Collecting and analyzing Data- Working with Small Data Sets

Working with Tribal/College Institutional Boards

Quality Education for Minorities (QEM) Network
National Science Foundation (NSF) Tribal Colleges and Universities Program (TCUP)

October 30-31, 2015

Nader Vadiee, Ph.D.
Coordinator/Faculty, Engineering Programs,
Department of Advanced Technical Education (ATE),
Southwestern Indian Polytechnic Institute (SIPI),
9169 Coors Rd., Albuquerque, NM 87120,
Phone: 505-792-4618, Message: 505-346-7733
Email: nader.vadiee@bie.edu
Table of Contents

- Institution and Program Overview, Mission and Vision
- Goals and Objectives
- Outcomes and Measures
- Sampling and Targets
- Action Plans, Reflections and Challenges
- Working with Tribal/College Institutional Boards
- Conclusions
Southwestern Indian Polytechnic Institute-Overview

SIPI is a national Indian community college with students from over 100 Native Nations.

Approximately 550-650 students

Located in Albuquerque, NM

USDA Land Grant Institution since 1994
NSF, NASA, and DoD assisted SIPI in Developing Science Programs

New Science and Technology Building opened Fall of 2003
74,000 sq. ft with office, laboratory and classroom facilities
SIPI offers Associate of Science and Associate of Applied Science degrees in several areas:

- Natural Resource Management
- Geospatial Information Technology
- Environmental Science
- Instrumentation & Control Technology
- Network Management
- Pre-Engineering
Mission and Vision

SIPi Mission Statement

Southwestern Indian Polytechnic Institute is a National Indian Community College that prepares Native American students to be productive life-long learners as tribal members in an ever-changing global environment. As a land grant institution, SIPI partners with tribes, employers, and other organizations with a stake in Indian education. An enduring commitment to student success is the hallmark of SIPI’s operations.
Mission and Vision (cont.)

Department Mission Statement

The mission of the Advanced Technical Education (ATE) Department is to provide students with a comprehensive and up-to-date technical and scientific education in their program areas. This education is based on a rigorous general education component that allows our graduates to transfer to four-year baccalaureate programs and/or enter the workforce. The ATE Program supports students through their crucial first two years of college, providing them with both the necessary academics and the student success skills they will need to complete a four-year degree.
Mission and Vision (cont.)

- The Pre-Engineering program endeavors to equip students with necessary skills in Math, Physics, Chemistry, Computer-aided Design, and lower division engineering courses, which will insure their success in the pursuit of advanced engineering degrees.
Goals and Objectives

The Engineering Program Goals Statement:

- The Engineering program strives to equip students with necessary skills in math, physics, chemistry, computer aided design, and lower division engineering courses. These skills prepare students to apply the learned theoretical foundations and skills of their discipline to solve practical engineering problems by using existing technology knowledgeably, confidently, and effectively.

The Engineering Outcome Objectives are:

- Be able to communicate analytical theory and problem solutions effectively in both oral and written form.
- Be able to use general mathematical, engineering and physical concepts.
- Be able to use common engineering instrumentation to test and measure phenomena and then to analyze the resulting data.
- Be prepared to continue in a Bachelor of Science Engineering or Engineering Technology degree program.
Outcomes and Measures

Outcome 1:
Graduates of the A.S. in Pre-engineering program will be able to demonstrate calculus-based math and science ability.

Measure 1.1
Final exam in Calculus II (MATH 163)

Sampling 1.1
All program majors enrolled in MATH 163.

Target 1.1 (P)
80% or more of students will earn an exam grade of B or better.

Target 1.1 (S)
No more than 10% will earn an exam grade of C or below.
Sampling and Targets

- How many students were included in the data collection for Measure 1.1? How were they selected? (p. 45, p. 53)
- If data collection did not occur, please explain why, and describe plans for data collection in the coming cycle.
- All four students, majoring in AS in pre-engineering, who were enrolled in Calculus II (MATH 163) in 2014 Spring trimester, were included in the data collection.
- Please provide a brief summary of your analysis of the data for Measure 1.1. (p. 49, p. 53)
- The grades from the final comprehensive exam were used as the data for measure. The data and its subsequent analysis was intended to assess that students who graduate the program are able to be competent and competitive upon transfer to a bachelor degree program offered in major universities. The exam was adopted from the online Course Information archives of the major universities. The assignment included sample problems from Physics as well as engineering analysis and design.
- The students had access to a desktop computer with internet capability. The students were required to solve problems using EXCEL software environment.
Sampling and Targets (cont.)

The following table illustrates the distribution of grades:

<table>
<thead>
<tr>
<th>Score</th>
<th>N</th>
<th>Pct.</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>2</td>
<td>50</td>
</tr>
<tr>
<td>B</td>
<td>2</td>
<td>50</td>
</tr>
<tr>
<td>C</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>D</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>F</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

- Do your data indicate that Target 1.1(P) and Target 1.1(S) were met? Partially met? Not met? Not reported this cycle? (If not reported, please indicate the reason.)
- Please place an “X” in the appropriate box below.
Please provide a brief summary of the factors you believe contributed to these results. (p. 49, p. 53)

Throughout the trimester, the students were trained in the use of software tools such as EXCEL, MATLAB, MATHEMATICA, etc. They were given the flexibility to choose any method to partially or completely reach the final answer and use the result to compare with other methods or to assist in reaching the correct answer using alternate methods. The exam was an open-book exam and students had access to derivative-integral look-up tables and scientific graphing calculators.

The students were encouraged, first, to form a conceptual and intuitive understanding of the problems. It is understood that each students learns using different set of skills and styles. The emphasis was placed equally on all different modes of learning and the use of analytical as well as computational methods. The flexibility encouraged the students to be more motivated to try their best abilities and skills to approach the problem.
Action Plan

- **Outcome 1 Action Planning.** Three blank action plan templates are provided below. Copy and paste the template into this section for additional action plans related to this outcome. (p. 57, p. 61)

- **Action Plan 1.1 Title:** The incoming freshman students’ academic advisement.

  - **Action Steps:**
  - **Estimated implementation date:** Spring 2016
  - **Estimated completion date:** Fall 2016
  - **Priority**
    - High
    - Medium
    - Low
  - **Person(s) responsible:** Full-time faculty in the pre-engineering Program and CADD.
  - **Expected outcome:** Completion of the Math and science pre-requisites.
  - **Resources requested:** None
  - **Estimated cost (s):** 0.00
  - **Status Update**
Action Plan (cont.)

- **Action Plan Title:**
  Mandatory problem solving and tutoring sessions added to the required Engineering Physics and Calculus I and Calculus II courses.
  Add two hours per week to the contacts weekly hours required for the Engineering Physics and Calculus I and II courses. This step needs to be passed by the school Curriculum Committees and the academic Affairs Committee.
  Reduce the required teaching load for the pre-engineering full-time faculty.
Action Plan (cont.)

- **Action Steps:**
  - Hiring of a third pre-engineering full-time faculty.

- **Estimated implementation date:**
  - 2014 Spring trimester

- **Estimated completion date:**
  - Summer 2014 trimester.

- **Priority** High Medium Low

- **Person(s) responsible:** ATE Department chairperson

- **Expected outcome:** Improvement of the students problem solving and use of graphing scientific calculators skills and fluency.

- **Resources requested:** Funding for the hiring of a third pre-engineering full-time faculty.

- **Estimated cost (s):** $100,000 per year (salary and benefits)
Reflections

- **Assessment Reflection**

- During the 2013-2014 academic year, how has your program used assessment to drive the improvement of student learning? Please provide one or more concrete examples.

- 1 – In order to improve the students’ success rate in Engineering Physics-PHYS. 160, all students are now advised to enroll in the “Introduction to Physics – PHYS. 102.

- The students are encouraged to apply to summer internship opportunities to gain soft skills.

- 3 – Extensive peer tutoring service is provided by top senior students, supported under various grants.
4 - The students were extensively trained, in all engineering–related courses, in the use of software tools such as EXCEL, MATLAB, MATHEMATICA, etc. They were given the flexibility to choose any method to partially or completely reach the final answer and use the result to compare with other methods or to assist in reaching the correct answer using alternate methods. The exam was an open-book exam and students had access to derivative-integral look-up tables and scientific graphing calculators. The students were encouraged, first, to form a conceptual and intuitive understanding of the problems. It is understood that each student learns using different set of skills and styles. The emphasis was placed equally on all different modes of learning and the use of analytical as well as computational methods. The flexibility encouraged the students to be more motivated to try their best abilities and skills to approach the problem.
Challenges

During the 2013-2014 academic years, what assessment-related challenges did your program face? What needs to occur to avoid those challenges in the future?

1 - We need to devise an ‘Assessment Timeline” and calendar to make sure it gets done in a timely and reliable way.

2 – We need to give ample time for students to understand the rubrics and assessment questions.

3 – We need an up to date list of program graduates and alumni with contact information.
Purpose of the IRB is to ensure the welfare of any member of the SIPI community who will be the subject of human subjects testing or research. Research is defined as work that contributes to broad knowledge in the field, and doesn’t include activities for quality assurance (such as assessment of student learning to improve curriculum and pedagogy). If a researcher wants to conduct research within the SIPI community with human subjects, the SIPI IRB needs to review the project to gauge the risk level (social risk, psychological risk, health risk, legal risk, financial risk, etc.).
There are three key components in place:

1) Informed consent (basically notifying participants of the nature of research, data to be collected, confidentiality or anonymity to be guaranteed, voluntary or required nature of participation, and usage of data),

2) Risk assessment (what could go wrong in the process – e.g., mishandling of data and the revelation of the identity of participants), and

3) Risk management (what will be done to mitigate risks to ensure the safety and well-being of participants – e.g., how will anonymity or confidentiality be protected? How will data be stored? When will data be destroyed? Etc.)
Upon reviewing the application for IRB review, the Chair can determine the risk level and either:

1) Grant an exemption from additional IRB review (e.g., no risk to participants, or project doesn’t qualify as “research”),

2) Grant an expedited review from at least 2 IRB members (for low risk proposals), or

3) Grant a full review of the entire IRB (for higher risk proposals).
The IRB grants permission for one-year, and any research that continues beyond that term must file an extension request. If research instruments (like surveys) change, a modification request must be submitted and approved by the IRB before changes take effect.

Failure to comply with IRB processes and protocols can result in confiscation of data, and prohibitions against the individual or organization from conducting future research in the SIPI community.
SIGN UP NOW!
Fall 2012 Trimester!
ENGR 105
Introduction to Engineering and Design

Instructor: Dr. Nader Vadiee
Pre-requisite: Your interest in Engineering or Robotics!
Thank You!

Questions?