A Meta-Assessment Model for Industrial Engineering

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Abstract - *Calls for greater accountability in higher education have become more strident than ever. As a response to these external demands, the EAC has adopted Criteria 20000 as a bold move to promote curricular innovation and continuous improvement in the engineering education. As engineering programs respond to these changes, it would seem logical that a first step in the improvement process is to determine what a well qualified engineering graduate ought to look like. For the past year, Industrial Engineering at the South Dakota School of Mines & Technology has been developing a meta-assessment model to define a qualified graduate in IE. This paper summarizes the meta-assessment approach for developing student outcomes.*

Assessment Model

With advent of outcomes-based evaluation in engineering education, it is important to develop meaningful measures for clearly defined, albeit sometimes non-quantifiable, goals. A meta-assessment model provides a systemic approach to defining these measures within the curriculum as well as defining the trade-off equivalencies among those goals [1]. Industrial Engineering faculty at SDSM&T began using a meta-assessment approach in 1997 with the introduction of a teaming and communications rubric as a formal assessment tool for an introductory course in engineering. Since that time, efforts have been expanded to include feedback from our Industrial Advisory Board and alumni to define a set of desired outcomes for an industrial engineering graduate. The meta-assessment model along with a set of educational outcomes is shown in Figure 1 below. Weights for each educational outcome are preliminary weights determined through a survey of SDSM&T's constituency base. Final weights will be determined through an extensive survey once all rubrics are finalized.

Each general outcome is related to a set of behavioral objectives with a set of performance criteria. The rubric for problem solving is shown below in Table 1. To date, a set of general rubrics have been developed defining outcomes for communication skills, problem solving, teaming, and business/management skills. The general outcome for technical skills is further subdivided into the general areas of probability and statistics, manufacturing, optimization,

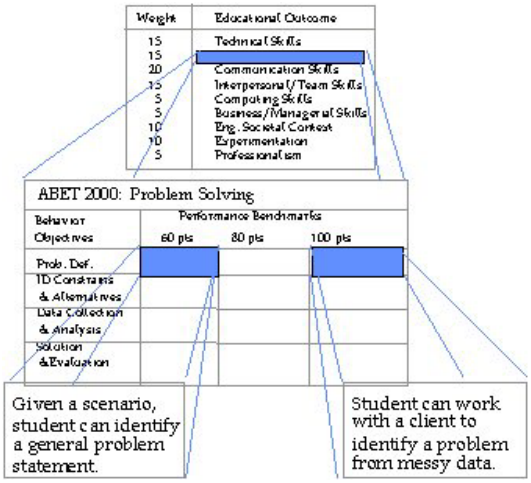

Figure 1. Educational Goals and Weights for an SDSM&T Industrial Engineering Graduate

simulation, production, and work measurements. Final performance rubrics, weights, and assessment criteria are expected in Spring 2000.

Table 1. Problem Solving Rubric

ABET Criteria 2000 Criteria: **Problem Solving**				
Behavioral Objectives	Performance Benchmarks Marginal Qualified			Well Qualified
Problem Definition	given scenario identify general prob. statement	open-ended scenario, be able to id. prob. stmt.	work with client to identify prob. statement	work with client messy data to id prob. statement
Identify Constrains & Alternatives	identify some alternatives	identify complete set of alternatives	identify altern. & set of constraints	be able to qualify alternatives
Data Collection & Analysis	collect data & analyze given techniques	select appropriate analysis methods for data	given problem collect data & analyze	determine approp. methods for & collect & analyze data
Solution/Evaluation	Identify a solution	Identify several solutions	Identify solutions & evaluate	Qualify solutions by ethical & social impact
Implementation	build small design projects	paper implement for complex designs	implementation criteria for client	work with client to implement solution

References

[1] Naples, L., "Evaluating Engineering Education: A Stakeholder-Driven, Outcomes-Based Approach," *Proceedings of the 1995 ASEE Conference on Engineering Education*, Washington DC, 1995.