Integrated Science Studies (ISS) Baccalaureate Degree

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ACADEMIC YEAR COVERED BY THIS REPORT: 2021-2022

I. PROGRAM LEARNING OUTCOMES

Students will demonstrate foundational knowledge and competency in core science disciplines (BIO, EES, CHEM, PHY, STAT).

Students will demonstrate proficiency in laboratory and/or field skills.

Students will demonstrate effective scientific communication skills.

II. PROCEDURES USED FOR ASSESSMENT

A. Direct Assessment

Objective 1: Composite calculations from cumulative assessments in foundational courses from EES, CHM, PHY, and BIO were used to create a single number that gages learning of foundational lecture material from the first-year science courses in these specific disciplines.

OBJECTIVE 1: Foundational Skills Rubric

Name

Percent Mastery of BIO

Percent Mastery of CHEM

Percent Mastery of EES

Percent Mastery of PHY/MTH/STAT

Overall

Class Average

Moving forward, this style of assessment will be dropped in favor of a single standardized short answer/essay style exam covering material from these foundational courses which will be administered to the capstone students in the senior seminar. The construction of this new exam is an iterative process and is not yet complete but a few sample questions for this new assessment tool are as follows (questions to be graded on a scale of 0 to 10 arranged by discipline with new rubric to follow):

Objective 2: Composite calculations from cumulative lab and/or field book assessments from foundational courses in EES, CHM, PHY, and BIO were used to create a single number that gages lab skills across the disciplines. This single number is a composite of all available lab activities. See individual courses for specific course objectives and lab outcomes. In this summary is a single numeric which measures the degree to which the following overarching objectives have been met:

OBJECTIVE 2: Lab and Field Skills Overarching Education Goals and Rubric

To what extent did labs help, foster, facilitate, or otherwise – (overall scale of 0 to 100)

Introduce students to scientific methods and experimental design

Teach students how to use scientific equipment and perform experiments safely

Help students understand scientific concepts and theories

Develop students' critical thinking and problem-solving skills

Encourage students to ask scientific questions and formulate hypotheses

Help students learn how to collect, analyze, and interpret data

Teach students how to communicate scientific ideas and results through oral and written reports

Help students learn how to work effectively in a team

Expose students to real-world applications of scientific concepts

Help students develop technical skills and expertise in a particular scientific field

Foster creativity and curiosity about the natural world

Encourage students to think about the ethical and societal implications of scientific research

Help students learn how to identify and evaluate sources of scientific information

Teach students how to design and conduct their own independent research projects

Prepare students for careers in science, technology, engineering, and mathematics (STEM).

Objective 3: Research papers and/or presentations were collected and analyzed from the senior capstone class (SM 4000) using defined rubrics. Rubric follows the following categories:

OBJECTIVE 3: Communication Skills Rubric

Name

Scientific Content (10 pts)

Interpretation of Content (10 Points)

Readable for a Wide Audience (10 Points)

Organization (10 Points)

Overall Writing Quality (10 Points)

Class Average

B. Scoring of Student Work

Scoring of student work was done using in house rubrics and other methods indicated in procedures used for assessment (see above section for rubrics).

The 2021-22 program assessment includes all students registered for the BS in ISS during this time period. This assessment includes a total of 21 students.

The objective assessed for this year was Objective 2: Lab and Field Proficiency.

C. Indirect Assessment

The following Likert style survey is comprised of 10 questions, with each on a sliding scale from agree completely to do not agree at all (a numeral of 5 corresponds to agree completely). The survey is administered via email to students that have been enrolled in the program at one time or another. Note that not all students are/were/will able to be reached. As time moves forward, presentation of results will expand with a rolling composite average compared to the current assessment year.

Survey Questions

Survey Results

Topic and Extent of Perceived Mastery

Average Score (2017-2024; N=11)

2021-2022

Core Concepts in Biology

5.00

5

Core Concepts in Earth Environmental

4.82

5

Core Concepts in Chemistry

4.64

4.75

Core Concepts in Physics

3.91

4.25

Core Concepts in Math and Statistics

4.64

4.5

Scientific Method

4.91

5

Communication Skills

5.00

5

Problem Solving and Reasoning Skills

5.00

5

Ethical Implications of Science

4.91

5

Feeling of Preparation

5.00

5

III. ASSESSMENT RESULTS/INFORMATION:

Assessment Metric

Summary and Analysis in Relation to Learning Outcome

OBJECTIVE 1: Foundational Knowledge

Not assessed during this year.

OBJECTIVE 2: Lab/Field Skills

Metric assessed using student data from 2021-22. Included 21 students with single cumulative lab artifacts reflecting lab knowledge from 8 labs across disciplines. Dataset includes 168 unique scores. Average across all disciplines was 93.2%. Additional improvements to lab assessment is warranted. See above sections.

OBJECTIVE 3: Communication of Science

On a larger scale, this program has realized a total of 27 graduates from 2017 to 2022. See table below. It is worth noting that while this is not a huge number of graduates compared to a large university program that graduates hundreds ever year that we are a small enrollment branch campus and that this program is the only opportunity for a Bachelors of Science Degree in this or other surrounding counties in Ohio. Moving forward, enrollment could grow in this program provided expanded attention to recruitment. In addition, enrollment could grow in this program if it was opened/promoted to Dayton Campus students as it is a multidisciplinary science degree that meets the needs of communities.

BS Integrated Science Graduates

Huelsman

Stephen

2017

Mason

Chad

2017

Smith

Austin

2017

Gnau

Nicholas

2018

Mazzone

Nichole

2018

McClure

Nicole

2018

Teeters

Brian

2018

Crites

Aaron

2019

Kanorr

Shelby

2019

Mason

Shawn

2019

Poore

Phillip

2019

Kinney

Brittany

2020

Rohrer

Emma

2020

Axe

Bradley

2021

Bornhorst

Adam

2021

Cobb

Chasalin

2021

Homan

Benjamin

2021

Shimp

Bethany

2021

Strang

Benjamin

2021

Wendel

Cody

2021

Dodds

Jenna

2022

Griesdorn

Madalyn

2022

Heinrichs

Bryan

2022

Morden

Megan

2022

Muether

Geordan

2022

Senger

Zachary

2022

Thomas

Reece

2022

[Analysis]

IV. ACTIONS TO IMPROVE STUDENT LEARNING

There are many steps that can be taken to improve or maintain the excellent student learning in the ISS Degree Program. Some potential strategies to continue on with or begin include:

1. Continuing to provide students with a clear and well-defined curriculum that outlines the goals and objectives of the program, along with specific knowledge and skills.
2. Ensuring that students continue to have access to high-quality instructional materials, such as textbooks, lectures, and online resources, that are relevant to the sciences.
3. Providing students with additional opportunities beyond the few experiences that currently exist to engage in hands-on learning activities and experiments that allow them to apply the concepts and principles they are learning in the classroom outside of the classroom through internships, jobs, volunteer opportunities, etc.
4. Continuing to encourage students to develop critical thinking and problem-solving skills, which are essential for success in the sciences.
5. Providing students with more opportunities to interact with practicing earth and biological, agricultural, and healthcare professionals and/or other experts in the field, so that they can learn from their experiences and insights.

6. Expanding students access to state-of-the-art technology and equipment, such as advanced laboratory equipment and computer simulations, to enhance their learning experiences.

V. SUPPORTING DOCUMENTS

Additional documentation, when provided, is stored in the internal Academic Program Assessment of Student Learning SharePoint site.