

# Evaluating the Pre-Professional Engineer: Exploring the Peer Review Process

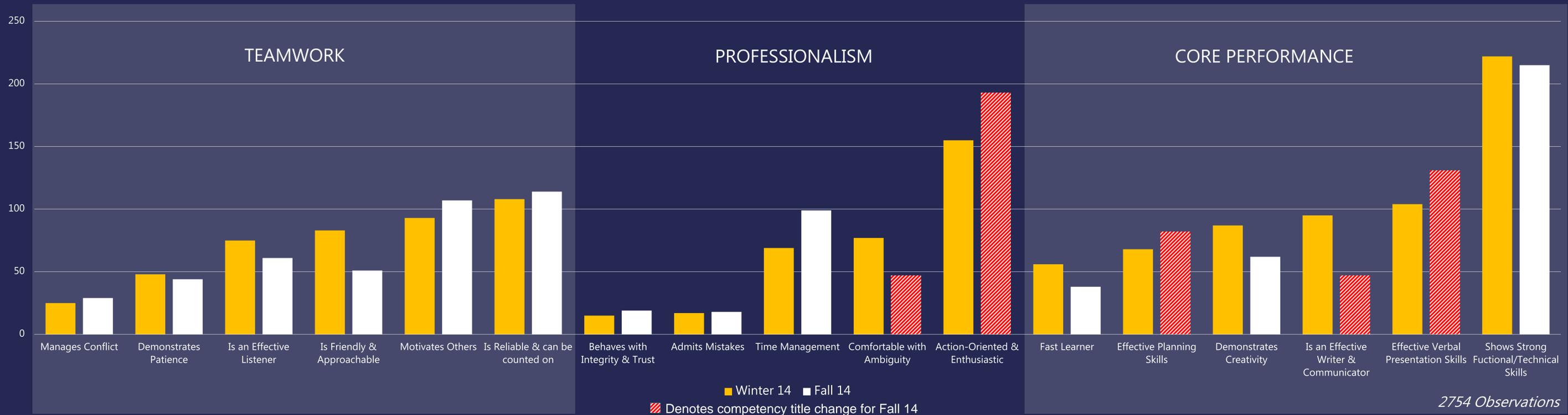
Joy Adams, Mical DeGraaff, Gail Hohner  
Multidisciplinary Design Program

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## Competency Selection in Peer Evaluation Process



## ABSTRACT

This research project studies the effectiveness of individualized peer feedback in a multidisciplinary design team and the scalable administration of this process. Utilizing the CATME system we observed inability by students to integrate peer feedback from a numeric only scale. We created and implemented an additional peer-to-peer anonymized feedback mode: a qualitative survey utilizing coded professional competencies drawn from various industry-based best practices. In this additional qualitative survey, students select two performance competencies (one positive and one developmental) from a predefined list for each of their peers. Students then support the selected competencies by citing specific behavioral examples. Student growth is measured via peers' quantitative (CATME) and qualitative evaluations of engineering design skills and professional behavior, as well as the students' own ability to craft constructive feedback statements. We identify trends in peer evaluations with regard to sex, residency status, academic year, and other categories.

## METHODOLOGY

- Data is collected, anonymized, and analyzed for accuracy in competency selection and qualitative statement "match." A selection is considered correctly categorized when the accompanying written statement matches the selected competency. Selections are considered incorrectly categorized when these do not match.
- Data is coded into three skill constructs: Professionalism, Teamwork, and Core Performance
- Data is analyzed against certain factors such as sex, residency status, and academic year. (Fall 2014 Data Not Yet Coded)

## PRELIMINARY CONCLUSIONS

Peer feedback does not occur in a vacuum – the change in competency distribution (volume) in key categories such as Comfortable with Ambiguity/Adaptability and Creativity follows students' progress through the design process. These competencies in particular appear more highly valued at the beginning of the project than towards the end

In the team-forming stage at the beginning of the project, overt personality traits such as Friendliness, Patience and Listening skills were more commonly evaluated. As the students got to know one another, and as the design process unfolded, other traits became more highly valued, such as Time Management.

Students improve their evaluations with practice/experience; so multiple practice rounds create the opportunity for increased growth.

Competencies selected often represented complex and/or personality- or interpersonal interaction-based abilities. It appears that STEM students are much more adept at recognizing technical or more simplistic interpersonal skills and less adept at addressing more complex concepts.

## PARTICIPANTS

The Multidisciplinary Design Program provides a wide variety of co-curricular and curricular options, including an academic minor, for creative and motivated students to develop their project-based engineering design skills.

The 198 students in this study hail from seven different colleges and ranged from First Year to M.S. students. They participated on either an Externally Sponsored Project or a Faculty Research Project, in teams or subteams of 4 – 10 students. Each team/subteam completed a two-term Design-Build-Test project for a customer, and participated in a Peer Performance Evaluation process each term

## ACTION RESEARCH

Utilizing action research methodology, we made relevant changes to the surveys prior to the second round of evaluations to improve the students' understanding of the survey questions.

- Changed the name of five competencies based on students' error rate in Winter 2014.
- Provided descriptions for all competencies via "hover text" where students could read thorough descriptions of each competency before selecting

Original/Winter 2014	Updated/Fall 2014
Is Action-Oriented & Enthusiastic	Shows Initiative & Acts with Enthusiasm
Is Comfortable with Ambiguity	Demonstrates Adaptability
Shows Effective Planning Skills	Is an effective planner
Is an effective writer and communicator	Demonstrates Strong Written Communication Skills
Has strong verbal Presentation Skills	Demonstrates Strong Verbal Communication Skills

## FUTURE RESEARCH

Students struggle to make sense of exclusively quantitative peer feedback (CATME); does adding qualitative (incident specific) feedback influence a students' behavior? Does a students' feedback, both given and received, change?

How do student peer evaluations change over time?

Future statistical analysis on results to identify significant changes.