

Chapter 11: Problem Solving –Purple Paper

The 2008-2011 Strategic Plan lists several desired characteristics of graduates of Truman. Through developing trends in performance-based funding, and our participation in the HLC Pathways Demonstration Project and the Wabash Study, Truman is exploring the development of these characteristics. The Truman Assessment Intern has prepared this “Purple Paper” – a summary of our current understanding of the competence in and perceptions of problem solving skills among Truman students.

Working Definitions

Problem Solving

- “The process of designing, evaluating, and implementing a strategy to answer an open-ended question or achieve a desired goal.” (Rhodes, 2010, p. 41)
- “Considering and weighing information from discrete sources to make decisions (draw a conclusion and/or purpose or course of action) that logically follow from valid arguments, evidence, and examples. Considering the implications of decisions and suggesting additional research when appropriate. “ (CLA, 2012)

Both definitions provide a concrete cognitive structure for problem solving processes despite varied problem scenarios. These definitions describe the framework that is used in solving unique problems. The first definition from the VALUE Problem Solving Rubric is the current working definition for future problem solving assessment within the Truman Portfolio.

What We Know: Problem Solving at Truman State University

Five current assessment tools contain direct assessment of student problem solving skills and perceptions. These include the GSQ, the Alumni Survey, the NSSE, the FSSE, and the CLA. The EBI indirectly measures elements of problem solving within non-academic experiences at Truman, and the Truman Portfolio is currently developing a problem solving prompt for future data.

Graduating Student Questionnaire (GSQ) Results

Description:

The GSQ asks graduating seniors questions related to student satisfaction, campus involvement, and time spent on certain activities in a twenty minute online survey.

Summary:

- The majority of graduating Truman students report adequate preparation to solve problems based on the experiences in their majors at Truman.

Relevant Items:

12. How adequately has your first major prepared you in each of the following?

- 1: Very Inadequate
- 4: Very Adequate

12f. Ability to apply knowledge in defining problems and solving them

	Mean Rating	Valid Submissions
2011	3.48	1131
2008	3.4	1040

23. How adequately has your second major prepared you in each of the following?

- 1: Very Inadequate
- 4: Very Adequate

23Bf. Ability to apply knowledge in defining problems and solving them

	Mean Rating	Valid Submissions
2011	3.36	143

*Question added in 2011

The Alumni Survey Results

Description:

The Alumni Survey is issued every spring to alumni asking them to reflect on their experiences at Truman.

Summary:

- The majority of alumni report adequate preparation from Truman to solve real-world problems.

Relevant Items:

24. How adequately has your major prepared you in each of the following?

- 1: Very Inadequately
- 4: Very Adequately

24f. Ability to apply knowledge in defining problems and solving them

	Mean Rating	Valid Submissions
2011	3.59	337
2008	3.59	354

25. How adequately did your Truman experience provide you with knowledge and skills necessary to be successful in the following areas?

- 1: Very Inadequately
- 4: Very Adequately

25s. Combine knowledge from multiple areas to solve problems

	Mean Rating	Valid Submissions
2011	3.56	331
2008	3.49	354

The National Survey of Student Engagement (NSSE) Results

Description:

All freshmen and seniors are asked to take this fifteen minute online survey asking students their level of engagement in academics, collaborative learning, student-faculty interactions, enriching educational experiences, and supportive campus environment.

Summary:

- In the past four years Truman students have indicated a greater emphasis on problem solving in their coursework compared to other institutions and overall NSSE results.
- Students also respond that their experience at Truman has had less of an impact on their real-world problem solving abilities than other students reporting from their respective institutions and NSSE general results.

Relevant Items:

2. During the current school year, how much has your coursework emphasized the following mental activities?

- 1: Very Little
- 4: Very Much

2e. Applying theories or concepts to practical problems or in new situations

2010				
Year	Truman	COPLAC	Lib Arts	NSSE 2010
First Year	3.14	2.99	3.12	3.08
Seniors	3.32	3.21	3.29	3.25
2008				
Year	Truman	COPLAC	Lib Arts	NSSE 2008
First Year	3.06	3	3.13	3.03
Seniors	3.19	3.2	3.27	3.19

11. To what extent has your experience at this institution contributed to your knowledge, skills, and personal development in the following areas?

- 1: Very Little
- 4: Very Much

11m. Solving complex real-world problems

2010				
Year	Truman	COPLAC	Lib Arts	NSSE 2010
First Year	2.6	2.64	2.75	2.72
Seniors	2.76	2.75	2.82	2.83
2008				
Year	Truman	COPLAC	Lib Arts	NSSE 2008
First Year	2.61	2.67	2.74	2.69
Seniors	2.65	2.7	2.82	2.78

The Faculty Survey of Student Engagement (FSSE) Results

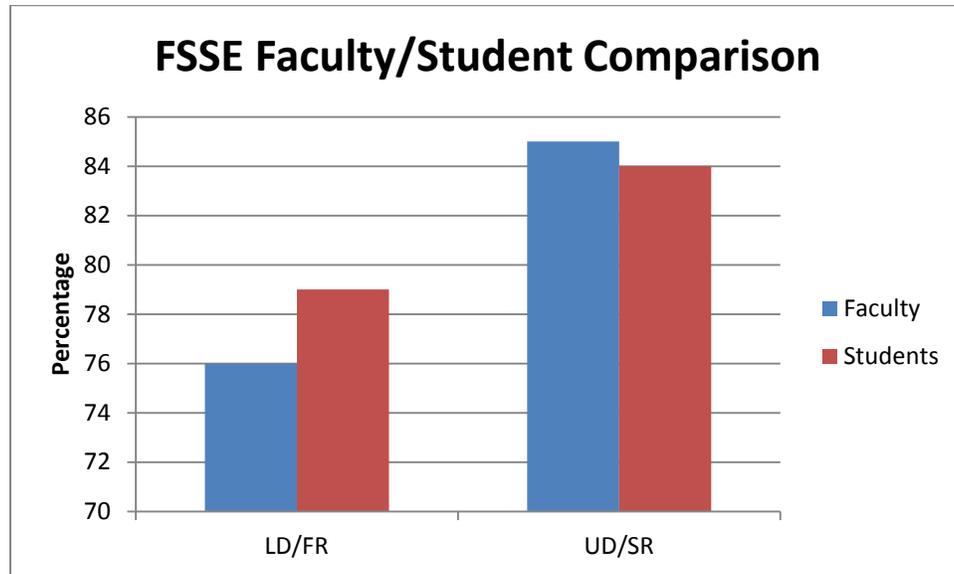
Description:

FSSE is a fifteen minute survey issued to faculty during the spring to compare student NSSE responses for academic engagement to faculty perceptions of students' engagement.

Summary:

- Faculty place emphasis on the development and usage of problem solving skills at roughly the same rate that students indicate a sense of developing and using these skills. Greater importance and development of problem solving skills are indicated by students and faculty for upper division classes as compared with lower division classes.

Relevant Data:



*[LD= lower division, FR= first year, UD= upper division, SR= senior]

Faculty values represent the percentage of respondents indicating that it is important or very important that their students apply theories or concepts to practical problems or in new situations.

Student values represent the percentage of respondents indicating that their college experience contributed to their knowledge, skills, and personal development in applying theories or concepts to practical problems or in new situations.

Collegiate Learning Assessment (CLA) Results

Description:

The CLA is a sample of over one hundred first year students and all senior students to determine students' competence in analytical writing tasks and performance tasks.

Summary:

- Based on the CLA Performance Task Scoring Criteria, Truman students on average perform problem solving at a greater level of competence at both the freshman and senior levels than the average of students in the other institutions participating in the CLA.

Relevant Data:

Submissions were evaluated on a scale of one to six, with one representing introductory skills and six representing high competence. The submissions were evaluated for the provision of a decision, inclusion of rationale, use of credible sources, weighing of the options, choosing based on evidence, considering implications of actions, and recognizing need for further research. To view the detailed CLA rubric, visit <http://assessment.truman.edu/almanac/2011/index.asp>.

2011		
Truman	Mean	Standard Deviation
First Year	3.4	0.7
Senior	4	0.8
Others		
First Year	2.9	0.9
Senior	3.4	0.9

*Individual Performance Task data not available prior to 2011

Discussion

The data represented in this Purple Paper are largely based on students' self-perceptions of their problem solving abilities. The CLA is currently the only standardized method of assessing problem solving skills in Truman students. However, the CLA's overarching purpose is to aid institutions in analyzing the multiple aspects of analytical writing and performance, with problem solving being only one element of these. Truman needs an assessment tool that focuses specifically on the development and competent usage of problem solving skills in our students.

A new mode of assessment for problem solving is currently being developed in a prompt for the Truman Portfolio. Beginning in the Fall 2012 semester, graduating seniors will be required to submit and reflect on the skills and thought processes utilized in a problem they encountered during their Truman experience. The AAC&U VALUE Rubric for Problem Solving has been adapted for Truman's assessment purposes in this new prompt.

In developing standardized assessment of problem solving, a key challenge is providing flexibility to accommodate the varied types of problems that an individual may solve. Jonassen (2005) identified an extensive list of potential problem styles, including logical problems,

algorithms, story (word) problems, induction problems, decision making, troubleshooting, diagnosis-solution problems, policy analysis, design problems, and dilemmas.

Singh (2009) indicated that students must be actively engaged in the development of problem solving skills in order to acquire such task performance competency. Singh also suggests that students can more effectively develop their problem solving competence by building on their prior knowledge. Assessment tools frequently prompt students to offer their best work or greatest success. However, furthering Singh's built competence research, Otacioglu (2008) proposed the value of both success and failure in the development of problem solving excellence. If students do not reflect on their failures they cannot gain knowledge to add to their current understanding, and may fail to progress in their problem solving development. Inclusion of reflection on failure may be equally valuable to assessment as submissions of successful experiences.

The implementation of the problem solving prompt within the Truman Portfolio and the development of a standardized rubric for assessment of problem solving will give Truman more concrete insight into the competency of its students in this area.

References

CWRA scoring criteria: Performance task. (n.d.). *Collegiate Learning Assessment*. Retrieved

December 8, 2012, from

www.collegiatelearningassessment.org/files/CWRAScoringCriteria

Jonassen, D. (n.d.). Nature of problem solving. *Center for the study of problem solving*.

Retrieved December 8, 2012, from <http://csps.missouri.edu/index.php>

Otacioglu, S. (2008). Prospective teachers' problem solving skills and self-confidence levels.

Educational Sciences: Theory and Practices, 8, 915-923.

Rhodes, T. L. (2010). *Assessing outcomes and improving achievement: Tips and tools for using rubrics*. Washington, DC: Association of American Colleges and Universities.

Singh, C. (2009). Problem solving and learning. *AIP Conference Proceedings*, 1140, 183-197.