

Undergraduate Program Assessment Report 2011

Department of Integrated Science and Technology, including the programs in Environmental Science and Natural Resources and Recreation Management

(Prepared by Brian Morgan and Mike Little)

I. Program's Mission:

The Department of Integrated Science and Technology offers students majors within three degree programs, Integrated Science and Technology, Environmental Science and Natural Resources and Recreation Management.

IST provides a student centered environment predicated on three principles:

- The integration of traditionally independent subject areas through technology
- Use of active learning approaches emphasizing hands-on problem solving
- Preparing students for employment in their field with a bachelor's degree

The primary mission of the department is to offer students a degree program with a curriculum that combines knowledge of scientific principles with the use of advanced technology. The approach to teaching and learning gives students opportunities for growth that they might not find in a more traditional program. A secondary mission is economic development of our region through producing graduates who can use the knowledge they've acquired in real-life situations and will be ready to make a contribution in the workplace with or without an advanced degree.

The integration of scientific approaches and technical competence that is at the heart of our curriculum involves three unique curricular divisions, the IST Core Curriculum, the IST Strategic Sector, and the IST Capstone Experience. The IST Core Curriculum consists of IST Connections I and II (IST 120 and 220), IST Analytical Methods II (IST 131) and III (IST 230), IST Introduction to Programming (IST 160) and IST Instrumentation (IST 260).

The IST Strategic Sector consists of 300 level courses that provide content integration, problem solving strategies, and project management skills in the academic major of participating students – with different foci for students who are IST, Computer and Information Technology, Biotechnology, Environmental Science and Natural Resources and Recreation Management.

The IST Capstone Experience consists of completion of a required course IST Senior Project I (IST 490) and the completion of one of three options, IST Senior Project II (491), IST Internship (470), or a 6 hour course sequence that enriches the experience of the strategic sector experience.

During discussions within the IST Department and between IST Faculty and Staff and members of the University Assessment Committee, it was determined that the most effective assessment of these degree programs would involve those factors that have defined the unique elements of IST teaching and learning and have contributed to the success of our graduates. Consequently, the initial assessments were designed to measure the effectiveness of the IST Core Curriculum and the IST Capstone experience. At a later point we plan to add assessments of the strategic sector, and of specific senior project experiences but right now we are focusing on the effective assessment of the core courses all students take, the IST Core and Senior Project I.

II. Program's Student Learning Outcomes (you may refer to the chart):

Outcome I: Given a real world problem, students will be able to choose the most appropriate hardware and software technology to solve the problem. (Core Curriculum Assessment, appended to this document)

Outcome II: Students will be able to analyze the potential consequences of the hardware and software technology choices they have made to solve problems. (Core Curriculum Assessment)

Outcome III: Students will be able to plan and execute a project at a professional level using discipline-specific knowledge. (Capstone Project Assessment)

Outcome IV: In the development of their project, students will be able to clearly identify an issue and relate the goals and objectives of the project to this issue. (Capstone Project Assessment)

Outcome V: In the development of their project, students will design an experiment or project employing the appropriate scientific or technical methods. (Capstone Project Assessment)

Outcome VI: In the development of their project, students will analyze data in appropriate tabular and numeric form. (Capstone Project Assessment)

Outcome VII: In the development and presentation of their projects, students will show originality in both the development of purpose for the work and creativity in the design of the methods for the work. (Capstone Project Assessment)

II. Assessment Activities (you may refer to the chart):

A. Assessment Measures (Tools)

a. Assessment Activities: (Applicable to Outcomes III, IV, and V for all students enrolled Fall 09, IST 490 Capstone I)

i. Assessment Measures

- All students were required to propose and develop a plan for a research or product development project. As specified in the course syllabus the sequence of steps for assessment were:
 - Review and practice rules for effectively organizing a project
 - Review and practice rules for effective presentation of a project
 - Apply Deming principles to goal setting
 - Define project objective(s)
 - Define project scope of work
 - Define project deliverables
 - Schedule progress and final reports
- **Benchmarks** Mean performance across students will be 3.5 (on 4-point scale) on standard 1-5 of scoring rubric (attached)

- **Results/Analysis**
 - Students enrolled in IST 490, Capstone I were the target population for the initial assessment of Benchmarks III, IV, and V
 - During the Spring Semester of 2011, five, eight, and nine students respectively made presentations on their work in IST 470 Internship, IST 490 Senior Project I, and IST 491 Senior Project II. Presentations were assessed by attending students and faculty for quality of presentation and by responsible faculty for scores relative to the five questions on the Capstone Project Assessment (CPA). Faculty involved in the application of the rubrics from CPA found the simple but direct queries of CPA to be a very thorough assessment tool.

- **Analysis/Planned Action**
 - In the previous Assessment Report, faculty committed unanimously to the following:
 - 1) Introduce students in IST Connections I and II to proper protocols to propose, design, and initiate a research project as per Learning Outcomes III, IV, and V.
 - 2) Develop a follow up activity for all environmental studies, computer information technology, and biotechnology students in one or more 300 level classes to apply principles assessed by Learning Outcomes III, IV, and V
 - Subsequent to this action, the IST Department lost the full time Connections faculty position and the key faculty member for this initiative. This has been a serious setback. However, part time faculty has been employed who are committed to the above outcomes and have started the process of their implementation.

III. Assessment Activities (please refer to chart)

IV. Overview of changes implemented in your program this past year based on results and planned action specified in last year's report.

The IST Department including Degree Programs in Environmental Science, Natural Resource and Recreation Management and Majors in Integrated Science and Technology, Computer Information Technology, and Biotechnology has identified two Assessment Tools, i.e., the Core Curriculum Assessment and the Capstone Project Assessment. Both have been applied to student work over the past year. Reported below are the results of their initial implementation.

Issues identified in the previous Assessment Report:

Issue from 2010 Assessment Report: The technology core of IST is a critical element of the department's unique infusion of technology across the curriculum. This has not been effectively assessed. Consequently, a multiple choice test has been developed for a pre and post Core Curriculum assessment.

Action: The test was set up on line and administered via the IST website to all perspective students enrolled in the first IST Core Course, IST 160 at the start of the 2011 Fall Semester. Students were informed that completion of the IST Core Curriculum Assessment was prerequisite to enrollment into their specialty IST junior classes. However, only 16 students out of over 100 prospective students completed the initial exam. Because of issues identified below on the second assessment initiative, assessing Capstone/Project performance, this issue has been given lower priority and will be addressed in the future.

Issue from 2010 Assessment Report: “Following the assessment of the core curriculum and senior project course, we noted that students needed more in the way of algebra and statistics and how these can be used in science and technology settings. Consequently we are reviving the inactive course IST 130; Analytical Methods I, which will be taught by our faculty and will introduce students to statistics and scientific thinking.”

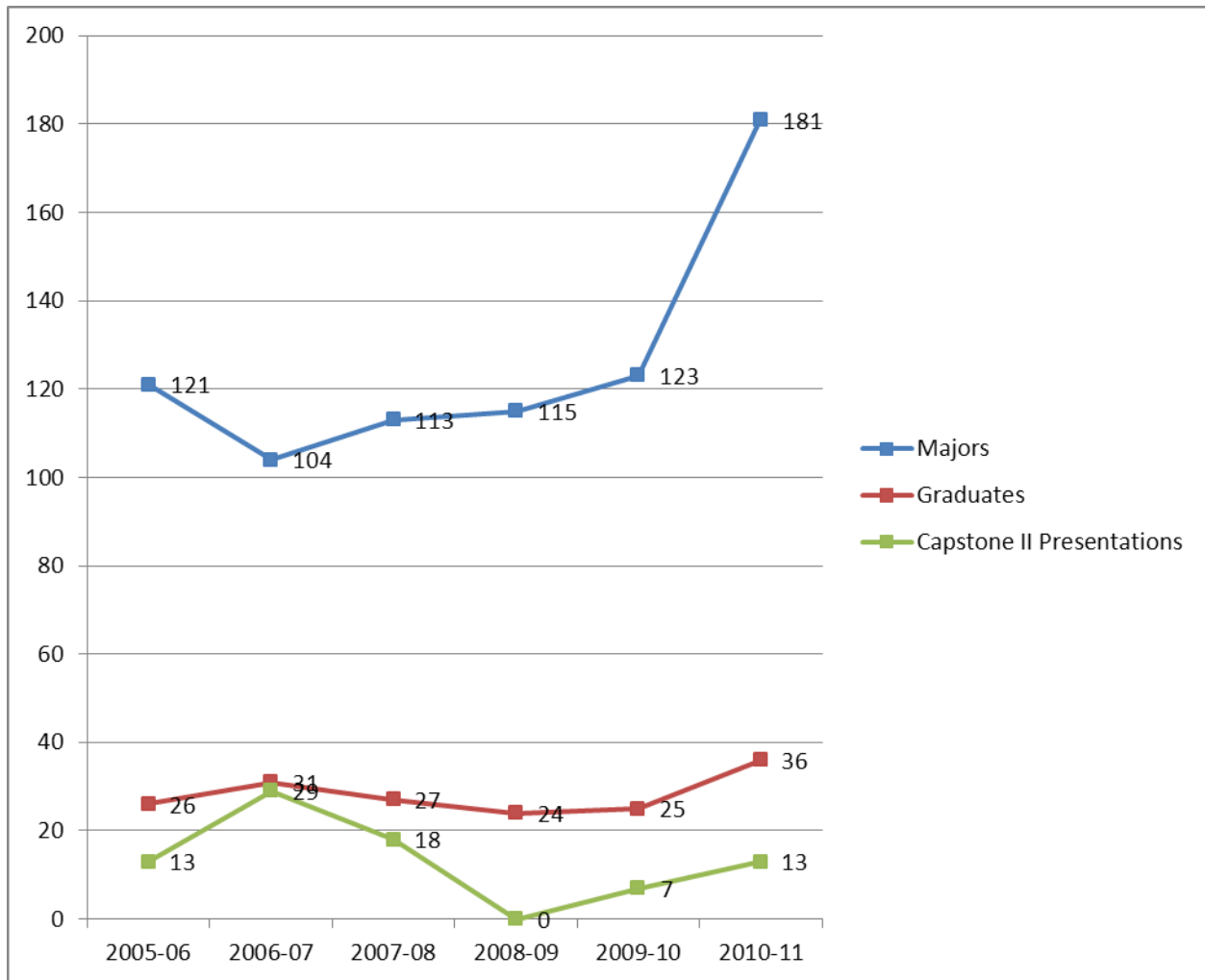
Action: Sections of IST 130 Analytical Methods I and IST 212 Energy have been offered in the spring and fall semesters of 2011 and both will be taught in the fall of 2012. Both courses require students intensively integrate quantitative measures into the interpretation of scientific information. Two faculty teams of two members each have been assigned to instruction for these courses and a standardized curriculum is being developed for both courses.

Issue from 2010 Assessment Report: Students have not sufficiently used standard quantitative measures/methods from IST and MTH courses in their projects.

Assessment/Action: Of 15 student presentations at the end of the spring 2011 semester, 7 used either algebraic, statistical, or geometric math applications at an appropriate level for the work, four were either descriptive or technical in nature, and only four made inadequate quantitative application in the work.

V. Changes suggested from activities on Assessment Day

As we have reported previously, we are a growing and changing program and have had to structure assessment accordingly. We presently are integrating NRRM students into the IST core and Capstone experience. We are also expanding our current offerings in Computer Forensics, Game Development, and Environmental Science. These expansions will incorporate four additional full time faculty members in the near future. There presently are nearly 200 majors in the department. However, the numbers of students planning and completing projects has changed little over time and now less than 20% of majors in all IST programs either plan or conduct a project. (see graph below).



.Consequently, the major issue for the IST Department, including all degree programs, is providing curricular components that prepare students for project planning and management and faculty with sufficient time to direct them. This is a major effort and has been given highest priority by faculty, staff, and departmental administration.

Marshall University
Assessment of Program's Student Learning Outcomes for the Integrated Science and Technology and
undergraduate Environmental Science Programs
2010/11

Not every student learning outcome must be assessed every year. However, it is expected that at least one-fourth of the outcomes will be assessed each year, allowing for assessment of all outcomes within a four-year cycle. It also is important to use more than one assessment measure for each outcome.

Program's Student Learning Outcomes	Year evaluated	Assessment Measures (Tools)	Benchmarks	Results	Analysis/ Planned Actions
<p>Given a real world problem, students will be able to choose the most appropriate hardware and software technology to solve the problem.</p> <p>Students will be able to analyze the potential consequences of the hardware and software technology choices they have made to solve problems.</p>	2010 /11	Multiple choice tests administered pre and post completion of the IST Core Curriculum. This test consists of problems that allow students to make reasoned choices.	Mean scores exceed 70% correct answers on the posttest.	Pretest administered to 47 IST and ES freshmen and transfers Fall of 09	Test results presently being analyzed

Program's Student Learning Outcomes	Year evaluated	Assessment Measures (Tools)	Benchmarks	Results	Analysis/ Planned Actions
Students will be able to plan and execute a project (individualized toward their career goals) at a professional level using discipline-specific knowledge.	2010 /11	A faculty assessment of student performance in the two tiers of IST capstone.	Mean performance across students will be 3.5 (on 4-point scale) on standard 1 of scoring rubric (attached)	Students presently enrolled in Senior Project I, IST 490 are following the rubrics for project development, consistent with this assessment	
In the development of their project (individualized toward their career goals), students will be able to clearly identify an issue and relate the goals and objectives of the project to this issue.	2010 /11	A faculty assessment of student performance in the two tiers of IST capstone Scoring rubric is attached.	Mean performance across students will be 3.5 (on 4-point scale) on standard 2 of scoring rubric (attached)	Students presently enrolled in Senior Project I, IST 490 are following the rubrics for project development, consistent with this assessment	

Program's Student Learning Outcomes	Year evaluated	Assessment Measures (Tools)	Benchmarks	Results	Analysis/ Planned Actions
In the development of their project (individualized toward their career goals), students will design an experiment or project employing the appropriate scientific or technical methods.	2010 /11	A faculty assessment of student performance in the two tiers of IST capstone Scoring rubric is attached.	Mean performance across students will be 3.5 (on 4-point scale) on standard 3 of scoring rubric (attached)	Students presently enrolled in Senior Project I, IST 490 are following the rubrics for project development, consistent with this assessment	
In the development of their project, students will analyze data in appropriate tabular and numeric form.	2010/11	A faculty assessment of student performance in the two tiers of IST capstone Scoring rubric is attached.	Mean performance across students will be 3.5 (on 4-point scale) on standard 4 of scoring rubric (attached)	Students presently enrolled in Senior Project I, IST 490 are following the rubrics for project development, consistent with this assessment	

<p>In the development and presentation of their projects (individualized toward their career goals), students will show originality in both the development of purpose for the work and creativity in the design of the methods for the work.</p>	<p>2010/11</p>	<p>A faculty assessment of student performance in the two tiers of IST capstone</p>	<p>For a majority of students work is judged to be original and both the purpose of the work and the methods used to fulfill are highly creative and original to the student(s) producing the work .</p> <p>Mean performance across students will be 3.5 (on 4-point scale) on standard 5 of scoring rubric (attached)</p>	<p>Students presently enrolled in Senior Project I, IST 490 are following the rubrics for project development, consistent with this assessment</p>	
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Scientific and Critical Thinking Domain Standards and Rubrics

This assessment is applicable to student projects submitted for credit in IST 490 Senior Project I and IST 491 Senior Project II. All IST, ES and NRRM students are required to complete IST 490. IST 491 is one of three options used by IST students as specified by IST Department to complete the departmental requirement for Capstone. Assessment is expressed as mean score submitted by participating faculty. Faculty qualified for assessment must be full time faculty within the COS and must review all documents submitted by the students as specified by departmental standards and attend the student's final presentation of the work.

Standard # 1: Capacity of student(s) to demonstrate discipline-specific content knowledge.

1. Does not possess any measureable content knowledge.
2. Has some, but incomplete and inaccurate, understanding of content knowledge.
3. Has significant understanding of content knowledge.
4. Displays a full understanding of content knowledge.

Standard # 2: Assessment of ability to clearly identify an issue and relate the goals and objectives of the project to this issue.

1. Issue not clearly defined. Purpose of work and has limited use of scientific vocabulary. There are major flaws in understanding and interpretation.
2. Uses appropriate vocabulary, but presents only partial understanding of the problem and has minor flaws in the interpretation.
3. Uses appropriate scientific vocabulary, shows complete understanding of a discussed scientific issue, and correctly identifies the conclusions.

Standard # 3: Assessment of ability to design an experiment or project employing the appropriate scientific or technical methods:

1. Conceptual flaws in the design of the experiment.
2. Work contains a design of the experiment with logical procedural problems.
3. Work contains a complete and correct design of the experiment.

Standard # 4: Assessment of ability to analyze data and present data in appropriate tabular and numeric form.

1. No evidence of data analysis.
2. Major flaws in the analysis of the data; data is not clearly connected to stated purpose or hypothesis
3. Analysis of the data is present with minor flaws; data is adequate but it's analysis and use is not
4. Data is clearly presented and subjected to appropriate statistical tests where appropriate. Data "proves the point" of the work and is connected to the hypothesis or stated purpose.

Standard # 5: Extent to which student work shows originality in both development of purpose for the work and creativity in the design of the methods for the work.

1. Objectives of the work and the methods used are relatively mundane and repetitive to the work of others
2. Work shows some originality but clearly follows the purpose of methods of others
3. Work shows some original thought and some of the purposes and methods are unique to the study and clearly the creation of the student(s) producing the work
4. Work is original and both the purpose of the work and the methods used to fulfill are highly creative and original to the student(s) producing the work.