

## Program-Level Assessment: Annual Report

Program Name (no acronyms): Integrated Applied Sciences	Department: NA
Degree or Certificate Level: PhD	College/School: College of Arts & Sciences
Date (Month/Year): 7/1/2021	Assessment Contact: Vasit Sagan
In what year was the data upon which this report is based collected? 2020-2021	
In what year was the program's assessment plan most recently reviewed/updated? 2020	

### 1. Student Learning Outcomes

Which of the program's student learning outcomes were assessed in this annual assessment cycle? (Please list the full, complete learning outcome statements and not just numbers, e.g., Outcomes 1 and 2.)

Outcome 1. Students will use scientific principles underpinning the primary scientific discipline in which their concentration is based and by applying basic research methodology, demonstrate their application to their particular field of interest (chemistry, biology, physics, environmental science, sustainability science).

Outcome 2. Students will demonstrate advanced creativity in scientific research methodology in their concentration and appropriately use techniques in a laboratory and/or field setting – including experimental, theoretical, and computational methods. Students will integrate methods, theories, paradigms, concepts etc. from more than one discipline.

Outcome 3. Students will demonstrate an ability to communicate (oral and written) results and conclusions from their research, describe techniques and methodology used, and apply their experiences in the greater world in which we live.

### 2. Assessment Methods: Artifacts of Student Learning

Which artifacts of student learning were used to determine if students achieved the outcome(s)? Please describe and identify the course(s) in which these artifacts were collected. Clarify if any such courses were offered a) online, b) at the Madrid campus, or c) at any other off-campus location.

#### Outcome 1.

Students complete a coursework sequence tailored to their research project and guided by their primary and secondary faculty mentors. Coursework options are detailed in the IAS graduate program handbook. Due to the pandemic, most of our courses were offered online during the past academic year.

At the end of their 2<sup>nd</sup> year or start of 3<sup>rd</sup> year of studies, students take comprehensive written exams. In the middle of their 3<sup>rd</sup> year, students undergo an oral examination to defend an original research proposal. Upon completion of studies, students undergo an oral examination to defend their dissertation.

Students are expected to: 1) perform advanced quantitative calculations using experimental data; 2) have an advanced recognition of the methods and tools used in their concentration; 3) connect observations with prior information.

#### Outcome 2.

During their 3<sup>rd</sup> year, students prepare an original research proposal that is based upon their preliminary laboratory and/or field findings.

Students enroll in 12 hours of Dissertation Research during their 3<sup>rd</sup>-5<sup>th</sup> years in the program; during this time, students meet regularly with their faculty advisor to review research progress and discuss experimental design and data.

Throughout their studies, students prepare abstracts for meeting presentations and work on manuscripts submitted for peer review (publications are expected).

Students prepare a final dissertation with defense that is based upon their research findings.

Students should be able to: 1) independently design experiments to investigate a scientific hypothesis; 2) carry out experiments safely, using proper equipment and techniques; 3) independently conduct data analysis.

### **Outcome 3.**

In their 3<sup>rd</sup> year of studies, students give an oral presentation on their proposed research.

Students typically present posters or talks on their research at SLU's annual Graduate Research Symposium.

It is the expectation that students also present a poster or a talk on their research at a scientific conference at least once during their studies.

Students will assist in the preparation of manuscripts for publication of results in peer review journals.

Students must enroll in a Current Topics (IAS 6030) course each semester in their 3<sup>rd</sup> and 4<sup>th</sup> years where they give oral presentations on recent research from current literature not directly based their own specific research topic. They are expected to project their own independently crafted research ideas based on the chosen research presentation subject.

At the end of their studies, students give an oral presentation to defend their research.

### **3. Assessment Methods: Evaluation Process**

What process was used to evaluate the artifacts of student learning, and by whom? Please identify the tools(s) (e.g., a rubric) used in the process and **include them in/with this report document** (do not just refer to the assessment plan).

#### **Outcome 1.**

Courses: graded by faculty based upon a rubric given in the course syllabus.

Comprehensive written exams: students are tested on their knowledge gained through their coursework. Questions are written by faculty committee members in each of three specific subject areas. Students are expected to score 70% or above to pass each part. Scores in the 50-70% range are considered conditional passes, with the conditions for passing set by the faculty committee member concerned (reattempt incorrectly answered questions, provide additional material or information, etc.). Students who do not pass are given an opportunity to retake part or all of the exam, following discussion with committee member(s).

A Dissertation Research Proposal Assessment rubric has been developed and has been appended (Appendix A1). This should be used by all members of the Dissertation Research Proposal Committee.

Dissertation Assessment and Final Defense Assessment rubrics have been developed and appended (Appendices A2 and A3). They should both be used by all members of the Dissertation Defense Committee.

#### **Outcome 2.**

Primary mentors give student feedback in annual reviews that include goals for the next year. Secondary mentors may also contribute, thus providing a means to assess the interdisciplinary skills demonstrated by the student. These are also reviewed by the graduate Program Director.

Oral examinations: students demonstrate knowledge by answering questions posed by faculty members who are on their committees. Questions assess student knowledge of concentration topics covered in their course work and research area. After the examination, committee members discuss the student's performance and assess if the student demonstrated knowledge that would be expected for a student at a comparable level. The committee chairperson will complete a ratings form ranking student performance in the areas of scientific merit and communication skills and also report specific weaknesses in the student's research methodology that need to be addressed.

Submitted manuscripts are reviewed by accomplished scientists in the relevant research area. Peer reviewers provide feedback on the manuscript and assess if the manuscript is acceptable for publication in the journal the manuscript was submitted to.

The dissertation committee evaluates the research votes to pass or not pass the student in the final defense.

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### **Outcome 3.**

Oral presentation on the PhD proposed research is given to the committee and feedback is provided by the committee as described above.

Presentations given at scientific conferences are public. Students may receive informal feedback and advice from peers and faculty from other institutions.

Annual student reviews are completed by the student that list presentations and publications given. The quality may be partially assessed in terms of the size and prestige of the conference (regional, national or international) for presentations, or journal impact factor for publications.

Oral presentations given as part of Current Topics (IAS 6030) course requirements are evaluated by the course instructor and graded by a rubric given in the course syllabus. Students are given feedback to help them refine and improve their oral presentation and communication skills.

Oral presentations given at the end of studies are public presentations; feedback is mainly provided by the research mentor and committee as described above.

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## **4. Data/Results**

What were the results of the assessment of the learning outcome(s)? Please be specific. Does achievement differ by teaching modality (e.g., online vs. face-to-face) or on-ground location (e.g., STL campus, Madrid campus, other off-campus site)?

### **Outcome 1.**

- 10 students completed coursework and received passing or above grades except one who failed and dropped the program due to personal reasons.
- 3 students took a written comprehensive exam, which re-examines prior coursework understanding and expertise and challenges students to apply knowledge. Student received a full passing grade on all three exam papers.

### **Outcome 2.**

- Students published 10 papers in peer-reviewed journals; and have a further 5 manuscript preparations in progress.

### Outcome 3.

- Students published 10 papers in peer-reviewed journals and conference proceedings (1.25 papers/student – an 12 % increase from the previous year) and have a further 5 manuscript preparations in progress.
- Students gave a total of 5 presentations at conferences or other scientific meetings.
- 6 students completed the IAS 6030 Current Topics course, each giving oral presentations on recent research literature and all passing with excellent grades.

## 5. Findings: Interpretations & Conclusions

What have you learned from these results? What does the data tell you?

90 % of students passed coursework with acceptable grades for graduate students (learning outcomes #1 and 3).

100 % students (that attempted candidacy exams) passed written exams thus demonstrating proficiency in research creativity and productivity (learning outcomes #1,2 and 3).

Students published peer-reviewed journal papers in top scientific journals demonstrating proficiency in research creativity and productivity (learning outcomes #1,2 and 3).

## 6. Closing the Loop: Dissemination and Use of Current Assessment Findings

- A.** When and how did your program faculty share and discuss these results and findings from this cycle of assessment?

Feedback was given to students and mentors in oral dissertation proposal exams with regard to research achievements and future objectives.

Feedback was given to selected students and mentors during student/mentor/committee meetings pursuant to written annual reports.

Feedback was given to students in the IAS 6030 Current Topics course with respect to communication skills in research presentations.

- B.** How specifically have you decided to use these findings to improve teaching and learning in your program? For example, perhaps you've initiated one or more of the following:

Changes to the Curriculum or Pedagogies

- Course content
- Teaching techniques
- Improvements in technology
- Prerequisites
- Course sequence
- New courses
- Deletion of courses
- Changes in frequency or scheduling of course offerings

Changes to the Assessment Plan

- Student learning outcomes
- Artifacts of student learning
- Evaluation process
- Evaluation tools (e.g., rubrics)
- Data collection methods
- Frequency of data collection

Please describe the actions you are taking as a result of these findings.

Most of the students in the IAS program are enrolled in GIS and Environmental Science track. We are in the process of establishing a new PhD program in Geoinformatics to replace the GIS and Environmental Science track. There are PhD programs in Biology and Chemistry. Therefore, the remaining tracks Biology, Chemistry, and physics (which does not have any students) will be closed.

If no changes are being made, please explain why.

**7. Closing the Loop: Review of Previous Assessment Findings and Changes**

**A.** What is at least one change your program has implemented in recent years as a result of assessment data?

To encourage students conduct independent research and publish academic papers, we established two awards.

**GEOSPATIAL RESEARCH AND INNOVATION AWARD**

The this award recognizes scientific, methodological and visualization innovations in geospatial science (GIS, cartography, remote sensing, GPS, surveying and mapping, and spatial statistics). The award is given annually to students who have demonstrated significant creativity in applied research demonstrated by peer-reviewed publications, conference presentations, patents and other creative work.

**EXCELLENCE IN INTEGRATED APPLIED SCIENCE RESEARCH**

This award recognizes one IAS student annually for their scholarship demonstrated by originality of broadly disseminated interdisciplinary research (number and quality of peer-reviewed journal publications and presentations at conferences), success in coursework (GPA), work ethic, and leadership.

Jorge Luis Ocampo Espindola was awarded EXCELLENCE IN INTEGRATED APPLIED SCIENCE RESEARCH and recognized in College of Arts and Sciences Pre-commencement.

**B.** How has this change/have these changes been assessed?

No enough data to assess.

**C.** What were the findings of the assessment?

NA

**D.** How do you plan to (continue to) use this information moving forward?

NA

**IMPORTANT: Please submit any assessment tools (e.g., rubrics) with this report as separate attachments or copied and pasted into this Word document. Please do not just refer to the assessment plan; the report should serve as a stand-alone document.**