |  |  | **Y** |  | **Y** |  |  |  | **Y** |  |  |  | **Some** |
|  | error terms |  |  | **Y** |  |  |  |  |  | **Y** |  |  |  |  |
|  | Effect Sizes |  |  | **Y** |  |  |  |  |  |  |  |  |  |  |
|  | factor analysis |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | Box plots, scatter plots, box and whisker plots |  |  | **Y** |  | **Y** |  | **Y** |  |  |  |  |  |  |
|  | parametric distributions and distribution fitting |  |  | **Y** |  |  |  |  |  |  |  |  |  | **Y** |
|  | `Baseball card’ aggregation |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | Data annotation |  |  |  |  |  |  | **Y** |  |  |  |  |  |  |
|  | Confidence Intervals |  |  | **Y** |  |  |  |  |  |  |  |  |  | **Y** |
|  | Relational algebra rename and feature addition |  |  |  | **Y** |  |  |  |  |  |  |  |  |  |
|  | Generalized Linear Model (GLM) |  |  | **some** |  |  |  |  |  | **Y** |  |  |  |  |
|  | Data Segmentation: Connectivity-Based methods (Hierarchical clustering) |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | Data Segmentation: Centroid-Based methods (k-means clustering, x-means clustering, canopy clustering) |  |  |  |  | **Y** |  |  |  |  |  |  |  |  |
|  | Data Segmentation: Distribution-Based methods (Gaussian mixture models) |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | Data Segmentation: Density-Based methods (fractal and DB scan) |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | Data Segmentation: Graph-Based methods (cliques and semi-cliques) |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | Data Segmentation: Topic Modeling |  |  |  |  |  |  |  |  | **Y** |  |  |  |  |
|  | Variable determination: tree-based methods, generalized linear models (statistical measures of importance), regression with shrinkage (LASSO, elastic net), stepwise regression |  |  | **Y** |  | **Y** |  |  |  | **Y** |  |  |  |  |
|  | Neural Nets |  |  |  |  | **Y** |  |  |  |  |  |  |  |  |
|  | Random Forests |  |  |  |  | **Y** |  |  |  |  |  |  |  |  |
|  | Decision Trees (CART, CHAID) |  |  |  |  | **Y** |  |  |  |  |  |  |  |  |
|  | k nearest neighbor |  |  | **Y** |  | **Y** |  |  |  |  |  |  |  |  |
|  | naïve Bayes |  |  |  |  | **Y** |  |  |  |  |  |  |  |  |
|  | Hidden Markov models |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | The knapsack problem |  |  |  |  |  |  |  |  |  |  |  | **Y** |  |
|  | Critical path analysis |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | SEIR Epidemiology |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | Search Theory |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | Lanchester Models of Warfare |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | Hughes' Salvo Model of Combat |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | Single-Use Models |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Document and report findings (e.g., insights, results, business performance) |  |  |  |  | **Y** |  |  | **Y** |  |  |  |  |  |  |
| Refine the business and analytics problem statements |  |  |  |  |  |  |  | **Y** |  |  |  |  |  |  |
| **Domain IV Methodology (Approach) Selection** |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Identify available problem solving approaches (methods) |  |  |  |  |  |  |  | **Y** |  |  |  |  |  |  |
|  | Descriptive vs. predictive vs. prescriptive |  |  | **Y** |  | **Y** | **Y** |  |  | **Y** |  |  | **Y** |  |
|  | Prescriptive: Optimization (linear programming, integer programming, nonlinear programming, mixed integer programming, network optimization, dynamic programming, metaheuristics, greedy heuristics, combinatorial optimization (simulated annealing), constraint programming, Response Surface Methodology (RSM), Branch-and-Bound algorithm, genetic algorithms) |  |  |  |  |  |  |  |  |  |  |  | **Y** |  |
|  | Prescriptive: Simulation-Optimization |  |  |  |  |  |  |  |  |  |  |  |  | **Y** |
|  | Prescriptive: Stochastic Optimization |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | Predictive: Forecasting models (time series models (trend extrapolation, moving averages, auto-regression, etc.)) |  |  |  |  |  |  |  |  |  |  |  |  | **Y** |
|  | Predictive: Simulation (Discrete event, Monte Carlo, queuing models, Agent-based modeling, System dynamics (SD)) |  |  |  |  |  |  |  |  |  |  |  |  | **Y** |
|  | Predictive: Regression (Logistic, Linear, Stepwise, Ridge, Quantile) |  |  | **Y** |  | **Some** | **Y** |  |  | **Y** |  | **Y** |  |  |
|  | Predictive: Statistical Inferences (Confidence intervals, hypothesis testing, ANOVA, ANCOVA, MANOVA, design of experiments) |  |  | **Y** |  |  |  |  |  | **Y** |  |  |  |  |
|  | Predictive: Classification |  |  | **Y** |  | **Y** |  |  |  |  |  | **Y** |  |  |
|  | Predictive: Clustering |  |  |  |  | **Y** |  |  |  | **Y** |  | **Y** |  |  |
|  | Predictive: Artificial Intelligence (AI) |  |  |  |  |  |  |  |  | **Y** |  | **Y** |  |  |
|  | Predictive: Game Theory |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | Descriptive: charts, graphs, histograms, scatter plots, raw counts, mean, median, mode, variance, cross tabulations, standard deviations, standard error, ranges, MSE, MTBF |  |  | **Y** |  | **Y** | **Y** | **Y** |  |  |  |  |  |  |
|  | Failure Mode and Effects Analysis (FMEA) |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | Bayesian vs. conditional probabilities |  |  |  |  | **Y** |  |  |  |  |  |  |  |  |
|  | Economic Analysis (IRR, NPV, FV, Payback period, cost of capital, fixed costs, variable costs, opportunity cost, ROI, RFM, yield) |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | Study Designs: Observational (exploratory/descriptive/analytic, cross-sectional, longitudinal, case-control) |  |  |  |  |  | **Y** |  |  |  |  |  |  |  |
|  | Study Designs: Pre-Experimental (One-Shot Case Study, One-Group Pretest-Posttest Design, Static Group Comparison) |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | Study Designs: Experimental (Pretest-posttest control group, Solomon four group, posttest-only control group, factorial) |  |  |  |  |  | **Y** |  |  | **Y** |  |  |  |  |
|  | Study Designs: Quasi-Experimental (Time-Series, Equivalent Time-Samples, Equivalent Materials, Nonequivalent control group, Counterbalanced, Separate Sample Pretest-Posttest, Separate Sample Pretest-Posttest Control Group, Multiple Time-Series, Recurrent Institutional Cycle, Regression-Discontinuity Analysis) |  |  |  |  |  | **Y** |  |  |  |  |  |  |  |
|  | Study Designs: Correlational and Ex Post Facto (Retrospective Pretest, Panel Studies, The Lazarfield Sixteenfold Table, Ex Post Facto Analysis) |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | Principal Component Analysis (PCA) |  |  |  |  |  |  |  |  |  |  | **Y** |  |  |
|  | Probability density functions |  |  | **Y** |  |  |  |  |  |  |  |  |  |  |
|  | Artificial Intelligence (artificial neural networks, fuzzy logic, expert systems) |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | Decision Trees (CART, CHAID) |  |  |  |  | **Y** |  |  |  |  |  |  |  |  |
|  | Markov chain |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | Revenue management (yield management) |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | value stream mapping |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | Lift charts |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | Little's Law |  |  |  |  |  |  |  |  |  |  |  |  | **Y** |
|  | Global optimal vs. local optimal solutions |  |  |  |  |  |  |  |  |  |  |  | **Y** |  |
|  | Machine learning: pattern recognition |  |  |  |  |  |  |  |  |  |  | **Y** |  |  |
|  | Machine learning: Supervised/Regression (Linear/Non-linear regression, neural networks, regression trees) |  |  | **Y** |  | **Y** | **Y** s |  |  | **Y** |  | **Y** |  |  |
|  | Machine learning: Supervised/Classification (classification trees, support vector machines, k-nearest neighbors) |  |  | **Y** |  | **Y** | **Y** |  |  | **Y** |  | **Y** |  |  |
|  | Machine learning: Supervised (Time Series Forecasting) |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | Machine learning: Supervised/Ensemble methods (Sample averaging, stacking, bootstrap aggregating, boosting) |  |  | **Y** |  | **Y** |  |  |  |  |  |  |  |  |
|  | Machine learning: Unsupervised/Clustering (k-means clustering) |  |  |  |  | **Y** |  |  |  |  |  | **Y** |  |  |
|  | Machine learning: Unsupervised/Dimension reduction (Principal components analysis, bag-of-words) |  |  |  |  |  |  |  |  | **Y** |  | **Y** |  |  |
|  | Machine learning: Unsupervised (Kernel Density Estimation, association rule mining, principal components analysis (PCA), clustering methods, bag-of-words/vector space models) |  |  |  |  |  |  |  |  |  |  | **Y** |  |  |
|  | Machine learning: Reinforcement learning (Q learning) |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | Machine learning: data acquisition and cleaning |  |  |  |  |  |  | **Y** |  |  |  |  |  |  |
|  | Machine learning: feature engineering and scaling |  |  | **Y** |  | **Y** |  |  |  |  |  | **Y** |  |  |
|  | Machine learning: model fitting (training) and feature selection (balancing bias and variance) |  |  | **Y** |  | **Y** | **Y** |  |  |  |  | **Y** |  |  |
|  | Machine learning: model selection |  |  | **Y** |  | **Y** |  |  |  |  |  | **Y** |  |  |
|  | Machine learning: model performance assessment |  |  | **Y** |  | **Y** |  |  |  |  |  | **Y** |  |  |
|  | Machine learning: model implementation |  |  |  |  |  |  |  |  |  |  | **Y** |  |  |
|  | Next best offer (NBO) |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | Nominal Group Technique (NGT) |  |  |  |  |  |  |  |  |  |  |  |  | **Some** |
|  | Pareto principle |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | Six Sigma |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | traveling salesman problem |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | vehicle routing problem |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Select software tools |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | Enterprise Resource Planning (ERP) systems |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | Spreadsheet systems |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | Statistical systems |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | Optimization systems |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | Simulation systems |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | Business intelligence systems |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | Data management systems (structured data, unstructured data) |  |  |  | **Y** |  |  |  |  |  |  |  |  |  |
|  | Data integration systems |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | Operating systems (Hadoop) |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | MS Excel |  |  |  |  |  |  |  |  |  |  |  | **Y** | **Y** |
|  | MS Access |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | R |  |  | **Y** |  | **Y** | **Y** | **Y** |  | **Y** |  | **Y** |  |  |
|  | Matlab |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | SPSS |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | SAS |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | STATA |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | Flexsim |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | Pro Model |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | Minitab |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | JMP |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | Crystal Ball |  |  |  |  |  |  |  |  |  |  |  |  | **@Risk** |
|  | Analytica |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | Frontline |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | Tableau |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | Anylogic |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | Python |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Test approaches (methods)\* |  |  |  |  |  | **Y** |  |  |  |  |  |  |  |  |
| Select approaches (methods)\* |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| **Domain V Model Building** |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Identify model structures\* |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | Distributions (normal, binomial, gamma, exponential (Poisson), chi-square vs. gamma) |  |  | **Y** |  |  |  |  |  | **Indirectly for certain methods** |  |  |  | **Some** |
|  | Fitting models |  |  | **Y** |  |  |  |  |  |  |  |  |  | **Some** |
| Run and evaluate the models |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | Goodness of fit (misclassification, sensitivity, specificity, concordance, discordance, ROC/c-statistic, chi-square test, coefficient of determination) |  |  | **Y** |  | **Y** |  |  |  | **Y** |  | **Y** |  |  |
|  | Honest assessment (data splitting, k-fold cross validation, leave-one-out cross validation) |  |  | **Y** |  | **Y** | **Y** |  |  |  |  |  |  |  |
| Calibrate models and data\*? |  |  |  |  |  |  |  |  |  | **Y** |  | **Y** |  |  |
| Integrate the models\* |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | API's and documentation standards |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Document and communicate findings (including assumptions, limitations and constraints) |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| **Domain VI Deployment** |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | CRISP-DM, DMAIC (Six Sigma) |  |  | **Y** |  |  |  |  |  |  |  |  |  |  |
|  | Job Task Analysis (JTA) |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Perform business validation of the model |  |  |  |  |  |  |  | **Y** |  | **Y** |  | **Y** |  |  |
| Deliver report with findings; or |  |  |  | **Y** |  |  |  |  |  | **Y** |  | **Y** |  |  |
| Create model, usability and system requirements for production |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Deliver production model/system\* |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Support deployment |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| **Domain VII Model Lifecycle Management** |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Document initial structure |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Track model quality |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Recalibrate and maintain the model\* |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Support training activities |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Evaluate the business benefit of the model over time |  |  |  |  |  |  |  |  |  | **Y** |  | **Y** |  |  |
| **Other Topics of Interest** |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | The analytics organization (marketing, operations management, information technology, strategy, shared services, finance, product development, etc.) |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | Analytics Careers |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| \* Note these tasks are beyond certification level and, therefore, not addressed by the CAP exam, which is a basic certification. Potential future certifications may cover more advanced areas. | |  |  |  |  |  |  |  |  |  |  |  |  |  |

MASTER OF SCIENCE IN INFORMATION SYSTEMS DETAIL

| **Learning Objectives**  What did we assess | **Sample**  Who did we assess? When? Where? | **Methods**  How did we assess? (see grid below) | **Findings/**  **Evidence**  What did we find out? | **Interpretation/ Action Items**  What are we going to do about it? |
| --- | --- | --- | --- | --- |
| Leadership: Students will demonstrate the ability to motivate and lead a team (=>3) on a technical project. | Graduating MSIS students each semester. | Peer review assessment on a scale of 1-5 (see grid below) | **Leadership:** The benchmark has been met in our IT Leadership and Strategy elective. The benchmark was also met with Data Warehousing, but there is some mixing of grad and undergraduate data. | We have been exploring development of a core business class or boot camp for all non-business undergraduate students. This would help our students to further develop their leadership skills. Service projects have been added to our program as part of our orientation and outside of orientation since our last AACSB review. |
| Strategic decision making: Students will apply knowledge of business objectives and of technology capabilities and limitations to make strategic decisions. | Graduating MSIS students each semester. | Homework assignments and activities from multiple courses – see grid below | **Strategic Decision Making:** Benchmarks were met both in the Java Development and Project Management courses. | Our recommendation is to stay on course in this area for now. We do need to focus on faculty hires for all classes included in our AOL plan to make sure there is consistency in data collection going forward. Additional technical faculty (full-time and part-time) have been requested. |
| Communication: Students will demonstrate professional written and oral communication skills. | Graduating MSIS students each semester. | Via peer review, capstone project, written and oral prompts – see grid below | **Communication (Oral and Written):** Benchmarks have continued to be met for the MSIS capstone course and the system analysis and design course, but we are still seeing challenges in this area. Regular feedback from faculty that students struggle in this area (especially international). November 2016 faculty meeting we had an explicit discussion about this. As a result, a writing center requirement was added to our internship for study class. That requirement has been in place all of 2017-2019. That still has not solved the issue. | We are working with the MGT department to put a technical writing class on the schedule. |
| Ethics: Students will understand how decisions with an ethical dimension affect the workplace, and will understand the ethical issues raised by technology in business. | Graduating MSIS students each semester. | Homework assignment in data mining course – see grid below | **Ethics:** Our weakest area. This is not covered very well in our MSIS courses. We added a module on ethics to our IT leadership and strategy course as of Summer 17. The grading benchmark has been met on this content. | A lecture on ethics was also added to the e-business elective class starting in fall 2018. |
| IT knowledge and problem solving: Students will have a foundation in general IS knowledge, and will demonstrate the ability to develop creative technological solutions to business problems. | Graduating MSIS students each semester. | Multiple in-class and final exams - see below | **IT Knowledge and Problem Solving:** Multiple measures here. We are meeting all benchmarks. We’re at a 59% pass rate on IT industry certifications (2015-2018). | We’re looking to raise the bar in 2019-2020, especially on the IT certification front. We continue to look for ways of integrating data analytics content across our programs (an AACSB priority). We have many students completing the graduate certificate in business analytics as part of the MSIS. We’re also looking to increase offerings around the technology of analytics. One the security front, we are currently looking for ways of aligning our curriculum with the NSA standards (endorsement). Students and advisory board members have all asked/recommended that we add Python to our course. We also added a python elective in spring 2019 to meet demand from MSIS and MSBA students. We will also continue to increase pass rates on industry certs by narrowing approved certifications and by refining the grading criteria. |
| Technology entrepreneurship: Students will apply knowledge of how to assess technology-related business risk. | Graduating MSIS students each semester. | Homework assignments with creation of web applications, homework assignments – see grid below | **Technology Entrepreneurship:** Benchmarks are being met for this area of competence. However, we should be doing more in this area given Eccles’ reputation as an entrepreneurship school (Lassonde). Interest in capstone projects that are entrepreneurial has been low to this point. That could be due to our international mix and visa concerns. | In fall of 2018 we added content related to technology entrepreneurship to our e-business elective. Covered topics included (e-commerce, blockchain, iot, and analytics) and students were given all of the necessary steps to incorporate their own business in Utah. |

| **Learning Goal** | **MSIS Competency** | **Assessment Measures** |
| --- | --- | --- |
| Leadership | • Principle-based technology leadership • Ability to motivate and lead work groups and project teams • Ability to manage work groups and project teams • Ability to manage technology unit in organization | **IS 6410 -- Systems Analysis and Design**  IS 6410 includes a semester long effort by a team of 3-5 students to identify a business problem in a real-world firm/setting, and design a technology solution to address the problem.  **Assessment Measure:**  Student’s score on a set of peer review assessment questions (by teammates) on his or her ability to 1) take initiative for and lead the work for a part of the group project; and 2) Demonstrate ability to work with diverse individuals.  **Minimum Acceptable Standard:** A score of 4 or better on a scale of 1-5. |
| **IS 6480 -- Data Warehousing**  In IS 6480, students form groups, and engage with a company to define and execute on a project involving dimensional modeling. Along with their project deliverables, they are required to submit a breakdown of what each team member contributed to the initiative. In addition, they are required to submit a peer assessment so that leadership can be assessed.  **Assessment Measure (link – ability to motivate and lead; ability to manage work groups):** Student’s score on a set of peer review assessment questions (by teammates) on his or her ability to 1) Take initiative for and lead the work for a part of the group project; and 2) Demonstrate ability to work with diverse individuals.  **Minimum Acceptable Standard:** A score of 4 or better on a scale of 1-5 |
| Strategic Decision Making | • Strategic decision-making ability • Ability to analyze important technology issues strategically | **IS 6615 -- Data Structure and Java**  Strategic decision making is assessed in homework assignment #4 where students write code to conduct numerical and graphical analyses to understand the tradeoffs that technology managers face in choosing between memory usage (cost) and speed.  **Minimum Acceptable Standard:** A grade of B or better demonstrates a good understanding of the choices that form a crucial component of decisions made by IT employees and managers. |
| **OIS 6660 -- Project Management**  In OIS 6660, students learn to identify critical activities in the strategic management process. Students also demonstrate through classroom activities, labs, exams, and assignments, the ability to strategically analyze and manage any technology-related project. Students will also utilize project management software to demonstrate an ability to organize and identify the requisite activities, which upon completion, will ensure a successful and timely achievement of project management outcomes.  **Minimum Acceptable Standard:** A grade of B or better demonstrates acceptable competence in this area |
| Communication | • Develop good interpersonal communication skills • Ability to write professionally and present orally | **IS 6410 -- Systems Analysis and Design**  In IS 6410, communication skills are assessed in three ways: 1) Student’s score on a set of peer review assessment questions (by teammates) on his or her ability to contribute quality work to the written project deliverable documents.  2) Student’s performance on written homework assignments Hw1-Hw4 that require them to communicate technological aspects of the solution in a manner understandable and accessible to business managers – via the use of appropriate systems analysis diagrams, charts and tables.   3) Student’s performance in verbal and written correspondences (F2F and phone interviews, online surveys) with business clients to adequately understand and elicit appropriate requirements for the solution to be designed.  **Minimum Acceptable Standard:** A grade of B or better. |
| **IS 6596 & IS 6597 -- Capstone Project**  As part of the capstone project, students are required to write a report. The grading criteria for the report includes : 1) minimum content length; 2) references; 3) visual appearance; and 4) clarity of communication.  **Minimum Acceptable Standard:** A grade of B or better on the group project across the written communication based grading criteria.  As part of their capstone project, students are required to deliver a presentation to the faculty and their fellow students about their capstone experience.  **Minimum Acceptable Standard:** A grade of B or better on the presentation across the verbal communication based grading criteria. |
| Ethics | • Demonstrate integrity in personal and professional practices • Understand importance of ethical behaviors in work context | **IS 6482 -- Introduction to Data Mining**  In IS 6482 homework assignments and on the exam, each student needs to answer questions regarding the reasons why and the examples of how identifiers, pseudo identifiers and sensitive information of individuals should be protected during the process of mining data and sharing mining results.   **Minimum Acceptable Standard:** 80% or higher of scores a student receives for those questions will be an indicator of satisfactory performance. |
| IT knowledge and Problem Solving | • Demonstrate competency in general IS knowledge • Demonstrate competency in at least one IS specialty area such as data-driven business analytics and IT security • Ability to develop creative technological solutions and lead changes | **IS 6615 -- Data Structure and Java**  Student’s grades on the two in-class examinations in IS 6615 demonstrates learning and understanding on one IS specialty area – developing custom in-house technology solutions (coding).  **Minimum Acceptable Standard:** A grade of B or better. |
| **IS 6471 -- Emerging Web Technologies and Strategies**  In IS 6471, students take a final exam that covers the broad spectrum of topics on emerging web technologies. Their score in this exam reflect their IT knowledge and problem solving skills.   **Minimum Acceptable Standard:** A grade of B or better on the project/report demonstrates a good understanding of this aspect. |
| Technology Entrepreneurship | • Ability to commercialize IT-based solutions • Develop skills to determine the right mix of exploitation and experimentation of technology resources to satisfy the needs of a firm • Ability to take appropriate technology-related risks while managing existing ones. | **IS 6465 -- Web Based Applications**  In IS 6465, students have to create web applications that are novel and have the potential of becoming viable businesses.  **Minimum Acceptable Standard:** A grade of B or better on the project/report demonstrates a good understanding of this aspect. |
| **IS 6480 -- Data Warehousing**  In IS 6480, there is a module in the course related to data warehouse operations. In this module we will cover trade-offs between different operational solutions to common problems. Each solution carries with it the management of ongoing risks.  **Assessment Measure (Ability to take appropriate technology-related risks while managing existing ones):** There will be 1 – 2 exam questions related to this module.  **Minimum Acceptable Standard:** At least 83% of students answering these questions correctly |

MASTER OF BUSINESS ADMINISTRATION DETAIL

| **#** | **Learning Objective** | **Sample** | **Methods & Timing** | | **Findings/Evidence** | | **Interpretation/Action Items** |
| --- | --- | --- | --- | --- | --- | --- | --- |
| 1 | Students will demonstrate comprehensive business knowledge | Random sample of MBA students in year 2 of their program | Students will be asked to complete the MBA exam offered through ETS. | July/August 2017 and April/May 2019 | Year 1 contained a sample size that was too small, so a concerted effort was made year 2 to increase participation. | Year 1 - 13 test takers, and the lowest score was the 66th percentile with an average of 84th percentile, so all students scored well above average. Year 2 - 67 test takers, and lowest score was 1st percentile. The average percentile was 77th, so as a class they are still well above average. | Overall, performance on general MBA knowledge is strong for both testing years. Representation exists from all MBA offerings, but more participation is needed from PMBA, EMBA, and MBAO next year for the sample to be more representative of each population. This will be a focus next testing cycle. |
| 2 | Students will gain comprehensive business knowledge and feel confident about the knowledge they gained during in the program. | Random sample of MBA students in year 2 of their program | Students will identify for each area of knowledge (finance, accounting, economics, etc.) how well they feel that they understand concepts in these areas via the exit survey completed when they finish the program. | August 2017 and August 2019 | FT MBA data was not collected in testing year 1, but was added to testing year 2. The collection format was not uniform for the FT MBA's, but this will be corrected in the next cycle. | For testing year 1, most PMBA courses fell below the benchmark of 8.0, and only one EMBA course, Marketing, fell below this benchmark. All other areas were above an 8.0. For testing year 2, PMBA scores increased overall with only 6 being below an 8.0. MBAO saw a few dips below 8.0 (6), whereas the first testing year showed 0 below 8.0. | For year 1, PMBA coursework was the lowest by far with most of their courses falling below an 8.0 benchmark for fall and summer graduates. EMBA only had 1 class below an 8.0, and MBAO had no classes below an 8.0. Several faculty changes were made, and effort was put into revamping cases as well as giving feedback to the PMBA faculty and the business school curriculum committee. For year 2, the PMBA coursework experienced dramatic improvements and only a few courses were below an 8.0. MBAO also had a few courses below 8.0, and feedback was shared with the curriculum committee and faculty members about this. We believe the new format is the main contributor to lower scores. EMBA'a marketing course is still below an 8.0, and we hope to have a new faculty member for the next assesment cycle. This result was shared with both the faculty and the curriculum committee. |
| 3 | Students will identify and define current leadership theories and practices | MBA Students in Managing and Leading, typically taught in the fall and spring semesters | Students will complete a final exam that covers a good breadth of current ob/management/leadership research. The exams and scores will be collected, and average scores of the exam will be analyzed to determine retention and understanding of these concepts. | May 2017 and May 2019 | As this has never been assessed, we do not have a benchmark to use in analyzing the results. In the first year, the exam was fairly uniform between MBA students. In the second year, the final exams were not uniform but still tested relevant managerial theories. This may explain the dramatic increase in score from year 1 to year 2. | Average final exam for Managing and Leading was an 80.8% for 141 exams for the first year. Second year testing showed an average of 91% on the final exam. Both testing years showed strong results. | The dean’s office at the David Eccles School of Business has requested that each course final grade average should fall between a 3.1 and a 3.5, and often the final exam is one of the highest weighted assignments in a course. Year 1 was slightly lower than this requirement as an 80.8% average score is below a 3.0. Year 2 testing was dramatically higher as a new faculty member was introduced and feedback was shared with the curriculum committee. The course format and cases were revamped when some of the new faculty joined the MBA program and we saw an inrease in the average score as a result. This result was shared with both the faculty and the curriculum committee. |
| 4 | Students will demonstrate their use of ethical decision making abilities in a business environment | MBA Students in Ethics course | Cases and Personal Statements of Ethics will be collected from Ethics courses and will be graded using a standard rubric. These case analyses and statements will be collected and graded using a standardized rubric and external, independent grader. | May 2017 and May 2019 | Year 1 grader was not a content expert, but rather was a gramatical expert (English major). Year 2 this was corrected and we got a content expert, but they could not grade the same volume of papers. | Average grades for the cases and personal statements of ethics were a B average or better, which is considered strong. Year 1 tested 123 students. Year 2 only tested 22 total students and the average grade was a B or better, and in fact the Uber case specifically showed an average grade of A-. Both testing years showed strong results. | In general, the feedback and average grades for these papers seemed to be positive. A grade above a “B” average is determined as acceptable for this assessment. The benchmark for this test is an average grade of a B or better for each testing group, and for both years 1 and 2 we found this to be the case, with some groups scoring higher than a B average. This result was shared with both the faculty and the curriculum committee. |
| 5 | Students will apply concepts of strategy and innovation to solve complex business problems | MBA Students in Strategy course | Students will complete a case analysis and apply strategy concepts to analyze a business problem. These case analyses will be collected and graded using a standardized rubric and external, independent grader. | October 2016 and October 2018 | Year 1 grader was not a content expert, but rather was a gramatical expert (English major). Year 2 this was corrected and we got a content expert, but they could not grade the same volume of papers. | Year 1 tested 69 strategic analyses and case studies. The average grade was a B or better. Year 2 tested 14 students and the average grade was a B+ or better. Results seemed to increase from year 1 to year 2. | In general, the feedback and average grades for these papers seemed to be positive. A grade above a “B” average is determined as acceptable for this assessment. For both testing years 1 and 2, the averages for each testing group were a B or better. In addition, the Strategy faculty members were changed for some of the Strategy courses. Prof. Schulze, Prof. Zenger, and Prof. Hesterly no longer teach in the PMBA strategy courses and Prof. Gorman was added in their place and may be the reason for the increase in year 2. This should add consistency for about 150 of the MBA students. For our next testing cycle, we are also adding an additional Strategy faculty member. |
| 6 | Students will solve complex business problems using relevant leadership business theories in organizational behavior and finance | MBA Students in Managing and Leading and Finance courses | Students will complete business case analyses in both finance and management courses. These case analyses will be collected and graded using a standardized rubric and external, independent grader. | April 2017 and April 2019 | Year 1 grader was not a content expert, but rather was a gramatical expert (English major). Year 2 this was corrected and we got a content expert, but they could not grade the same volume of papers. | Year 1 tested 118 students and the average results were grades of B or higher. In particular, the NW Hospital case showed an average grade of A and Ocean Carriers was an average of A-. Year 2 tested 12 students, and the average grade was much lower. The Clarkson Lumber case was an average of 71.5% and the Teuer Furniture was an average of 56%. The cases students seemed to struggle with were the finance cases in particular. The average grade for the managing and leading case was 92%. | For year 1, the finance and management cases analyzed were shown to be of high analytical quality. For year 2, the finance assessment, completed by a content expert, was lower than in the first testing year. The result of this test will be sent to the faculty and to the curriculum committee and we plan on analyzing this a bit more deeply and creating an action plan for future years. In addition, faculty changes were made. Prof. Heath replaced Prof. Lins, Prof. Bessembinder, and Prof. Welch to teach 150 of the PMBA students for continuity purposes. We are hopeful that next testing year the scores will increase as a result. |

MASTER OF REAL ESTATE DEVELOPMENT DETAIL

|  | **Learning Objectives** | **Sample** | **Methods** | **Findings/Evidence** | **Interpretation/ Action Items** |
| --- | --- | --- | --- | --- | --- |
|  | *What did we assess?* | *Who did we assess? When? Where?* | *How did we assess? (attach rubrics)* | *What did we find out?* | *What are we going to do about it?* |
| Measure 1 | Students will propose a complete, non-hypothetical real estate development project. | 9 graduating students. July 2017. | Students were assessed by the instructor on the following criteria: Executive Summary, Highest and Best Use, Economic Feasibility, Site Analysis and Detail, Market Analysis, Layout and Flow, and Professional Finish. | All students met or exceeded expectations. | Continue, but fine-tune assessment methodology. |
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| Measure 2 | Students will propose a complete, non-hypothetical real estate development project in both written. | 9 graduating students. December 2018. | Students were assessed by the instructor on the following criteria: Executive Summary, Highest and Best Use, Economic Feasibility, Site Analysis and Detail, Market Analysis, Layout and Flow, and Professional Finish. | All students met or exceeded expectations. | Review course to ensure relevant topics and material are emphasized. |
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| Measure 1 | Students will deliver a professional presentation on a non-hypothetical real estate development project. | 9 graduating students. July 2017. | Students were assessed by the instructor on their oral presentation in the following areas: Professional Attire, Use of Technology, Concise Opening Summary, Balanced Team Approach, Thorough Coverage/Argument, and Concise Concluding Statements. See rubric. | All but one student met or exceeded expectations. | Investigate tools/opportunities to help students enhance presentation skills. |
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| Measure 2 | Students will deliver a professional presentation on a non-hypothetical real estate development project. | 9 graduating students. December 2018. | Students were assessed by the instructor on their oral presentation in the following areas: Professional Attire, Use of Technology, Concise Opening Summary, Balanced Team Approach, Thorough Coverage/Argument, and Concise Concluding Statements. See rubric. | All but one student met or exceeded expectations. | Investigate tools/opportunities to help students enhance presentation skills. |
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| Measure 1 | Students will build a fully functional cash flow model in Excel. | 15 students. Summer 2017. | Students were assessed by the instructor on the functionality, correctness and accuracy of their models. | Measure 1: Students lacked necessary proficiency in Excel to perform at an intermediate to advanced level. | In Fall 2018 FINAN 6040 - Excel for the Finance Professional was added to the core curriculum. |
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| Measure 2 | Students will build a fully functional cash flow model in Excel. | 15 students. Summer 2019. | Students were assessed by the instructor on the functionality, correctness and accuracy of their models. | Measure 2: All students met or exceeded expectations. | Continue with the current core as initial results are very positive. |
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Objective 1

Rubric:

|  |  |
| --- | --- |
| Criteria | Points |
| Executive Summary | 125 |
| Highest and Best Use | 75 |
| Economic Feasibility | 100 |
| Site Analysis and Detail | 100 |
| Market Analysis | 100 |
| Layout and Flow | 50 |
| Professional Finish | 50 |
| Total | 600 |

Benchmark: 80% of students should meet or exceed expectations.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Real Estate Development Project** | **2017** | | **2018** | |
| Exceeded Expectations (100%) | 3 | 33% | 4 | 44% |
| Met Expectations (85-99%) | 6 | 67% | 5 | 56% |
| Did Not Meet Expectations (Below 85%) | 0 | 0% | 0 | 0% |
| **Total** | **9** | **100%** | **9** | **100%** |

Objective 2

Rubric:

|  |  |
| --- | --- |
| Criteria | Points |
| Professional Attire | 10 |
| Use of Technology | 10 |
| Concise Opening Summary | 10 |
| Balanced Approach | 20 |
| Thorough Coverage/Argument | 40 |
| Concise Closing Statement | 10 |
| Total | 100 |

Benchmark: 80% of students should meet or exceed expectations.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Real Estate Development Project** | **2017** | | **2018** | |
| Exceeded Expectations (100%) | 1 | 11% | 3 | 33% |
| Met Expectations (85-99%) | 7 | 78% | 5 | 56% |
| Did Not Meet Expectations (Below 85%) | 1 | 11% | 1 | 11% |
| **Total** | **9** | **100%** | **9** | **100%** |

Objective 3

Benchmark: 80% of students should meet or exceed expectations.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Financial Modeling Final Project** | **2017** | | **2019** | |
| Exceeded Expectations (100%) | 8 | 18% | 15 | 38% |
| Met Expectations (85-99%) | 25 | 56% | 22 | 55% |
| Did Not Meet Expectations (Below 85%) | 12 | 27% | 3 | 8% |
| **Total** | **45** | **100%** | **40** | **100%** |

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| --- | --- | --- | --- | --- | --- | --- |
| **MRED Program Curriculum Map** | | | |  |  |  |
| Goals - Students will be: | Goal 1 - Problem Solvers | Goal 2 - Effective Communicators | Goal 3 - Technologically Proficient |  |  |  |
| Objectives | Objective 1 - Students will propose a complete, non-hypothetical development project in both written and oral formats. | Objective 1 - Students will deliver a professional presentation on a non-hypothetical real estate development project. | Objective 1 - Students will build a fully functional cash flow model in Excel. |  |  |  |
| **Core Curriculum** | | | |  | Key: |  |
| Real Estate Finance | I | I | I |  | I | Introduced |
| Excel for the Finance Professional | I |  | I, R |  | R | Reinforced |
| Real Estate Financial Modeling | M |  | M |  | M | Mastered |
| Real Estate Appraisal & Investment | R |  | R |  |  |  |
| Real Estate Development Life Cycles | I |  | R |  |  |  |
| Land Use Law | I, R |  |  |  |  |  |
| Sustainability Planning | I, R |  |  |  |  |  |
| Site Planning & the Entitlement Process | R |  |  |  |  |  |
| Market Analysis for Real Estate Development | R, M | R |  |  |  |  |
| Real Estate Due Diligence | R |  |  |  |  |  |
| Professional Project (Capstone) | M | M | M |  |  |  |
| **Elective** | | | |  |  |  |
| Real Estate Contracts & Transactions | R | R |  |  |  |  |
| Construction for Real Estate Developers | R |  |  |  |  |  |
| Real Estate Capital Markets | R | R | R |  |  |  |
| Argus | I |  |  |  |  |  |
| GIS | I |  |  |  |  |  |
| Project Consulting | M | M | R |  |  |  |
| Real Estate Investment Trusts | R |  | R |  |  |  |
| Commercial Leasing | R |  |  |  |  |  |
| Innovations in Housing Affordability | R | R |  |  |  |  |

MASTER OF ACCOUNTING DETAIL

***MAcc Audit***

| **Learning Objectives**    What did we assess | **Sample**    Who did we assess? When? Where? | **Methods**    How did we assess? (attach rubrics)  **Students are tested in the following ways:** | **Findings/**  **Evidence**    What did we find out? | **Interpretation/ Action Items**    What are we going to do about it? |
| --- | --- | --- | --- | --- |
| 1. ***Proper consideration and use of audit professional standards.*** | Each individual Audit MAcc student | Setting Materiality | Sampling - The weakest area was the concept of sampling, where the students scored an average of 65%  Control Assessment - The control assessment concepts were weak (at 74%). This appears to be a matter of judgment and the interpretation of professional standards. | Sampling - Online resources obtained in Fall 2019 and pushed out to students. Resources provided better templates and descriptions of MUS sampling  Control assessment - More time is dedicated in class starting in Fall 2019 to working through the complexities of assessing controls during an audit.  Also instituted more frequent evaluations on Canvas during Fall 2019 to elicit student feedback during the semester.  The 2018 case was also a bit too long and onerous for one sitting. The case was shortened starting in Spring 2019. |
| 1. ***Ability to obtain knowledge of the client's industry, business and operations in order to assess inherent risks, fraud risks and control risks in an audit situation.*** | Analytical Procedures |
| 1. ***Proper formulation of planning based on perceived risks.*** | Significant financial statement risks (determine top three) and scoping significant classes of transactions, events and balances |
|  |  |
| 1. ***Appropriate selection of audit procedures, mapped to assertions and linked to risks.*** | Fraud Risk Considerations |
| 1. ***Exercise of appropriate professional judgment utilizing case facts and professional standards in planning and executing the audit.*** | Control Risk and Testing Considerations |
| 1. ***Application of professional standards to documentation in work papers and in formulating audit opinions.*** |  |

***MAcc Tax***

| **Learning Objectives**    What did we assess | **Sample**    Who did we assess? When? Where? | **Methods**    How did we assess? (attach rubrics) | **Findings/**  **Evidence**    What did we find out? | **Interpretation/ Action Items**    What are we going to do about it? |
| --- | --- | --- | --- | --- |
| 1. ***Student will decipher what information is critical to drawing a conclusion and discard irrelevant information.*** | Each individual Tax MAcc student | Students will be given "real life" fact patterns and draft tax memos for each fact pattern. Drawing a correct tax conclusion in each situation will demonstrate the student's ability to select appropriate information and draw correct tax conclusions | Findings (individual exams, papers, presentations) are showing that our students are sufficient in these areas, but we can push them to be stronger. As such, we are implementing changes in our courses. | **Course Change**:  Group/Individual papers are a part of each of our tax emphasis courses.  Over the past several years, we have focused more on each student's writing skills in two ways - (1) grading with a more critical eye towards the student's written product (grammar, spelling, ease of reading paper, etc.) and (2) calling in specific students who demonstrate the need for improved writing skills and giving each such student suggestions as to how the student's writing could improve based on the substandard paper submitted by the student. |
| 1. ***Student will draw accurate and appropriate tax conclusions given a set of facts..*** | Given a specific set of facts, the student will perform tax research in drawing an accurate and appropriate conclusion. This work will be summarized in a tax memo outlining the facts, issues, and holding. | As always, for papers, quizzes and tests, We provide essential facts the student requires to accurately derive a conclusion.  On a selective but rather frequent basis, We have thrown in a number of irrelevant facts.  Doing so has forced students to select which facts actually matter and discard all others to derive the correct conclusion. |
| 1. ***Student will clearly comunicate tax knowledge in written communications appropriate for each recipient audience.*** | Students will be given opportunities to communicate technical tax information in the form of written tax memos tailoring the memo to specific audiences. | Findings (individual exams, papers, presentations) are showing that our students are sufficient in these areas, but we can push them to be stronger. As such, we are implementing changes in our courses. We are making changes to reinforce objective #2 only. Objective #1 has been mastered in A6300. | **Course Change:**  Group/Individual papers are a part of each of my tax emphasis courses.  Over the past several years, we have focused more and more on each student's writing skills in two ways - (1) grading with a more critical eye towards the student's written product (grammar, spelling, ease of reading paper, etc.) and (2) calling in specific students who demonstrate the need for improved writing skills and giving each such student suggestions as to how the student's writing could improve based on the substandard paper submitted by the student. |
| 1. ***Appropriate selection of audit procedures, mapped to assertions and linked to risks.*** | Fraud Risk Considerations |
| 1. ***Student will gain an understanding as the core body of tax knowledge required to begin a career in tax (whether in industry or public accounting).*** | Selected questions from various tests (midterms and finals) will be used to measure the students assimilation of technical tax information. | Findings (individual exams, papers, presentations) are showing that our students are sufficient in these areas, but we can push them to be stronger. As such, we are implementing changes in our courses (some courses need both objectives reinforced, while some courses have mastered #1 or #2). | As always, for papers, quizzes and tests, we provide essential facts the student requires to accurately derive a conclusion.  On a selective but rather frequent basis, we have thrown in a number of irrelevant facts.  Doing so has forced students to select which facts actually matter and discard all others to derive the correct conclusion. |
| 1. ***Application of professional standards to documentation in work papers and in formulating audit opinions.*** | Students will research technical tax issues and communicate findings in written memos. |

PHD DETAIL

**Ph.D. Program Graduates 2015-19**

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| --- | --- | --- |
| **2018-19 Graduates** |  |  |
| **Area** | **Name** | **Placement** |
| Accounting | Elia Ferracuti | Duke University |
| Accounting | Won Jung Kim | California State University, Sacramento |
| Finance | Jason Sandvik | Tulane University |
| Information Systems | Nicholas Sullivan | University of Dayton, Ohio |
| Information Systems | Yang Wang | University of Wisconsin, Millwakee |
| Marketing | Anuj Kapoor | None |
| Operations | Sina Moghadas Khorasani | University of California, San Diego |
| Strategy | Heidi Herrick | University of Utah |
| Strategy | Chad Killebrew | None |
|  |  |  | |
| **2017-18 Graduates** |  |  | |
| Accounting | Arthur Morris | NYU – Shanghai | |
| Accounting | Jing Pan | Southern Methodist University | |
| Finance | Lei (Matthew) Ma | Southern Methodist University (Visiting Professor) | |
| Information Systems | Yuanyuan Gao | SUNY New Paltz | |
| Information Systems | Michael Lee | UNLV | |
| Information Systems | Mohammad Amin Morid | Santa Clara University | |
| Information Systems | Jongtae Yu | King Fahd University of Petroleum/Minerals | |
| Org Behavior | David Hunsaker | NYU - Shanghai | |
| Org Behavior | Nathan Meikle | Notre Dame (Post Doc) | |
| Marketing | Salil Khetani | Heidelberg University, Ohio | |
| Marketing | Elham Yazdani | University of Georgia | |
| Strategy | Ryan Angus | West Virginia University | |
|  |  |  | |
| **2016-17 Graduates** |  |  | |
| Finance | Julian (Yan) Zhang | Loyola Marymount University | |
| Org Behavior | David Howe | West Texas A&M | |
| Org Behavior | Alex Romney | Utah State University | |
| Org Behavior | Justin Wareham | Visiting at Oklahoma City University | |
| Org Behavior | Teng Zhang | McNeese State University | |
|  |  |  | |
| **2015-16 Graduates** |  |  | |
| Accounting | Jing He | University of Delaware | |
| Finance | James Bulsiewicz | Texas Tech (Visiting Professor) | |
| Finance | Krisztina Buti | UCSD (Visiting Professor) | |
| Finance | Barbara Chambers | Monash University, Melbourne, Australia | |
| Finance | Wenhao Yang | University of South Carolina | |
| Org Behavior | Andrew Soderberg | University of Wisconsin at Oshkosh | |
| Operations | Ming Jin | University of Oregon | |
| Operations | Chunlin Wang | Southern Methodist University (Post Doc at Vanderbilt University) | |
| Strategy | Matthew Barlow | University of Texas, El Paso (U. of Nebraska 2019-20) | |
| **2014-15 Graduates** |  |  | |
| Accounting/ADS | Erik Boyle | University of Cincinnati | |
| Finance | Xiaodi Zhang | Central Florida University | |
| Marketing | Bo Liang | St. Vincent College | |
| Marketing | Keith Botner | Lehigh University | |
| Marketing | Jake Hoskins | Millsaps College | |
| Marketing | Oscar Moreno | Rutgers University | |
| Org Behavior | McKenzie Rees | Southern Methodist U. (Post Doc at University of Notre Dame) | |