

# Engineering Student Self-assessment in a Capstone Design Course

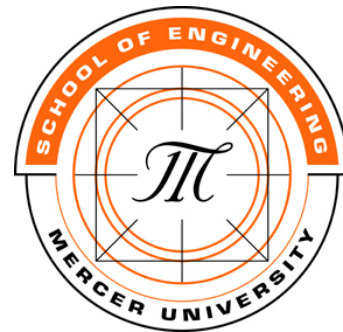
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# Presentation Outline

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- Introduce the MUSE capstone design course experience
- Review benefits from collaborative learning
- Provide overview of self-assessment instrument used in study
- Summarize findings
- Concluding remarks

# MUSE Senior Design

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- A sequential, two-semester, design experience is required during the senior year
  - Semester 1 – project development where students write a proposal and then conduct a preliminary design review (**PDR**)
  - Semester 2 – build, test, and then conduct a critical design review (**CDR**)

# Course Details

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- Students are encouraged to form ***interdisciplinary teams*** and to focus on an ***industry sponsored project***
- ***Communication*** between student teams, client, technical advisors and course instructor is forced through periodic meeting, written progress reports and oral progress reports
- ***“Just in time” lectures:*** team building, engineering ethics, brain storming, making presentations, etc.

# Benefits from team-oriented, problem based learning

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- Development of student skills:
  - Professional argumentation
  - Interpersonal relationships
  - Individual accountability
  - Communication
  - Presentations
  - Problem solving
  - Leadership
  - Delegation
  - Organization

# Downside of team-oriented, problem based learning

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- Formal assessment of each team member
- Identification of “social loafers” or “free riders”

# Self/Peer Team Assessment

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- Adapted instrument developed by Synthesis Coalition (Van Duzer and McMartin, 1999)
  
- Survey purpose
  - Identify “loafers”
  - Assist in quantification of individual team member grades
  
- Validity and reliability of student feedback?

# Assessment Form

## Self/Peer Team Assessment

Name \_\_\_\_\_ Date \_\_\_\_\_

1. Please circle the rating that best describes your team for each of the three questions below.

a. Did all members of the group share in the team's responsibilities?

Some members did no work at all.	A few members did most of the work.	The work was generally shared by all members.	Everyone did an equal share of the work.
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b. Which of the following best describes the level of conflict at group meetings?

Open warfare: still unresolved	Disagreements were resolved with considerable difficulty	There were disagreements, but they were easily resolved	No conflict; everyone seemed to agree on what to do
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c. How productive was the group overall?

Accomplished some but not all of the project's requirements	Met the project requirements but could have done much better	Efficiently accomplished goals that we set for ourselves	Went way beyond what we had to do exceeding even our own goals
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2. Please rate yourself and each team member on how well the following phrases describe your team's work.

Disagree
Tend to disagree
Tend to agree
Agree  
1
2
3
4

	Self			
<b>Team Member's Names</b>	:			
<b>a. Failed to do an equal share of the work</b>				
<b>b. Kept an open mind/was willing to consider others' ideas</b>				
<b>c. Was fully engaged in discussions during meetings</b>				
<b>d. Took a leadership role in some aspects of the project</b>				
<b>e. Helped group overcome differences to reach effective solutions</b>				
<b>f. Often tried to excessively dominate group discussions</b>				
<b>g. Contributed useful ideas that help the group succeed</b>				
<b>h. Encouraged group to complete the project on a timely basis</b>				
<b>i. Delivered work when promised/needed</b>				
<b>j. Had difficulty negotiating issues with members of the group</b>				
<b>k. Communicated ideas clearly/ effectively</b>				

3. Write a brief description of the problems you encountered in working with this group and how they were resolved.
  4. Please distribute 100 points among the members of your team, based on each member's contribution to the team's efforts.  
 (Don't forget to include yourself.) Use integers only. No two people should receive the same number of points.
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Name:	# of Points
(Self)	
<b>Total</b>	<b>100</b>

5. Over all, how would you rate your own ability to perform effectively on this multidisciplinary team?

Poor  
1

Improvement needed  
2

Good  
3

Excellent  
4

# Study Participants

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- Summation of a two-year period of senior design student demographics. All students in this study had the same instructor.

Student	N	Percent of total population (%)
Male Total	<b>46</b>	61
Minority Male	9	12
Female Total	<b>30</b>	39
Minority Female	13	17
<b>Total</b>	<b>76</b>	

# Assessment Question 1 – Group Productivity

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**Actually Question 1c on Assessment Form.**

Student item	1. How productive was the group overall?			
Faculty item	1. From your perspective, how productive was the team overall?			
Associated response and score	Accomplished some but not all of the project's requirements <b>(1)</b>	Met the project requirements but could have done much better <b>(2)</b>	Efficiently accomplished goals that we set for ourselves <b>(3)</b>	Went way beyond what we had to do exceeding even our own goals <b>(4)</b>

# Assessment Question 2 – Ability to Function on Multidisciplinary Teams

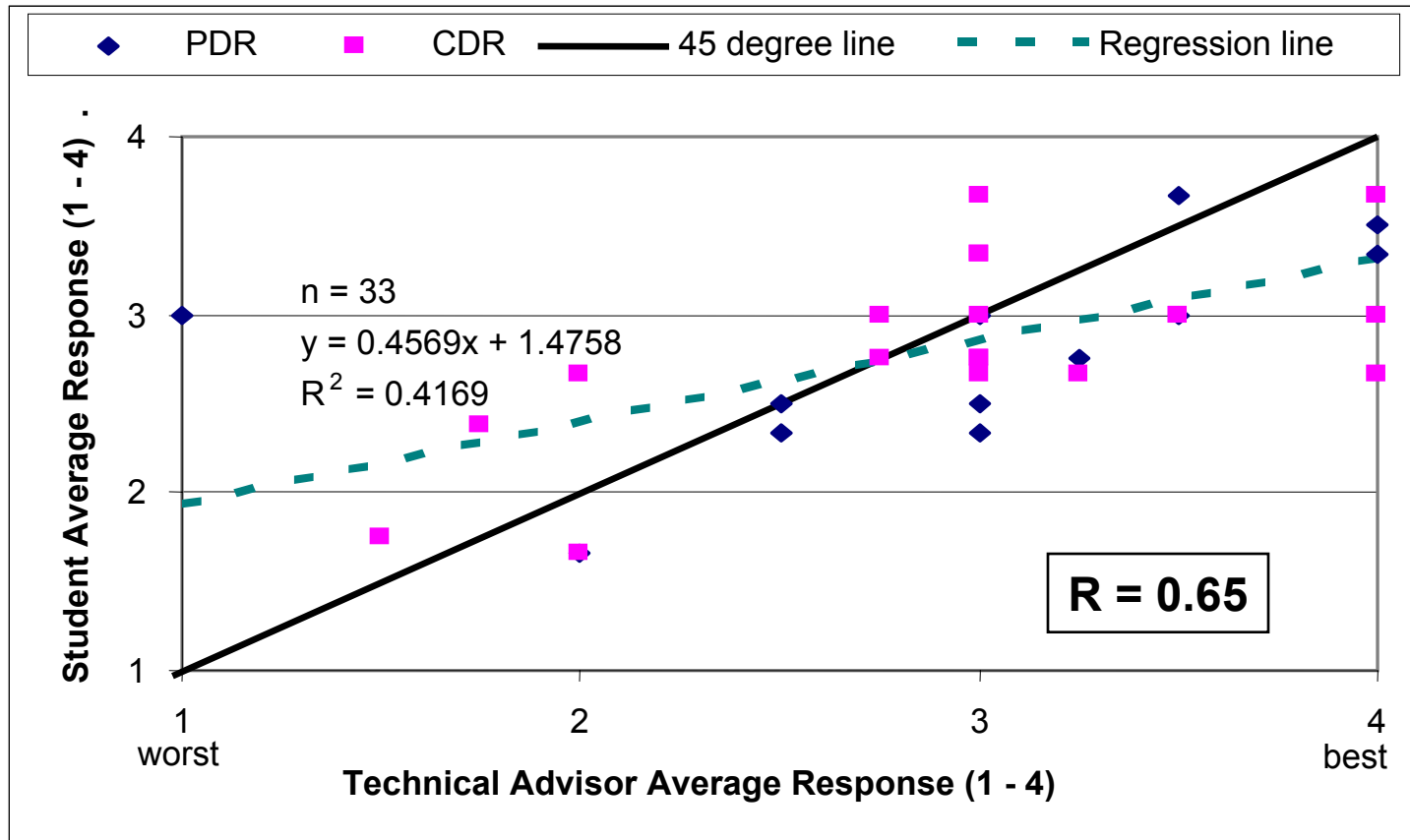
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**Actually Question 5 on Assessment Form.**

Student item	2. Overall, how would you rate your own ability to perform effectively on this multidisciplinary team?			
Faculty item	2. Overall, how effective would you say this team has been at working together, based on your experience with other project teams?			
Associated response and score	Poor (1)	Improvement needed (2)	Good (3)	Excellent (4)

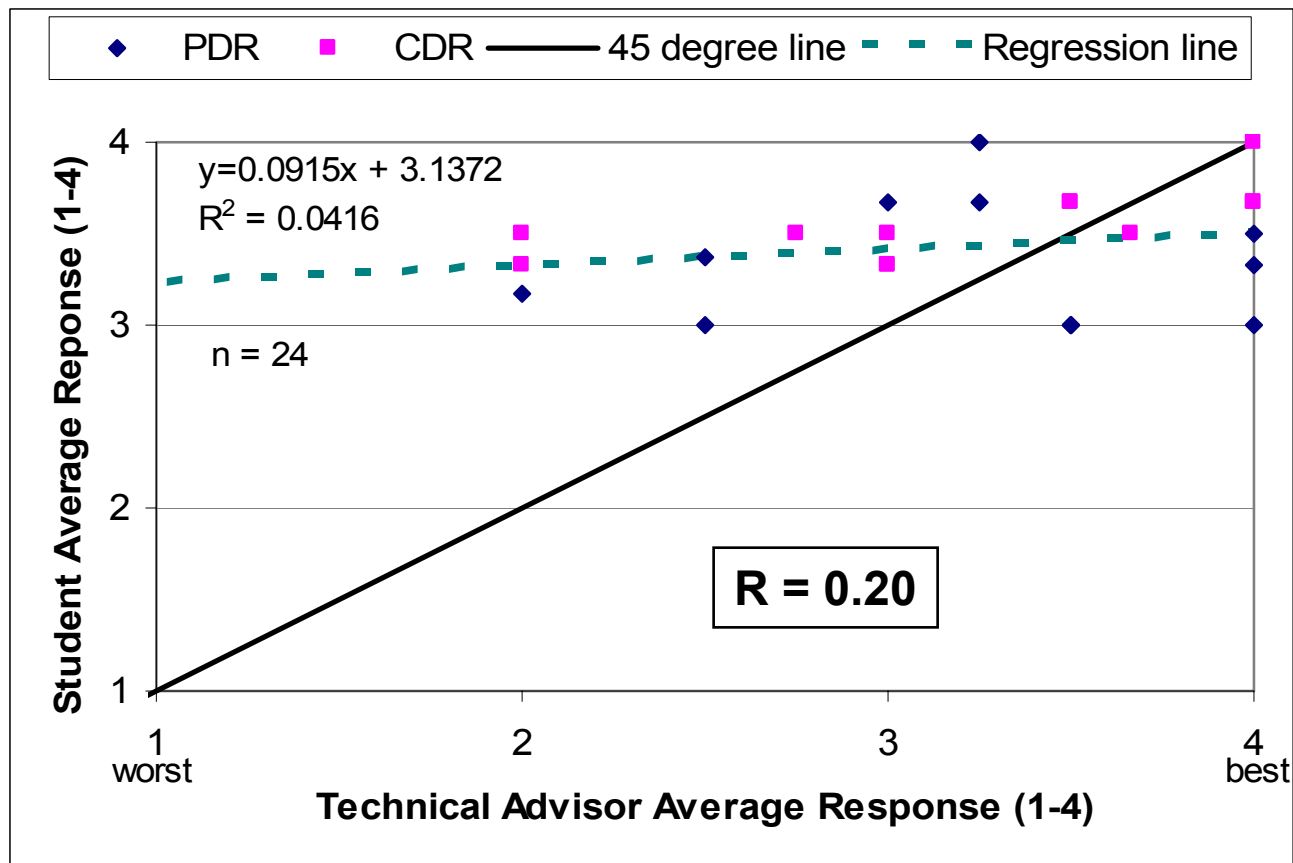
# Overall Group Productivity

## Question 1



# Ability to Function on Multidisciplinary Teams

## Question 2



# Average Group Productivity and Teaming Ability Ratings vs. Instructor

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Population	Group Productivity (1)		Ability to Perform on Team (2)		Instructor Assigned Grade	
	1 <sup>st</sup> term	2 <sup>nd</sup> term	1 <sup>st</sup> term	2 <sup>nd</sup> term	1 <sup>st</sup> term	2 <sup>nd</sup> term
All	2.84	2.71	3.27	3.55	3.49	3.42
Male	2.86	2.77	3.21	3.52	3.55	3.49
Female	2.7	2.61	3.39	3.53	3.39	3.30



# Group Productivity and Teaming Ability Ratings - Additional Observations

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- ❑ Students perceived their group productivity during the building and testing phase of the project inferior to their performance during the planning phase
- ❑ During 1<sup>st</sup> semester, male students ranked their group productivity performance higher than female students
- ❑ Minority students ranked their group productivity performance lower than for non-minority students
- ❑ Student perception of their ability to function as an effective team member increased from the first to second semester

# Productivity Rating

## Student vs. Tech Advisor – 2<sup>nd</sup> Semester

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			Overestimate		Underestimate		No Difference	
	n	%	n	%	n	%	n	%
Male	43	65	12	28	15	<b>35</b>	16	37
Female	23	35	7	30	11	<b>48</b>	5	22
<b>Overestimate</b>	19	<b>29</b>	<b>48% of female students underestimated their team productivity compared to 35% of their male peers.</b>					
Underestimate	26	39						
No difference	21	32						
<b>Total</b>	66	100						

**29% of students had inflated ratings of their group's productivity**

# Teaming Ability Rating

## Student vs. Tech Advisor – 2<sup>nd</sup> Semester

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			Overestimate		Underestimate		No Difference	
	n	%	n	%	n	%	n	%
Male	27	61	13	<b>48</b>	6	22	8	30
Female	17	39	11	<b>65</b>	2	12	4	23
<b>Overestimate</b>	24	<b>55</b>	<b>Female students were more confident in their teaming abilities (65% overestimated) compared to their male peers (48% overestimated)</b>					
Underestimate	8	18						
No difference	12	27						
<b>Total</b>	44	100						

**55% of students had inflated ratings of their teaming ability.**

# Conclusions

## Team Productivity Assessment

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- ❑ A moderate to strong positive correlation ( $r=0.65$ ) was observed between student and technical advisor responses that assessed group productivity
- ❑ Weaker teams over predict group productivity while overachievers under estimate their success
- ❑ Male students rank their group productivity higher than their female peers during both semesters of Sr Design
- ❑ 48% of female students underestimated their team productivity compared to 35% of their male peers
- ❑ Students perceive their productivity during the building and testing phase of the project inferior to their productivity during the planning phase

# Conclusions

## Teaming Ability Assessment

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- ❑ Results indicate that weaker students over predict their teaming skills while overachievers under estimate their abilities ( $r=0.20$ )
- ❑ Student scores relating to teaming ability correlated positively with faculty assigned course grades ( $r=0.53$ )
- ❑ Student perception of their ability to function as a team member increased from the 1<sup>st</sup> to 2<sup>nd</sup> semester
- ❑ Female students were more confident in their teaming skills (65% overestimated) than their male peers (48% overestimated)
- ❑ Students were more likely to overestimate their teaming skills during the 2<sup>nd</sup> semester

# Questions?

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