Program Review and Assessment Report

Bachelor of Science in Informatics

Department of Human-Centered Computing

School of Informatics and Computing

November 1, 2021

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I. Program Introduction

The Program Review and Assessment Committee (PRAC) report focuses on the Bachelor of Science (BS) in Informatics program for the period of 2018 - 2021. The Informatics program is hosted in the Department of Human-Centered Computing (HCC) at the School of Informatics and Computing.

Program Reputation

The Bachelor of Science degree in Informatics continues to be one of the few undergraduate programs focused entirely on the general study of informatics versus other universities and colleges, which typically have programs focusing on subcategories of informatics. For example, Northern Kentucky University has bachelor's degree in Business Informatics and Western Governors University has a Bachelor's in Health Informatics, making IUPUI one of the few that offer multiple areas of specialization within the field. With informatics being a discipline still in its infancy, there are not national rankings or professional standards yet to determine the quality of the school and its programs. Placement data for the past four years show that graduates of the undergraduate degree in Informatics enjoy considerable success in job placement, including an average salary of $52,000 - $55,000, higher than the average salaries of all other undergrade degrees in the school. Titles of the positions that some Informatics students have been able to secure include IT Developer, Technology Analyst, IT Consultant, Software Developer, Systems Engineer, Web and CRM Project Manager, Cloud Support Associate, Data Analyst, Technology Analyst and App Developer Analyst. Employers of IUPUI Informatics students include Accel Consulting, LLC, Amazon Web Services, Apparatus, Appirio, Asphalt Materials, Beyond Payroll LLC, CNA Insurance, ExactTarget, Interactive Intelligence, MasterCard, MOBI Wireless Management and Sogeti. Although many of these positions are in Indianapolis, several successful and highly motivated graduates have relocated to Seattle, Chicago, and St. Louis. Graduates of this program are in demand by both local and national organizations for their unique combination of information technology-related skills. Increasingly, these organizations are employing students first as interns and then offering them full-time positions upon graduation

Content and Curriculum

Informatics students learn skills that allow them to harness the power of computing to solve real problems that directly impact the lives of others. They use their technology and problem-solving skills to make a difference in the world. Informatics is an interdisciplinary field. For students interested in a career with great potential, informatics stands out as a strong, flexible, and dynamic field of study.

The **Bachelor of Science in Informatics** is a 120-credit hours program. Students must earn a C or higher in all courses and maintain a cumulative grade point average of 2.0 or higher to graduate. Courses in the Plan of Study are divided into the following six categories:

- Core A – 53 credit hours. This group includes courses that teach students the core and foundation of Informatics and computing. All students regardless their areas of specializations need to complete all the courses in the group.
- Core B – 6 credit hours. Students can choose any 300 level or higher INFO, LIS, or NEWN courses.

- Career Planning – 2 credit hours. There is one course in this group: NEWN-N 299 Career Planning. This course covers principles and practices for designing and developing a comprehensive portfolio and digital professional profile as well as interviewing and networking skills. This is a required course for all students.
- Capstone – 3 credit hours. Students are provided three options to fulfill the requirement: INFO-I 491 Capstone Project Internship, INFO-I 492/493 Senior Thesis or INFO-I 494 Design and Development of an Information System. Please see "Capstone Experience" section in this document for more details.
- General Education – 21 credit hours. Students take courses from other school on campus to fulfill the general education requirements set by the campus.
- Area of Specialization – 21 credit hours. Students are required to choose an area of specialization to apply what they learn in Informatics to another discipline that aligns with their career interests and plans. They may select any minor or certificate through IUPUI.

The Informatics program is especially significant because of several features of the curriculum. All students complete a thesis, capstone project, or internship, providing real-world, hands-on opportunities to conduct research, to engage with the community and to build a professional portfolio. This is a great way for students to combine all the knowledge gained from previous coursework and present it within their area of specialization. Students take an applied research course to better prepare them for their thesis or capstone project and/or as preparation for graduate school.

Students also take career courses that help them hone their goals, interests and aptitudes and then identify the appropriate courses to take within the plan of study. These career courses also include such practical activities as preparing resumes and cover letters, job searching and interviewing skills, and how to obtain internships. The combination of career courses and a final project helps students to prepare for opportunities after graduation.

The school also offers several areas of specialization that provide domain-centric knowledge and IT skills that are targeted to meet the needs of professions. Popular areas of specialization are Health Science, Human-Computer Interaction, Legal Informatics, and Media Arts and Science. The complete list can be found at https://soic.iupui.edu/degrees/undergraduate/informatics/plan-of-study/#specializations.

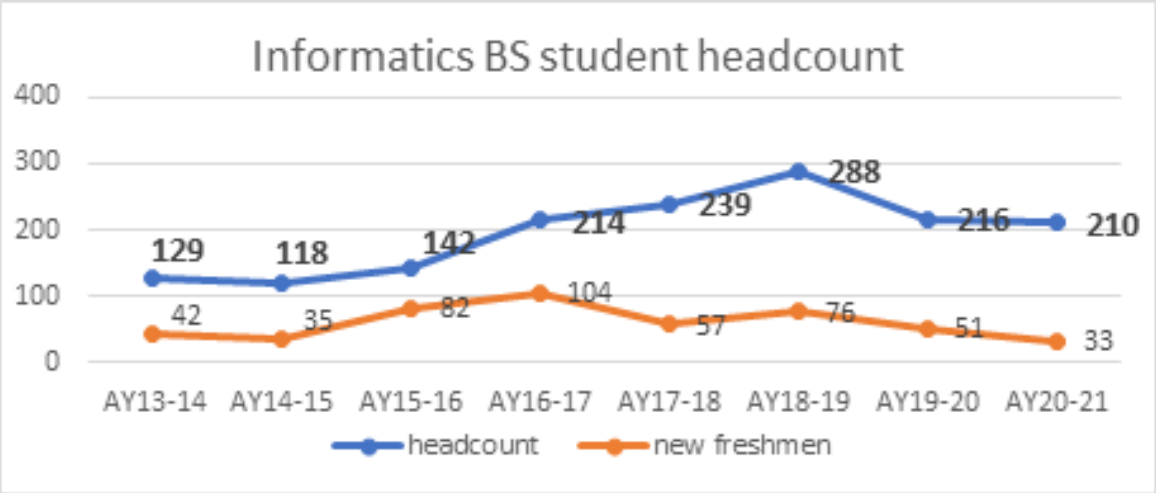
All students select an "area of specialization" that provides them with knowledge of a particular discipline. Students are allowed to select from a wide variety of areas of specialization, including recognized minors and certificates offered through other schools on campus. These areas of specialization have been an opportunity for the school to partner with other schools on campus to craft a program that will meet the unique needs of students who want to apply their technology skills within a particular domain or discipline. For example, a popular combination is for students to earn a degree in Informatics with a minor in Business from the prestigious Kelley School of Business. Because of the areas of specialization, the degree is interdisciplinary by design.

The Human-Centered Computing department also contributes to the richness of academic offerings on campus through Informatics minors and certificates. Students at IUPUI pursuing other undergraduate degrees who want to add informatics and IT skills can earn a minor in Informatics, a certificate in Informatics, a certificate in Legal Informatics, which is entirely online, or a certificate in Human-

Computer Interaction. Students pursuing a certificate in Paralegal Studies can simultaneously earn their Legal Informatics certificate with a reduced number of credit hours.

Past and Current Enrollment

The following chart shows the B.S. in Informatics student headcount and new freshmen from the Academic Year 2013-2014 through the Academic Year 2020-2021. The chart shows a steady increase in student headcount over the past eight years. The enrollment of new freshmen has slightly decreased in the last two years mainly due to the end of LiFT Scholars Program, the impact of unprecedented pandemic, and the competition from new programs within the school.



General Education Courses Offered by the Informatics Program

General education courses at IUPUI are designed to develop fundamental skills for intellectual inquiry and intellectual breadth and adaptiveness. These courses provide students with early foundational experience. The general education core courses are categorized into five domains, including Analytical Reasoning, Core Communication, Cultural Understanding, Ways of Knowing, and Arts, Humanities, and Social Sciences. The Informatics undergraduate program offer seven courses in two domains. The following table shows the Informatics courses approved for IUPUI General Education Core Courses.

IUPUI General Education Course Domain	**Informatics Courses Approved for IUPUI General Education Core**
Analytical Reasoning	INFO-I 101 Introduction to Informatics INFO-I 201 Math Foundations of Informatics INFO-I 210 Information Infrastructure I INFO-I 223 Data Fluency
Social Sciences	INFO-I 202 Social Informatics INFO-I 270 Introduction to Human-Computer Interaction Principles and Practices INFO-I 275 Introduction to Human-Computer Interaction Theory

Careers in Informatics

Informatics is a big part of our lives from mobile, web, social media, to information systems. There are big career opportunities in Informatics. The **Bachelor of Science in Informatics** program brings together business, technology, and experience and empowers students to join the next generation of computing professionals. Graduates work in fields including behavior science, health care, and industry. The following are the lists of the major career fields and popular job titles and the employers of Informatics graduates:

Major Career Fields

- Data mining and knowledge discovery
- Web and mobile app development
- Database administration
- IT consulting
- User experience design
- IT project management
- Information systems development
- Data and business systems analysis

Popular Job Titles

- Applications consultant
- Associate software engineer
- Business analyst
- CRM administrator
- Logistician
- Solutions architect
- System programming analyst
- Technical consultant

For detailed placement data, please refer to Section III, Course Assessments **V: Placement Data** in this document.

Accelerated Studies

The **Bachelor of Science in Informatics** is the gateway to accelerated graduate studies. In five years, students can earn a **Bachelor of Science in Informatics** plus a Mater of Science in

- Applied Data Science
- Bioinformatics
- Health Informatics
- Human-Computer Interaction
- Jurisprudence

The following table shows the past and current enrollment numbers for the accelerated programs.

Program	2017-2018	2018-2019	2019-2020	2020-2021
Informatics BS/Applied Data Science MS	0	0	2	5
Informatics BS/Bioinformatics MS	1	1	1	1
Informatics BS/Health Informatics MS	1	2	2	2
Informatics BS/Human-Computer Interaction MS	5	11	7	8
Informatics BS/Jurisprudence	0	0	0	0

II. Program-Level Learning Outcomes

The program-level learning outcomes for the B.S. in Informatics program were reviewed, revised, and implemented in 2017. This is the outcome of the PRAC Assessment Project led by Professor Sara Hook and Louie Zhu. Since then, the Informatics faculty has been constantly updating the learning outcomes. The following is the list of the program-level learning outcomes for the B.S. in Informatics program.

A. Foundations of Informatics and Computing

1. Explain the fundamentals of computer hardware and software
2. Apply knowledge and skills of logic and discrete mathematics
3. Apply the concepts of statistics and probability
4. Describe basic data and information representation
5. Manage information technology projects using appropriate software
6. Evaluate and create interfaces by applying user experience design principles, methods, and theories
7. Evaluate approaches to data and information governance, privacy, and security

B. Problem Solving and Critical Thinking

1. Use problem-solving techniques to design program algorithms, including pseudocode and flowcharts
2. Explain programming concepts of procedural and object-oriented programming
3. Create computer programs in one or more programming languages
4. Develop insights from data and apply them to address problems and explore opportunities

C. Data Studies and Analytics

1. Apply analytical methods for knowledge and pattern discovery and data analysis
2. Evaluate various data mining and machine learning algorithms
3. Create effective visualizations to analyze and communicate data
4. Communicate insights derived from data

D. Design and Analysis of Information Systems

1. Apply fundamental concepts of software architecture
2. Develop user requirements
3. Define terms and explain principles essential to the design of IT and computing systems
4. Design dynamic, data-driven web applications
5. Design large, complex, multilayered information systems with software design patterns
5. Design web service consumers and producers in service-oriented architectures

E. Social Dynamics of Informatics and Information Technology

1. Analyze the social, cultural, and organizational settings in which IT solutions will be deployed to achieve successful implementations
2. Interpret major societal trends affecting the development and deployment of technology, such as access, privacy, intellectual property, security, and equity
3. Analyze the impact of IT on individuals, groups, and organizations at local and global levels
4. Articulate the business considerations of technical knowledge

F. Professional Skills and Ethics

1. Evaluate social, legal, and ethical issues in informatics by applying ethical principles to resolve conflicts
2. Support the ethical and appropriate design and use of technology
3. Interpret constructive feedback
4. Demonstrate networking skills for personal and professional improvement
5. Communicate IT concepts orally and in writing to nontechnical audiences
6. Work collaboratively as part of a team, including global teams

G. Domain Specific Knowledge and Skills

Please see specific learning outcomes for individual certificates, areas of specialization, minors, etc.

III. Course Assessments

In Spring 2021, four faculty members volunteered to assess the student learning in their courses. The four courses that completed the assessment are INFO-I 100 Introduction to Informatics, INFO-I 202 Social Informatics, INFO-I 211 Information Infrastructure II, and INFO-I 223 Data Fluency. All of them are part of the Core A courses of the Informatics BS curriculum. Either comprehensive, multi-phased projects or the midterm exams were used to assess student learnings. Results show that students in all the four courses achieved the thresholds for performance.

Summary of Course Assessment Results

Course Number	INFO-I 101	INFO-I 202	INFO-I 211	INFO-I 223
Course Name	Introduction to Informatics	Social Informatics	Information Infrastructure II	Data Fluency
Total number of Students Assessed	21	47	32	29
# of Students Met or Exceeded Expectation	17	44	27	25
% of Students Met or Exceeded Expectation	81.0	93.6	84.4	86.2

Detailed results are shown on the following pages.

A. INFO-I 101 Introduction to Informatics

1. **Course Number and Title:** INFO I101 Introduction to Informatics
2. **Semester and Year:** Spring 2021
3. **Instructor Name:** James Lyst
4. **Grade Distribution:**

Grade	A	B	C	D	F	W	FN	FNN	Total
Number of Students	12	4	2		3				21

5. **Learning Outcome**

C3: Create effective visualizations to analyze and communicate data.

Criteria	Exceeds Expectation	Met Expectation	Below Expectation	Did Not Meet Expectation
Performance Indicator	97%	80%	60%	0%
Number of students	3	14	0	4

6. **Threshold for Performance:** 80% of students will achieve 80% or above.
7. **Method of Assessment:** Individual Project
8. **Evidence for Assessment:**

PROJECT 2: DATA VISUALIZATION

PROJECT CHALLENGE

Identify a problem to investigate using data collection and visualization techniques. Develop a visualization that provides new insight into the problem that may inspire action by your target audience. Dig deep and understand the context of the problem and the people it affects.

PROJECT DELIVERABLE REQUIREMENTS

- **The Final Visualization** - The visualization should stand on its own, so that anybody could understand the data being presented, along with its context, value, and the sources of the information.
    - Display at Least 3 Distinct and well-formatted Charts.
    - Provide a title, your name, descriptive text/annotation, and the information sources.
    - Format
        - Spreadsheet Based Project: Single page 11" x 17" PDF, Landscape or Portrait
        - Python Notebook: PDF Print
        - Web Application: Apply a grid format that adapts to desktop or mobile view.

- **Working File(s)** - Any Python Notebook, HTML/CSS/JS, or Spreadsheet Files
    - Include the files used to import data, transform the data, and generate the core charts.
    - Provide a shareable link or the actual files (for example, .ipynb or .xls files)
      * You do not need to submit the working graphics file you used to compose the visualization, like Google Drawing or Photoshop.
- **Informal Presentation** (~3 to 4 min) - Video file or link
    - Summarize the purpose/value of your visualization.
    - Identify key/unique features of your visualization.
    - Describe how you collected the data and generated charts.
    - Explain what you distinctly learned through the process.

RUBRIC

Purpose & Value

The purpose and value of the visualization is evident in the content and accompanying text or annotation.

Visualization Data

Thoughtful search, preparation, and presentation of the data is evident in the final visualization and the supplied working files. **Accuracy and transparency**

Visualization Styling

The styling provides an easy-to-read experience and appropriately reflects the nature of the visualization's purpose in an engaging way. The visualization meets the project formatting requirements described in instructions. (Higher expectations in the Spreadsheet and Web App Pathways)

Visualization Charts

The charts are fully labeled for a clear representation of the data, and appropriate chart types are applied to the data. Minimum of three charts included.

Presentation

The presentation clearly presents the required components of the project work and provides a succinct explanation of the visualization.

B. INFO-I 202 Social Informatics

1. **Course Number and Title: INFO-I202 Social Informatics**
2. **Semester and Year: Spring 2021**
3. **Instructor Name: Fawzi BenMessaoud**
4. **Grade Distribution:**

Grade	A	B	C	D	F	W	FN	FNN	Total
Number of Students	27	12	5	0	3	0	0		47

5. **Learning Outcome:** Introduction to key social research perspectives and literatures on the use of information and communication technologies. Discusses current topics such as information ethics, relevant legal frameworks, popular and controversial uses of technology e.g., peer-to-peer file sharing, digital divides, etc. Outlines research methodologies for social informatics.

6. **Threshold for Performance:** This course belongs to the second axis of the B.S. in Informatics program and will focus on helping students gain a better understanding of Social Informatics as an interdisciplinary study of the design; uses and consequences of information technologies considering their interaction and impact on individual, institutional and cultural contexts. The program requires a minimum grade of C for all the core curriculum courses. According to the course grading policy, the minimum percentage for grade C is 73%. For this assessment purpose, the threshold for performance is 80% of students will earn 73% or above.

7. **Method of Assessment:** The direct assessment method selected to assess several learning outcomes in this course is a Mile Marker assignment with the "Final Course Project". This assessment strategy also adopted learning outcomes and a rubrics approach focused on providing students with every opportunity to practice and demonstrate the following in their deliverables:
    1. Research & Discover
    2. Analyze & Synthesize
    3. Organize & Report
    4. Present in-person or deliver virtually online with embedded audio/video presentations

The students' cumulative score for the three parts:(Part-I: Topic Selection and List of Resources; Part-II: Research Topic Introduction and Literature Review; Part-III: Final Paper Report and Presentation) was used to evaluate student learning.

8. **Analytic Rubric**
   The following is the analytic rubric for accessing student's work:

I202 Final Course Project - Rubrics

Student's Name: _____

CRITERIA	Exceed Requirements (5 points)	Meet Requirements (3-4 points)	Needs Improvement (1-2 points)	Incomplete (0 points)	Weight	Points Awarded	Multiplier	Total Points
						Points Awarded x Multiplier = Total Points		
Mechanics	• Paper is easy to navigate • Paper has less than 3 spelling and grammatical errors	• Paper is easy to navigate • Paper has 3-5 spelling and grammatical errors	• Paper is not easy to navigate • Paper has 6 or more spelling and grammatical errors	• Paper is awkward to navigate • Paper is incomplete	5%		1	0
Social Informatics Topic	• Social Informatics topic clearly stated • Social Informatics challenge, issue, goals and objecitves clearly stated • Social Informatics topic introduction, body, conclusion included	• Social Informatics topic clearly stated • Social Informatics challenge and issue, goals and objectives slightly unclear • Introduction, body and conclusion transitions unclear	• Social Informatics topic and content do not align • Social Informatics challenge, issue, goals and objectives do not align •Introduction, body and conclusion clear but off topic	• Social Informatics topic unclear • Social Informatics challenge, issue, goals and objectives unclear or missing; introduction, body and conclusion poorly transitioned or missing	40%		8	0
Data Collection	• 5 or more sources (references) are listed and used • Sources are cited properly when used in the paper	• 3-4 sources (references) are listed and used • Sources are cited properly when used in the paper	• 1-2 sources (references) are listed and used • Sources are cited improperly when used in the paper	• No appropriate sources (references) are listed and used	20%		4	0
Multi-media/Graphics & Examples	• Paper enhanced by media choices • Media choices are logically placed • Media enhances Social Informatics topic (subject related)	• Paper enhanced by media choices • Media not always well placed • Media on enhances Social Informatics topic (subject related)	• Media placed at random, interupts topic flow •Media enhances Social Informatics topic (subject related)	• Media visually confusing, detracts from overall Social Informatics and/or is missing in sections or throughout the Paper	20%		4	0
Length, Organization & Conclusion	• Paper main page makes topic clear • Content is logically organized and sequenced • Content flows from one concept to the next via transitions • Conclusion is supported by the data presentation	• Paper main page makes topic clear • Content is logically organized and sequenced • Content does not flow from one concept to the next via transitions • Conclusion is supported by the data presentation	• Paper main page and Paper content somewhat unrelated • Content is not logically organized and sequenced • Content does not flow from one concept to the next via transitions • Conclusion is not supported by the data presentation	• Paper main page and Social Informatics topic unrelated • Paper is incomplete • Conclusion is not present	15%		3	0
					100%		Total Points (out of 100)	0

9. **Evidence for Assessment:** The assignment selected for this assessment was Final Course Project. This assignment was designed as a Mile Marker assignment with three deliverables Part-I, II, and III. All three parts build on the In-Class Activities practices and the Current Events and Trend Reports assignments throughout the term and associated with the students' selected topic or area of Information Communication Technology (ICT) interest. Students were evaluated on how they Integrated evidence supporting their conclusions about the behavior of individuals, groups, and organizations resulting from their selected ICT and how they presented their final report findings in relationship to the specific issue, problem, challenge, or opportunity they have identified in their selected topic, including their discussion of the following questions:
    1. In retrospect to the topic, you have selected and the challenges/issues, discuss and comment on the success or failure of the technological determinism associated with your selected area. In other words, and from your point of view what is the role of technology as a solution and answer to the challenges/issues or is technology the root of the problem or what has caused the problem to begin with?
    2. From a Social Informatics context, discuss how you would consider both the social aspect, not just the technology or ICT aspect of design and technology ethics in your proposed solutions or recommendations in terms of the individual and societal networks.

10. **Results:**

    47 students were assessed. The results are as follows:

Performance Indicator	Total # of students at Level	% at Level
Exceeds Expectation	27	57.4%
Met Expectation	13	27.7%
Below Expectation	3	6.4%
Did Not Meet Expectation	4	8.5%

11. **Faculty Reflection:** The Final Course Project assessment that was designed to mainly assess the students' ability to research and specify the social and computational features of several ICT they have encountered and how they evaluated the concept of social identity in a digital world in Part-I. In Part-II, the focus was to assess how each student went about recognizing and analyzing the extent and impact of diversity among individuals, cultures, or societies resulting from the digitization of human behavior and their environments. In Part-III, the main goal was to assess how each student applied basic data search, discovery, and visualization techniques to represent combined multiple views of social data and human behavior and integrated and presented their solution to the specific issue, problem, challenge, or opportunity they have identified in their selected topic. The results showed that more than half of the class (57.4%) exceeded the expectation in all 3 parts of the project and more than 27% met the expectation while only 6.4% fell below the expectation. Out of the 4 students that did not meet expectations, 3 also failed the class due to deficient performance in all other course deliverables.

C. INFO-I 211 Information Infrastructure II

1. **Course Number and Title: INFO-I 211 Information Infrastructure II**
2. **Semester and Year: Spring 2021**
3. **Instructor Name: Louie Zhu**
4. **Course Grade Distribution**

Grade	A+/A/A-	B+/B/B-	C+/C	C-/D/F	W	Total
Number of Students	12	12	8	0	2	34

5. **Learning Outcome:** Design a complex information system with the MVC design pattern.
6. **Threshold for Performance:** (e.g. – 80% of students will achieve 70% or above)
   The B.S. in Informatics program requires a minimum grade of C for all the core curriculum courses. According to the course grading policy, the minimum percentage for grade C is 73%. For this assessment purpose, the threshold for performance is 80% of students will earn 73% or above.
7. **Method of Assessment (direct measure)**
   One lab was chosen to assess one of the course learning outcomes, and students' scores earned from the lab were used to evaluate student learning. The following is the analytic rubric for assessing student's work.
8. **Analytic Rubric**

Criteria	Exceeds Expectation	Met Expectation	Below Expectation	Did Not Meet Expectation
Performance Indicator	Correctly designed an information system with the MVC pattern. The system implemented all required features. Execution of code caused no errors.	Correctly designed an information system with the MVC pattern. The system implemented most required features. Execution of code caused some errors.	Designed an information system with the MVC pattern. The system implemented some required features. Execution of code caused many errors.	The system was not designed with the MVC pattern, or the student did not submit assessment.
Minimum %	97%	73%	60%	< 60%

9. **Evidence for Assessment:** (Include question/assignment used to measure LO)
   The assignment that was chosen for this assessment was Lab 10, Handling books in KUNG FU PANDA Media Library. The lab requires students to design an MVC application. Required featuring include listing books from a database and showing book details of specific books. Routing of the application must be done RESTfully. This lab aligns very well with the assessed learning outcomes.

10. Results

32 students were assessed. The results are as follows:

Performance Indicator	Total # at Level	% at Level
Exceeds Expectation	20	62.5%
Met Expectation	7	21.9%
Below Expectation	0	0%
Did Not Meet Expectation	5	15.6%

11. Faculty Reflection

Lab 10 is the second lab that focuses on MVC design. The first lab (Lab 9) focuses on designing MVC application that handles a single object and routes user requests with query string variables. This second lab focuses on handling multiple objects in an MVC application and routing with RESTful URLs. The results show that students performed very well in the lab. More than 84% of students met or exceeded expectations. The experience and knowledge from Lab 9 helped students a lot in Lab 10. Among the 5 students who did not meet expectation, 3 did not turn in anything and 2 did the lab very poorly.

D. INFO-I 223 Data Fluency

1. **Course Number and Title:** INFO-I 223 Data Fluency
2. **Semester and Year:** Spring 2021
3. **Instructor Name:** Ran Chang
4. **Course Grade Distribution**

Grade	A+/A/A-	B+/B/B-	C+/C	C-/D/F	W	Total
Number of Students	9	13	5	2	0	29

5. **Learning Outcome:** Students learn the fundamental knowledge of data analysis. They will be able to create, access, clean, explore, analyze, and visualize data to draw inferences and make predictions. This course prepares students for taking more advanced data-related courses such as INFO-I 421 Data Mining.

6. **Threshold for Performance:** (e.g. – 80% of students will achieve 70% or above)
The B.S. in Informatics program requires a minimum grade of C for all the core curriculum courses. According to the course grading policy, the minimum percentage for grade C is 73%. For this assessment purpose, the threshold for performance is 80% of students will earn 73% or above.

7. **Method of Assessment (direct measure)**
The midterm exam was chosen to assess several learning outcomes, including to access, clean, explore, and to visualize the data and the data preprocess skills. The midterm exam score is used to assess student learning. The following is the analytic rubric for accessing student's work.

8. **Analytic Rubric**

Criteria	Exceeds Expectation	Met Expectation	Below Expectation	Did Not Meet Expectation
Performance Indicator	Correctly understand all data principal knowledges, including data types of data attributes, data quality, dataset types, data quality, data cleaning, data aggregation, and data visualization, etc. Correctly apply the above knowledge to some example	Correctly understand most of data principal knowledges, including data types of data attributes, data quality, dataset types, data quality, data cleaning, data aggregation, and data visualization, etc. Correctly apply most of the above knowledge to some example	Correctly understand some data principal knowledges, including data types of data attributes, data quality, dataset types, data quality, data cleaning, data aggregation, and data visualization, etc. Correctly apply some the above knowledge to some example	Can not correctly understand the core data principal knowledges, including data types of data attributes, data quality, dataset types, data quality, data cleaning, data aggregation, and data visualization, etc. Can not correctly apply the above

	datasets to preprocess. The data after preprocess is very clean and has preliminary exploration outcomes including all necessary plots/tables.	datasets to preprocess. The data after preprocess is clean but may have limit number of improper data like outliers, inconsistent data, etc., and has preliminary exploration outcomes including some necessary plots/tables.	datasets to preprocess. The data after preprocess is clean but may have quite a few improper data like outliers, inconsistent data, etc., and has preliminary exploration outcomes but without plot/table.	knowledge to some example datasets to preprocess. The data after preprocess is not clean and the preliminary exploration outcomes is very limit and has no plot/table. Or students did not submit assessment.
Minimum %	90%	73%	60%	< 60%

9. **Evidence for Assessment:** (Include question/assignment used to measure LO)
   The assignment that was chosen for this assessment was midterm exam. The midterm exam fully assesses the knowledge that is discussed in the first half semester, including understanding the definition of the data, dataset, data type of data attributes, types of datasets, data quality, data cleaning, data aggregation, type of data sampling, descriptive statistics of data, data visualization and plots/table, and properties and terms in certain data plot/table such as histogram, contingency table.

10. Results
    29 students were assessed. The results are as follows:

Performance Indicator	**Total # at Level**	**% at Level**
Exceeds Expectation	15	51.7%
Met Expectation	10	34.5%
Below Expectation	2	6.9%
Did Not Meet Expectation	2	6.9%

11. **Faculty Reflection**
    The midterm exam assesses the understanding of data analysis fundamental concepts, data preprocess and data preliminary exploration. This exam assesses the most important data analysis concepts, skills and technology that are comprehensively discussed in the first half of the semester. Students will demonstrate whether they can access the data; understand the data types of data attributes, different sampling methods; how to calculate the key parameters of the datasets, clean the data by overcoming the missing cells, inconsistent values, duplicated cells, defining outliers; how to explore dataset by using contingency table for categorical data, scatter plots, histogram, pie charts, box plots and stem-leaf plots for numerical data. This exam uses multiple-choices questions,

short essay questions, calculation questions, and demonstration of the preprocessing dataset, drawing plots using corresponding tools, such as excel. The exam will make students prepared for the second half of the semester and the next level data related courses (I421 Data Mining). The results show that students learned most important materials in the first half of semester very well. More than 85% of students met or exceeded expectations. Among 4 students who did not meet expectation, 3 did not perform well in the test, and 1 did take the exam.

IV. Capstone Experience

Capstones are a signature, culminating experience that requires students to integrate knowledge, skills, and dispositions acquired during college and apply them in a situation that approximates some aspect of disciplinary practice. Students are prepared to achieve excellence in the capstone when the program has intentionally designed a pathway that strategically places the capstone at the end of the students' journey.

Options the Informatics B.S. Undergraduate program provides to its students to fulfill the degree requirement of capstone experience

There are three options the Informatics B.S. Undergraduate program provides to its students to fulfill the capstone experience requirement. Students may complete any of the following three courses:

- INFO-I 491 Capstone Project Internship
- INFO-I 492/493 Senior Thesis
- INFO-I 494 Design and Development of an Information System

Among the three options, the most popular one is Capstone Project Internship. More than 90% of our graduates chose this option in the past few years. Only a few graduates chose to complete the I492 or I494 course.

For the INFO-I 494 course, the process starts with the student identifying a faculty member whose expertise matches well with the student's experience, knowledge, and career paths. Once the faculty agrees on advising the student for the project, the faculty and student work together to plan and execute the project.

Course learning outcomes and their mapping to IUPUI+

INFO-I 491 Capstone Project Internship

Learning Outcomes	IUPUI +
1. Explore a potential career path within media arts and science.	
2. Master knowledge and skills acquired during informatics coursework; strengthen resume.	Problem Solver
3. Collaborate to create information technology projects and solve problems in a workplace environment, using soft skills like communication and teamwork.	Communicator
4. Reflect upon internship experience in making future career choices.	Communicator
5. Develop an innovative digital application, from original concept to final production, in light of theory and practice in the major and specialization.	Innovator

6. Plan and evaluate a project, addressing the employer's requirements, budget, and team.	Problem Solver
7. Manage their time and meet deadlines to fulfill final project expectations.	Problem Solver
8. Document assets, code, and media created for the project weekly.	Communicator
9. Present their final work at the capstone event.	Community Contributor

INFO-I 492/493 Senior Thesis

Learning Outcomes	IUPUI+
1. Evaluate the research literature critically, interpreting contributions, deficiencies, and theories with respect to the thesis/project research problem, aims, questions or hypotheses, and methods.	Communicator Problem Solver
2. Assess the research designs of published research articles in the field.	Communicator Problem Solver
3. Formulate specific research aims, questions, or hypotheses within a topic area of the field.	Problem Solver Innovator
4. Determine appropriate research methods to answer particular research questions, to test hypotheses, or to evaluate algorithms or systems.	Problem Solver Innovator
5. Analyze data using appropriate qualitative and/or quantitative methods.	Innovator
6. Critique peers' research designs and provide generative feedback.	Communicator Problem Solver Innovator
7. Design, develop, and write a research thesis or project proposal and defend it before a research committee.	Innovator
8. Execute the research proposal, developing a system and/or collecting data, based on the research plan, and abiding by ethical standards for conducting research.	Innovator
9. Write a thesis/project report and defend it before a research committee.	Innovator

INFO-I 494 Design and Development of an Information System

Learning Outcomes	IUPUI+
1. Analyze a problem, including identifying and evaluating alternatives, then execute a solution.	Problem Solver
2. Create an information system, for which student applies knowledge and skills according to industry's best practices and standards.	Innovator
3. Manage time and meet deadlines to fulfill project expectations.	Problem Solver
4. Document assets, code, and media created for the project weekly.	Communicator
5. Reflect on the capstone experience regarding the impact on self, school, campus, community, and future career choices.	Communicator
6. Recognize the importance of planning for professional development beyond post-secondary education.	Communicator Contributor
7. Present their final work at the capstone event.	Communicator

Currently, it is up to individual faculty to set the expectations and requirements for the project. The consistency among faculty may be lacking. The INFO program is currently working to address this issue.

Capstone Project Presentation

The capstone project presentation is required for graduation. It is in the very best interest of all students to finish their project, thesis, or internship at the appointed time and present their work at the capstone presentation event. Students will have a chance to have one-on-one contact with local industry representatives who may come to their presentation. All students who do not present their project, thesis, or internship at the scheduled time will receive a reduction in their final grade.

Capstone Project Final Report

A final postmortem is turned in to the capstone advisor to complete the project. The format varies depending on the projects. It can be a summary of the project and a reflection on the student's experiences or a CD/DVD with a copy of the digital project.

Evaluation of Capstone Experience

In Spring 2021, the INFO program completed an evaluation of the capstone experience. The evaluation included a survey of the faculty members who have supervised capstone projects. Faculty was also asked to provide sample capstone projects and assessment results. Here are the excerpts of the survey questions and responses.

1. How do your students experience being a “Communicator” in your capstone experience?
   - Students need to make a proposal when starting the proposal. In the proposal, students need to write problem statements, state proposed solutions and the execution plan. During the project, students need to document and report the progress, issues you encounter, revision of the original plan. To complete the project, students also need to present the final work at the capstone event.
   - Students present the overall project introduction, communicate project updates, organize the project documentation for discussion and submission, and collaborate with team members.

2. How do you students experience being a 'Problem Solver' in your capstone experience?
   - A basic requirement of the project is that students identify real-world problems or issues and then develop an information system as the solution to solve the problems or address the issues. Students need to analyze problems, evaluate alternative approaches to solve the problems, and choose a solution to execute. During the project, students need to manage their timeline and make sure the project can be completed as scheduled and as expected.
   - Students analyze, visual, and wireframe ideas and solutions to real world business, organization, and technology problems through 3 main steps: 1). Identify and dissect problem to present solutions; 2). Diagram a system architecture and wireframe the selected solution; and 3). Build or prototype solution and present a final report and visual presentation.

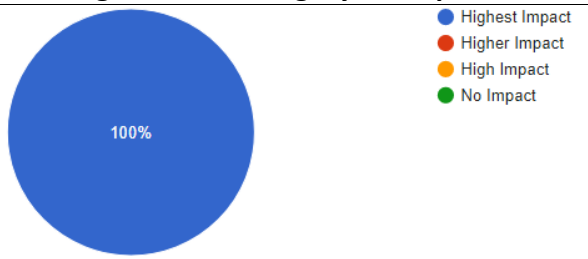
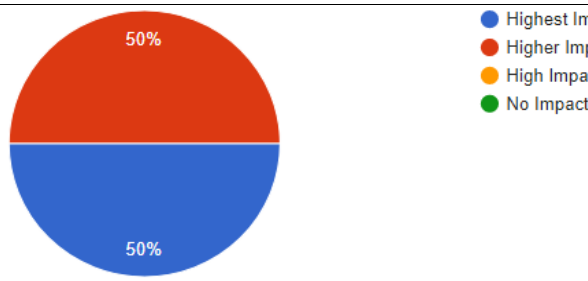
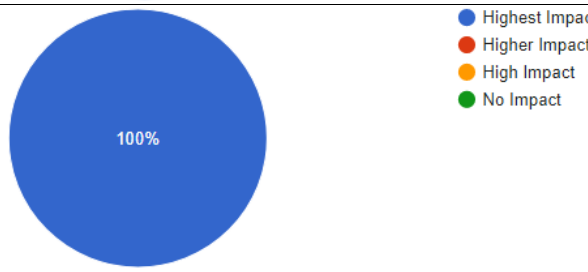
3. How do your students experience being an 'Innovator' in your capstone experience?
   - Students are required to design and create a complete information system using the skills they learn from their course work. This process allows students to apply their knowledge into practice by creating the information from scratch.
   - Students design and implement new ideas and solutions to various industry real world problems and business/organizational opportunities.

4. How do your students experience being a 'Community Contributor' in your capstone experience?
   - Students are required to present the complete information system at the capstone event. The event is well attended by students and their parents, local professionals, alumni, and people from local community.
   - Student work with industry partners and subject matter experts selected for their Capstone projects.

5. What MAJOR assignment, activity, or assessment is used to measure student learning outcomes in the capstone experience?
   - The major assignment is designing and creating a complete information system. The assignment is multi-phased. There are specific requirements and deadlines for each phase. Learning is assessed by evaluating the work the students complete for its quality, completeness, and creativity.

- Project introduction report, system architecture diagram, wireframe and flowcharts, final report, and poster and visual presentation.

6. Results of faculty survey

Survey Prompt	Percentage of each category of responses
Please gauge the understanding and value of the capstone experiences	
Please gauge student's integration of past course work into their capstone	
Please gauge student's capstone reflections of personal growth and professional development	
Please gauge student's capstone deliverable and ability to connect it to their story	

V. Placement Data

The School of Informatics and Computing's Career Services office provided the following data about the graduates from the BS in Informatics:

Total Informatics BS Degrees Awarded and Employment Status

Year	**July 1, 2019 – June 30, 2020**	**July 1, 2018 – June 30, 2019**	**July 1, 2017 – June 30, 2018**	**July 1, 2016 – June 30, 2017**
Number of INFO BS degrees	64	49	64	26
Percentage of the Total BS Degrees	34%	35%	37%	25%
Percentage of the Total Degrees	15%	14%	19%	9%
Percentage of Employed or Self-employed	96%	92%	98%	92%
Percentage of Employed Full Time and In-major	84%	94%	100%	96%

Bachelor Salary Distribution

Year	**July 1, 2019 – June 30, 2020**	**July 1, 2018 – June 30, 2019**	**July 1, 2017 – June 30, 2018**	**July 1, 2016 – June 30, 2017**
Informatics BS	$55,000	$55,000	$57,000	$52,000
Median Salary for all BS in the School	$50, 000	$54,000	$48,942	$51,150

Among the three BS programs in the school, the median salary of the BS in Informatics graduates was the highest and is higher than the school average by $5,000.

The top three job titles of the 2020 graduates are Business Analyst, Data Analyst, and Technology Consult. The top five employers are Community Health Network, Indiana University Health, Infosys, Navient Corporation, and The Basement. Majority of the graduates are employed in the State of Indiana.