

Changing the Paradigm “Cheating In a Traditional Exam Setting” Into a Possible Productive Team Work Arena and the Associated Student Perception

Yimesker Yihun¹, Rajeev Nair¹ and Jason Herron²

¹*Department of Mechanical Engineering, Wichita State University, Wichita, KS 67260, USA*

²*Department of Counseling, Educational Leadership, Educational and School Psychology, Wichita State University, Wichita, KS 67260, USA*

Abstract: Active learning and project-based-learning (PBL) approaches are getting great attention and acceptance to maximize learning in undergraduate education. For the success of these engagement methods, students’ collaboration plays a great role, however, there are only few studies available on an effective team formation method. The team integration and level of collaboration will directly affect the quality of the end-product as well as the amount of learning through the process. An effective team formation mechanism in Science, technology, engineering and mathematics (STEM) programs is vital to create a strong collaboration among students and to maximize learning. In this paper, a preliminary study has been performed to investigate a possible route to build an effective collaboration among students by changing the traditional paradigm “cheating on in-class Examinations” into a possible productive team work arena; and the associated students’ perception was assessed. The study has been conducted on a sophomore level, engineering course called Dynamics for Mechanical Engineers at a moderate sized research university in the Midwest U.S. In this course, a semester long project, two traditional exams, homework and in class group exercises were administered. In addition to these evaluation methods, one additional exam was administered with a fixed time as regular exams, but open for collaboration during the exam. The announcement about the exam protocol was made one month prior to the exam. At the end of the semester, a survey was conducted through Qualtrics and multiple regression was conducted to determine the predictive power of personal experiences of group tests and perceptions of group tests. The result indicates that, even though the preparation for the collaborative test helped students to come closer and develop trust among them, only individuals in the lowest competency group had a significantly higher perception of group test than individuals in the high competency group.

Background:

Collaborative group testing has been shown to be a very effective tool towards student learning in a multitude of studies done across a wide spectrum of learning vistas (DiCarlo 2002), (Hall and Stocks 1995), (Cortright, Lujan et al. 2016), (Gilley and Clarkston 2014) and (Löfgren and Lundahl 1996). Although this cooperative learning technique is not new, not much research has been done to understand the pros and cons of this much debated technique, especially among engineering students. There is a growing movement that suggests that group testing and its importance in student learning is something that will ensure a more equitable and all-encompassing learning experience for all students irrespective of their educational background, social skills, and other related parameters (Miller 1962), (Muir and Tracy 1999), (Stafford, Elgueta et al. 2014).

Research into educational experiences for students recognizes the importance of assessment in education and emphasize broadening methods of assessing student learning beyond paper and pencil measures and traditional written examinations (Hill, Ruptic et al. 1998), (Stiggins 1994). The nature of memory suggests that traditional written individual examinations may not maximize long-term retention of information and concepts (Stecher 2010), (Albanese and Case 2016), (Woolfolk, Hoy et al. 1980). There is enough data to

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claim that this technique promotes critical thinking, problem solving, and decision-making skills. Defining critical thinking as a conscious process means that teachers can make students aware of the process and affect the process. Critical thinking is a conscious process; the process involves comprehension, analysis, synthesis, and evaluation. But the process is not linear, nor is it two-dimensional; it is, instead, multi-dimensional (Dressel 1991). Examining the reactions and experiences of students to a group exam shows that depending on the particular situation, a collaborative exam can strengthen the learning community. The oral experience permits students to participate in the critical thinking process while preparing for the exam, to share the knowledge with others, and to learn from their peers (Dressel 1991, Yang, Chuang et al. 2013).

Initial research done by Cortright et al (Cortright, Collins et al. 2003), had suggested that collaborative testing (i.e., group test taking) increased student performance on quizzes. His future research established conclusively that collaborative testing improves student retention of course content. To test this hypothesis, Cortright and team used an undergraduate exercise physiology class of 38 students and randomly divided them into two groups of 19 students each. They used three exams and a protocol that followed a randomized crossover design to control for time and other effects. Student retention of course content was reduced when students completed the original examinations individually. In sharp contrast, student retention was improved when students completed the original examinations in groups.

Cooperative exams are described as an assessment format that is applicable in a wide range of disciplines. The primary goal is to enhance the application and long-term retention of critical course concepts. In addition, a well-developed and refined cooperative exam model provides prospective teachers an alternative method of assessing student learning. In addition to fostering group skills, cooperative/group exams deepen students' understanding of course material (Russo and Warren 1999), (Swanson, Case et al. 1996), (Williams and Mann 2016), (Emke, Butler et al. 2016).

Individual accountability, identified as a critical element in cooperative group learning (Johnson, Johnson et al. 1994), (Jacobs and Shan 2016), results from the fact that students are called on randomly, and each must be prepared to offer the group's analysis of any of the questions. Giving a single group grade for the exam provides positive interdependence, another essential element. Discussing with students the relationship of the cooperative oral exam to models of assessment, elements of effective cooperative learning and principles of memory are also helpful to successfully advocate for the positive values gained from this exercise (Murry 1990), (Van den Broek, Takashima et al. 2016).

There are studies that allude to the possibility of cooperative learning resulting in higher academic achievement and a more positive relationship among students and instructors (Rao, Collins et al. 2002), (Richardson 2000), (Lujan and DiCarlo 2017). This eventually would promote a more positive psychological well-being, and a more constructive classroom environment, all which may serve to produce professionals who are self-sufficient, critical thinkers, and lifelong learners.

In general, a team project is a natural practice in engineering courses, to fully utilize the potential benefits of this project engagement method, the instructor may be benefited by understanding the factors that can affect team effectiveness and effective team formation mechanisms. Mostly, in a semester long group project assigned at the beginning of the semester, there will be challenges as some of the group members barely knew each other, this is common especially in sophomore and junior level classes, and will be difficult to expect effective collaboration with equally shared responsibilities to assure quality end-product/result. The main motivation behind this study was, how to make the group collaboration more strong and how the student respond to it? In this paper, a timed, collaborative based closed book exam was chosen as a pilot study to strengthen the students' collaboration and maximizing learning. And the students' perspective towards this group exam philosophy is assessed and presented.

Implementation:**Participants**

Participants consisted of 53 engineering college students at a moderately sized research university in the Midwest U.S. The mean age of participants was 22.32 (SD = 3.50). A majority (94.20%) of participants were male. Whites (37.70%) made up the largest racial group in our sample followed by Asian (30.20%) A majority (50.9%) of participants were classified as academic juniors.

Race (n = 53)

Table 1: Participants Racial Group

Race	n	%
African American	4	7.5
Asian	16	30.2
Hispanic	4	7.5
Latino/a	2	3.8
Native American	1	1.9
White, non-Hispanic	20	37.7
Other	6	11.3

Table 2: Participants Academic Status

Status	n	%
Sophomore	14	26.40
Junior	27	50.90
Senior	12	22.61

Course Evaluation Methods: The course evaluation categories are shown in **Table 3**. Among these, Exam 2 was administered with a fixed time as regular exams, but open for collaboration during the exam. The announcement about the exam protocol was made one month prior to the exam. An online survey through Qualtrics was collected on the students' perception towards the collaborative exam. Students are also asked to assess the pros and cons of the collaborative exam approach and what need to be done to improve the collaboration exam philosophy effectiveness.

Table 3: Course Assessment Distributions

Evaluation Method	%	Evaluation Protocols
Exam 1	15	Closed book and notes, attempted individually
Exam 2	20	Closed book and notes, attempted <i>in group</i>
Final Exam	20	Comprehensive, Closed book and notes, attempted individually
Project	20	Provided at the beginning of the semester and has three progress reports
Homework	10	
Quiz & in-class exercise	15	A couple of exercise was attempted in group

Results and discussion:

Multiple regression analysis was conducted to determine the predictive power of personal experiences of group tests and overall student performance on student perceptions of group tests. In our regression model, the predictor variables were student competence and prior experience with group tests. Student competence

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in this study is represented by student prior performance in engineering courses, and students were categorized into three groups 1) high competency, 2) medium competency and 3) Low competency. The criterion variable in this study is student perception of group test as an assessment of course knowledge. We utilized a two model analysis of this data. Model 1 consisted of the competency variables and the criterion variable. The predictor (student competence) was dummy coded because of its categorical nature ($k-1 = 2$ dummy coded variables). The reference group for this study was individual in the high competency group. We compared these individuals to individuals in the medium and low competency group.

Table 4: Ordinary least squares (OLS) Regression Models (n =52)

Model	Predictor (X)	Criterion Variable (Y)
Model I	Student competency	Student perception of group tests
Model II	Student competency	Student perception of group tests
	Student prior experiences with group tests	

Model 1

Ordinary least squares regression (OLS) indicates the predictor (student competency) accounts for 12.2% of variance in scores on the criterion variable (student perceptions), which is significant [F (49) 4.532, $p = .016$, adjusted r-square =.122]. Unstandardized beta coefficients indicate that students in the high competency group had a mean perception of 3.226 concerning the group test. Students in the moderate competency group score on average.173 higher on perception scores in comparison to students in the high group. This beta coefficient is non-significant [$t = 1.516$, $p = .136$]. Students in the low competency group scored, on average.334 higher on perception of group test than individuals in the high group. This result was significant [$t = 3.00$, $p = .004$]. These results indicate that overall the model was a significant predictor of students' perception of group test. Furthermore, individuals in the lowest competency group had a significantly higher perception of group test than individuals in the high competency group.

Model II

Multiple regression analysis indicates that the predictors (student competency and prior experiences) accounts for 25.7% of the overall variance in the criterion variable (student perception of group tests). This result is significant [F (48) 6.888, $p = .001$, adjusted r-square =.257]. Analysis of the unstandardized regression coefficients indicates that for every one unit increase in experiences, students' perception of group tests. Increased.132 which is significant [$t = 3.154$, $p = .003$]. This result means that individuals who have had a positive prior experience with group tests have a generally more positive perception of group test in an engineering context.

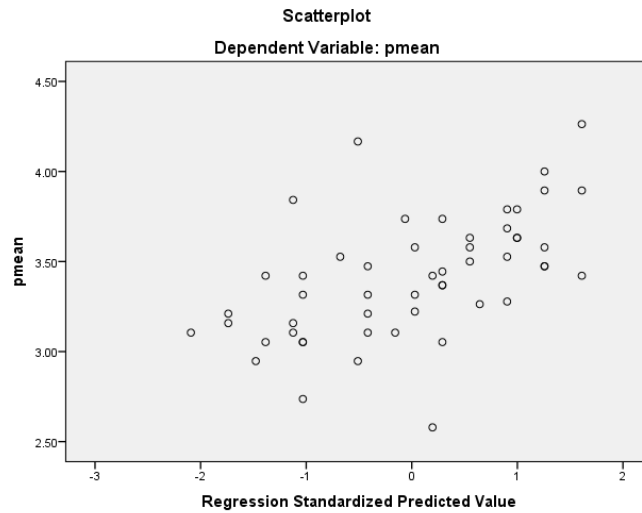


Figure 1: Student perception of group tests vs standardized regression coefficients

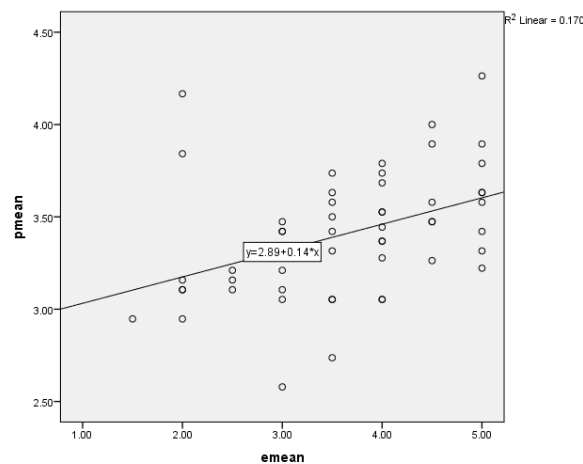


Figure 2: Student perceptions vs prior experiences with group tests

Students have been also asked to give a qualitative analysis of the group exam pros and cons. Here, a summary of the analysis is presented as a bullet point. In general, the majority of the student agreed upon learning in a group exam is more favorable than learning in individual exam preparation. Figure 4 shows the analyzed data based on 53 respondents, where response 1 means ‘completely disagree’ and response 5 is ‘completely agree’ and the rest falls in between.

Student’s response towards the pros of collaborative exams:

- Team work is encouraged, and a group exam mimics more clearly the actual work environment as the work is spread over many people depending on their expertise and to lighten the load.
- Grade doesn't suffer when a small detail is forgotten, group members can catch the mistake.
- Time management and dividing task and developing trust between group members will be encouraged. Overall, helps to improve group skills.
- Learning from group members is encouraged and learning is also maximized

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- The preparation for the group exam brings the group members more closely to do another evaluation scheme such as homework and projects as well.

Student's response towards the cons of collaborative exam:

- It will be a heavy load of well performing students
- Time management will be difficult while having a discussion and to resolve differences, this will affect the grades of some students.
- Some students may not prepare, by relying on others work, similar to group projects

Students' suggestions to make the group exam philosophy effective:

- Limiting the group size to a maximum of three members.
- The group formation should be decided by students and made at the beginning of the semester.
- A peer evaluation/ participation survey at the end of the exam will be good to maximize engagement.
- Reducing the number of problems will help to everyone to go through each problem and verify, otherwise the group members will divide the problems and the learning will be limited and copping will be promoted.
- The class setup should be arranged to favor group work

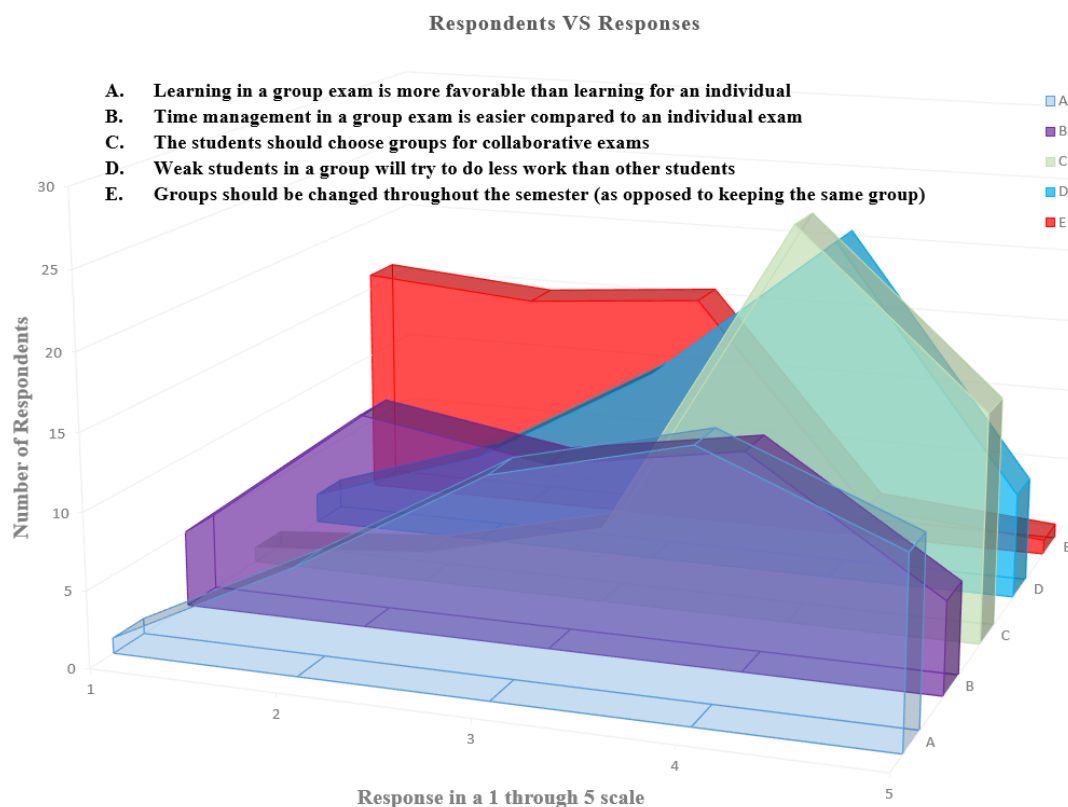


Figure 4: Students' perspective of the group exam

Conclusion:

The results of this study provide evidence that students who do better in engineering courses have less of a preference for group tests. However, the group exam preparation helped students to develop trust among themselves and strengthen the collaboration for the course project. A deeper examination is needed in order to increase our understanding of this preference. Future studies may incorporate measures of personality, in order to examine the existence of preference due to personality type. In other words, students with a higher level of neuroticism may have a more difficult time working on group test, this may be tired of their negative perception of group tests. More examination also needs to be done in order to determine exactly why individuals who are highly capable, have an aversion to group test. Qualitative data should be collected to determine if the negative perception is due to the extra work perceived (due to explaining concepts) or an aversion to working in a group in general.

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Authors Biography:

Dr. Yimesker Yihun: is an Assistant Professor in the Mechanical Engineering Department at Wichita State University, where he teaches undergraduate and graduate courses in the design, robotics and control area. His research interests are theoretical kinematics, robotics, control system design and applied mechanics.

Dr. Rajeev Nair: is an Assistant Professor in the Mechanical Engineering Department at Wichita State University, where he is teaching courses in mechanical systems design like Senior Capstone Design (ME 662), Computer-Aided Applications (ME 637) and Finite Element Analysis (ME 639). His research interests are laser-based flexible fabrication, laser surface nano/micro texturing, design and mechanical analysis of stents/orthopedic and other bio devices.

Dr. Jason Herron: Assistant Professor in the Department of Counseling, Educational Leadership, Educational and School Psychology in the College of Education is an expert in cognitive processes related to complex decision making and problem solving, teacher pedagogical decision making and epistemological beliefs like beliefs about knowing and learning, such as the certainty of knowledge, the complexity of knowledge, the speed of learning and the ability to increase learning capacity.