Assessing active learning and skills training through alumni and current student views

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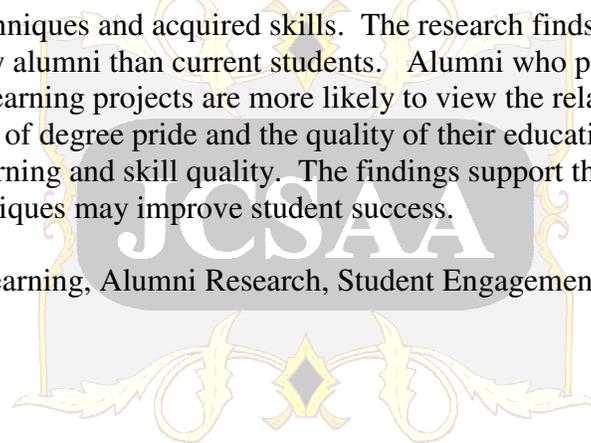
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ABSTRACT

With a focus on active and cooperative learning and skills training, this paper measures aspects of student engagement in a cross-sectional research study. Evaluations of the university by business school alumni and current students are associated with their assessment of active and cooperative learning techniques and acquired skills. The research finds that such learning and skills are more valued by alumni than current students. Alumni who participated in a higher number of cooperative learning projects are more likely to view the related skills as important. Moreover, alumni views of degree pride and the quality of their education are connected with their views on active learning and skill quality. The findings support the work of others which suggests that these techniques may improve student success.

Key Words: Active Learning, Alumni Research, Student Engagement, Student Success.

INTRODUCTION

Recent decreases in student retention and graduation rates are of concern with institutions of higher learning. Financial results can be deleterious. Moreover, faculty may be questioning the effectiveness of their teaching models and methods. In recent years, some scholars have suggested new directions for student learning based on their research. These directions posit moving away from a traditional lecture-based passive model to one that may provide higher student satisfaction. This new model uses active and cooperative student learning and skills training in conjunction with other supportive learning experiences (such as campus life activities). Research findings assessing these new directions suggest that colleges and universities that perform well in effecting higher levels of engagement will tend to show higher rates of graduation (and by inference, retention) than those that use more traditional teaching methods (Kuh, 2008; Kuh, Kinzie, Schuh, and Whitt, 2005; Felder and Brent, 2007, 2001, 1994; Johnson, Johnson, and Smith, 2007, 2006, 1991; Terenzini, Cabrera, Colbeck, Parente, and Bjorklund, 2001).

With a focus on active and cooperative learning and skills training, this paper measures aspects of student learning in a cross-sectional research study. The study attempts to associate evaluations by business school alumni at a private university and active and collaborative and/or cooperative learning and skills techniques which were applied there informally from 1980 to 2005 to parts of the business school curriculum and then formally from 2006 to the present across the curriculum. The data collected assesses whether active and cooperative student learning and skills training are correlated with higher levels of student satisfaction. The findings suggest that such techniques are seen as important and, as such, may lead to higher levels of student success through the formal inclusion of the techniques in the business curriculum. Much work by others suggests that engagement techniques such as these when applied and maintained improve student satisfaction which in turn can improve student retention and graduation rates (Kuh, 2008; Kuh, et al., 2005).

This paper complements the work of others and extends their efforts with findings that support the use and continued inclusion of in-class student group activities, casework, business group projects, open or for-credit internships, and business group projects working with outside small business community partners through semester-long in-class internships. The in-class internship projects, in particular, attempt to provide creative ways to solve the actual business problems presented by the community partners.

However, anecdotally, use of in-class internships leads to substantial increases in time and effort for the professor, with initial undergraduate student resistance to primary (original) group projects or casework. In addition, student evaluations may note that the professors are not acting as appropriate teachers and thus are rated lower. On the positive side, professors report greater student engagement and classroom integration with current course material. Students' completion of the group projects also provides internship notation for their résumé and a sample of work which they may present in job interviews. In follow-up discussions, twelve months or more after classwork, students mention the in-class internships as one of their most important activities in spite of the work involved.

LITERATURE REVIEW

In considering the active and collaborative and/or cooperative student learning category and skills training, it is important to first understand the difference between its components as primarily one of degree. The components make up a critical part of student engagement as opposed to passive learning, such as straight, non-participative lectures. Active learning differs from collaborative and cooperative learning in the degree and depth of student engagement in and out of the classroom. Simply stated, active learning has two parts: students participating in an appropriate learning activity in the classroom, and being required to think about and apply that activity as part of the learning process (Prince, 2004; Bonwell and Eison, 1991). Collaborative learning involves students in pairs or groups working toward some common learning goal and sharing what they have learned in an attempt to understand difficult concepts or applying the concepts in problem solving situations (Kuh, et al., 2005; Panitz, 2003). Cooperative learning also involves students working in groups toward some common learning goal. However, it also includes five important conditions (one of which is collaboration): positive interdependence, individual accountability, face-to-face interaction, collaboration skills, and group processing (Felder and Brent, 2007; Johnson, et al., 1991). Given these distinctions, the category should be simplified to one of active and cooperative learning and will be referred to as such throughout the discussion.

What has been suggested is that, depending on the level of engagement through active and cooperative learning, students appear to be more successful in a variety of situations in applying and implementing the concepts under study. They tend to present significantly improved levels of learning in drawing from the range of active and cooperative assignments, from simply responding to instructor questions, to proactively initiating discussions, to sharing information outside of class, to working in groups in class on small simple problems, or to full immersion in highly involved group projects requiring the sharing and discussion of information and creative, innovative problem solving (Kuh, 2008; Kuh, et al., 2005).

Students need to think about and understand what they are doing in the interactive class exercises leading to better retention. In fact, in a study of 6,000 students, interactive engagement techniques significantly improved student course performance. Also, researchers note how equally important it is for student engagement and overall success for institutions to assign enough resources, organize learning opportunities, and develop supporting services to encourage students to participate in and benefit from such activities (Kuh, et al., 2005; Astin, 1993, 1993; Hake, 1998; Wiggins and McTighe, 1998; Chickering and Gamson, 1987).

In a 164-study meta-analysis, cooperative learning was identified to "significantly increase student achievement (compared with competitive and individualistic learning) when properly implemented" (Johnson, Johnson, and Stanne, 2000, 12). Implementation is the key, with appreciable results noted over conventional methods. Of the eight methods studied under the cooperative learning framework, Learning Together (LT) showed the greatest effect (Johnson, et al., 2000). However, one must be careful, in that the framework may not be exhaustive and other approaches may be introduced with more measurable effects. What does emerge is that cooperative learning, when properly implemented and maintained, can lead to more positive effects in student engagement and learning achievements than traditional methods. As noted by others, effective student engagement can lead to improved student retention and higher graduation rates (Kuh, 2008; Kuh, et al., 2005).

In-class student group activities, casework, and business/service group projects all fit into various levels of the model. However, open or for-credit internships and business/service group projects working with outside community partners through semester-long in-class internships are at the top of the cooperative learning list in terms of importance, level of engagement, and incorporation of the five critical aspects of cooperative learning. In the Documenting Effective Educational Practice (DEEP) Study and other studies, such connection with the local community not only helped improve the quality of life of some of the communities but was an essential component for students to integrate and apply classroom learning and reflection to the work world (Kuh et al., 2005; Eyler and Giles, 1999; Astin and Sax, 1998).

One question of the active and cooperative learning model is whether current students view the techniques differently than do graduates. Another issue is whether graduates' views of the institution are related to their work using active and cooperative learning.

METHODOLOGY

Sample

The School of Business at the private university being studied periodically surveys its alumni. Feedback is used when updating the curriculum and course content. Results are reported to the Accreditation Council for Business Schools and Programs (ACBSP). In fall 2009, a faculty committee prepared an alumni survey, distributed with an explanatory cover letter in January 2010. The letter highlighted the importance of each alumnus's feedback. Alumni were asked to complete the survey within a roughly one-month time period. Responses were collected online using commercially available software. Respondents were guaranteed confidentiality and anonymity.

All business school alumni were contacted who graduated with a bachelor's degree in a business major since 1980 through 2009 (1,036 individuals). The alumni survey generated 122 replies (11.77% response rate). In addition, the study authors asked current undergraduate students (nearly 90) for response to selected survey questions. The students sampled were enrolled in business courses that met during a common time during spring 2010.

Survey Instrument

The instrument was adapted from questionnaires used by this School of Business in 2005, by the University of Chicago's Booth School of Business in 2007 and others. In addition, questions were written to determine the individuals' involvement in active learning exercises while students. Respondents were asked for their views on the use of cases, internships, class projects, presentations, skills and more. Current students were asked selected questions from the alumni survey.

Hypotheses

This paper will investigate which measures (if any) of alumni satisfaction are significantly impacted by former business students' participation in active and cooperative learning projects during their undergraduate careers at the University. Classroom activities include student participation and professor/student interaction. Applied activities include case

studies, team projects and in- and out-of-class internships. Acquired skills are computer, mathematical, presentation, reasoning and logic and writing. A focus is on work with outside business partners.

The following hypotheses are suggested:

1. The view of importance of active learning is expected to be higher for individuals who have participated in more activities (H1).

2. Alumni are expected to have higher regard for active learning and professional skills than current students (H2).

3. Participation in in-class internships with professional partners should lead to a higher importance for active and cooperative learning as well as for professional skills (H3).

4. A high quality of active and cooperative learning undertaken is positively related to the alumni's regard for the university (H4).

FINDINGS

Alumni & Current Students

Comparisons are made between the viewpoints of alumni and current students. Faculty members comment that students do not fully appreciate their education until after graduation when they are in the professional world, as reflected in Hypothesis 2. Table 1, found in the Appendix, provides evidence in support of that view.

The table shows the percentage of alumni and current students who rated the various classroom activities, applied activities and skills as "very important," the highest rating on the questionnaire. In all activities and skills, there are significant differences seen in the distribution of answers given by alumni and students. These differences are consistent across classroom activities, applied activities, and skills that students acquire throughout the educational process.

Alumni & In-Class Internships

Since 2006, students in the School of Business have had the opportunity to complete in-class internships: this involves work on team projects with outside business partners through their marketing courses. Students often complain about the amount of work required. The survey asked alumni to rate the importance of active learning activities and educational skills; the alumni are grouped based on the number of professional projects they had completed. The results are shown in the Appendix in Table 2.

In comparing the three groups (participated in zero projects, participated in one project, participated in two or more projects) there are three significant differences. All relate to applied learning activities. Alumni who, as students, participated in two or more projects with outside business partners were more likely to rate case studies, team projects, and team projects with outside business as very important. The results, which provide evidence supporting Hypotheses 1 and 3, indicate that active and cooperative learning does have value, and the value increases with the amount of cooperative and active work done by students.

Alumni Views on Active Learning & Skills Quality

Next, a university input (quality) is connected to alumni views. High quality is made relevant when the activity is also important, and the prior tables show that alumni view active and cooperative learning and professional skills as very important. Table 3 (Appendix) presents data relating the quality of educational activities and academic skills alumni received to their overall opinion on their education; the results support Hypothesis 4. Four questions were designed to measure graduates' overall experience.

Q: "I received a better education than most of my peers."

Several activities and skills were related to students strongly agreeing that they received a better education than most of their peers. Seventy-three percent of alumni who strongly agreed that they received a better education gave the university a top quality rating on student participation, while only 45 percent of alumni who gave a lower rating to their education gave the university a top quality rating on student participation. As indicated in Table 3 (Appendix), there were also significant differences in the distribution of quality ratings for case studies and five skills: computer, mathematical, presentation, reasoning and logic, and writing. For example, 69 percent of alumni who strongly agreed that they received a better education rated the university quality high in mathematical skills while only 33 percent of alumni with a lower regard for their education gave the top quality in mathematical skills.

In a different outcome, alumni who say they received a better education were less likely to give the university high marks for internship opportunities. This internal weakness has been previously identified and the university has hired an internship coordinator who specializes in working with business students.

Q: "I am proud of my degree."

Activities and skills were also connected to students strongly agreeing that they were proud of their degree. Alumni who strongly agreed that they are proud of their degree were more likely to give the school top quality ratings regarding the classroom environment, as indicated by student participation and professor/student interaction. Also, alumni who said they were proud of their degree were more likely to say the university provided high quality mathematical skills, computer skills and presentation skills.

Q: "I believe the university did an excellent job building a relationship with me."

Eighty-four percent of alumni who strongly agreed the university did an excellent job of building a relationship also said that the school provides high quality professor/student interaction. This is an expected result. Alumni who felt the university did an excellent job at relationship building also were more likely to say the school provided high quality mathematical skills and presentation skills; perhaps these were areas in which students received more feedback from professors.

Q: "I credit a significant part of my professional success to my degree."

Alumni who strongly credit their professional success to their degree were more likely to give the university top quality ratings for reasoning and logic skills compared to alumni who gave less credit to their degree (47 percent vs 20 percent). A similar pattern holds for writing skills and projects with outside firms.

CONCLUSIONS AND RECOMMENDATIONS

In services delivery, the higher the quality noted of the service, the higher the satisfaction; and the higher the satisfaction, the better the engagement and outcomes (Fournier and Mick, 1999; Kuh, 2008; Kuh, et al., 2005; Oliver, 1997; Zeithaml, Bitner, and Gremler, 2009). With this paper, alumni see active and cooperative learning techniques and acquired skills as highly important, more so than current students. This may not be surprising given anecdotal evidence many faculty members have of graduates coming back with stories of how significantly the classes helped, even where these same graduates debunked the class efforts as students.

The four hypotheses tested were supported. Alumni views of degree pride and the quality of their education are indeed connected with their views on active learning and skill quality. The overall results of this analysis suggest that an alumni's opinion on receiving a high quality education is associated with participation in learning activities and skills. Alumni degree pride and the relationship built are most strongly associated with a quality classroom environment. Professional success is associated most with providing high quality writing and reasoning and logic education. Moreover, those alumni who view a variety of active learning techniques and skills as important are more likely to have higher regard for the university. By focusing on active learning and solid skill education, schools can improve how their alumni feel about their undergraduate education.

College education is no longer viewed as a set of individual courses but as a comprehensive process of developing skills and learning to think critically and to apply knowledge. The surveys in this study were designed to measure this broad-based educational approach and how it contributes to alumni satisfaction with their degree. The results suggest that current students might not fully appreciate the value of their education; but once they graduate, they value these skills more. Additionally, they associate a higher quality degree with higher quality education from skills training and active learning activities.

Based on the results seen with this paper and with others, more colleges and universities may want to consider including additional active and cooperative learning and skills training in their curriculums, even formalizing such learning and training across the curriculums. Where the quality of the educational content increases, especially through these learning and training techniques, the greater the engagement may be possible, and the greater the student success that may be realized.

REFERENCES

Astin, A. (1993). "What Matters in College? Four Critical Years Revisited." San Francisco, CA: Josey-Bass.

Astin, A. and L. Sax (1998). "How undergraduates are affected by service participants." *Journal of College Student Development, 39*, 251-263.

Bonwell, C., and J. Eison, (1991). "Active Learning Creating Excitement in the Classroom." *ASHEERIC Higher Learning Education Report, No. 1,* George Washington University, Washington, DC.

Chickering, A., and Z. Gamson (1987). "Seven Principles for Good Practice." *AAHE Bulletin, 39*, ED 282491, 3-7.

Eyler, J., and D. Giles (1999). *Where's the Learning in Service-Learning?* San Francisco, CA: Josey-Bass.

Felder, R., and R. Brent (2007). "Cooperative Learning." In P. A. Mabrouk, ed., *Active Learning: Models from the Analytical Sciences,* ACS Symposium Series 970, Chapter 4, American Chemical Society, Washington, DC, 34-53.

Felder, R., and R. Brent (2001). "Groupwork in Distance learning." *Chemical Engineering Education, 35, (2),* 102-103.

Felder, R., and R. Brent (1994). "Cooperative learning in technical courses: Procedures, pitfalls, and payoffs". Report to the National Science Foundation. (*ERIC Document Reproduction Services* No. ED 377 038).

Fournier, S., and D. Mick (1999). "Rediscovering Satisfaction." *Journal of Marketing, 63, (October),* 5-23.

Hake, R. (1998). "Interactive-Engagement vs. Traditional Methods: A Six-Thousand-Student Survey of Mechanics Test Data for Introductory Physics Courses." *American Journal of Physics, 66,* (1), 64.

Johnson, D., R. Johnson, and K. Smith (2007). "The State of Cooperative Learning in Postsecondary and Professional Settings." *Education Psychology Review, 19,* (1), 15-29.

Johnson, D., R. Johnson, and K. Smith (2006). *Active Learning: Cooperation in the College Classroom, 3rd Ed.*, Edina, MN Interaction Book Co.

Johnson, D., R. Johnson, and K. Smith (1991). "Cooperative Learning: Increasing College Faculty Instructional Productivity." *ASHE-ERIC Higher Education Report No. 4*, George Washington University.

Johnson, D., R. Johnson, and M. Stanne, (2000). "Cooperative Learning Methods: A Meta-Analysis." From Cooperative Learning Center, *Methods of Cooperative Learning: What can we prove works?* Downloaded from the worldwide web on 3/16/2010: www.co-operation.org/pages/cl-methods/html.

Kuh, G. (2008). "High Impact Educations Practices: A Brief Overview." Excerpted from *High Impact Educational Practices: What They Are, Who Has Access to Them, and Why They Matter*. AAC&U. Downloaded from the worldwide web on 3/14/2010: www.aacu.org/LEAP/hip.cfm.

Kuh, G., J. Kinzie, J. Schuh, and E. Whitt (2005). *Student Success in College: Creating Conditions That Matter.* San Francisco, CA: Josey-Bass.

Oliver, R. (1997). *Satisfaction: A Behavioral Perspective on the Consumer*. New York: McGraw-Hill

Panitz, T. (1996). "A Definition of Collaborative vs Cooperative Learning." From *Deliberations*. Downloaded from the worldwide web on 3/14/2010: www.londonmet.ac.uk/deliberations/collaborative-learning/panitz-paper.cfm.

Prince, (2004). "Does Active Learning Work? A Review of the Research." *Journal of Engineering Education, 93*, (3), 1-9.

Terenzini, P., A. Cabrera, C. Colbeck, J. Parente, and S. Bjorklund (2001). "Collaboration learning vs. lecture/discussion: Students' reported learning gains." *Journal of Engineering Education, 90,* (1), 123-130.

Wiggins, G., and J. McTighe, (1998). "Understanding by Design." Merrill Education/ASCD College Textbook Series, Alexandria, VA: ASCD.

Zeithaml, V., M. J. Bitner, and D. Gremler, (2009). Services Marketing, Integrating Customer Focus Across the Firm, 5th ed. Boston: McGraw-Hill/Irwin, 104-110.

Appendix: Table 1
Importance of Activities & Skills - Alumni Compared to Current Students
Testing for Signficant Differences in Distribution of Answers

	Alumni		Current Students			
	Very Important *(Percentage who gave top ranking)*	All Other Rankings	Very Important *(Percentage who gave top ranking)*	All Other Rankings	Pearson Chi-Square	*p value*
Student participation in class	68.0%	32.0%	23.9%	76.1%	40.85	*0.000*
Professor / Student interaction	77.9%	22.1%	59.8%	40.2%	7.03	*0.008*
Case studies	49.2%	50.8%	17.4%	82.6%	23.14	*0.000*
Team projects	38.5%	61.5%	14.1%	85.9%	15.47	*0.000*
Team projects with outside businesses	48.4%	51.6%	16.3%	83.7%	23.83	*0.000*
Opportunities for internships	63.9%	36.1%	46.7%	53.3%	6.31	*0.012*
Computer skills	91.0%	9.0%	42.4%	57.6%	59.08	*0.000*
Mathematical skills	63.1%	36.9%	35.9%	64.1%	15.05	*0.000*
Presentation skills	76.2%	23.8%	45.7%	54.3%	21.06	*0.000*
Reasoning and logic skills	83.6%	16.4%	44.6%	55.4%	36.06	*0.000*
Writing skills	69.7%	30.3%	35.9%	64.1%	24.23	*0.000*

Notes: N=122 alumni, 92 current students. Answers were offered on a 5-point scale ranging from 'Very Important' to 'Not Important.'

Appendix: Table 2
Alumni Views of Importance of Active Learning and Skills Based on Number of Projects with Profissional Partners
Testing for Significant Differences in Distribution of Answers

	Completed Zero Projects		Completed One Project		Completed Two Projects			
	Very Important (*% who gave top ranking*)	All Other Rankings	Very Important (*% who gave top ranking*)	All Other Rankings	Very Important (*% who gave top ranking*)	All Other Rankings	Pearson Chi-Square	*p value*
Student participation in class	69.1%	30.9%	65.0%	35.0%	71.4%	28.6%		
Professor / Student interaction	79.4%	20.6%	72.5%	27.5%	85.7%	14.3%		
Case studies	54.4%	45.6%	30.0%	70.0%	78.6%	21.4%	11.47	*0.003*
Team projects	30.9%	69.1%	45.0%	55.0%	57.1%	42.9%	4.43	*0.109*
Team projects with outside businesses	51.5%	48.5%	35.0%	65.0%	71.4%	28.6%	6.11	*0.047*
Opportunities for internships	63.2%	36.8%	60.0%	40.0%	78.6%	21.4%		
Computer skills	91.2%	8.8%	90.0%	10.0%	92.9%	7.1%		
Mathematical skills	66.2%	33.8%	60.0%	40.0%	57.1%	42.9%		
Presentation skills	73.5%	26.5%	77.5%	22.5%	85.7%	14.3%		
Reasoning and logic skills	85.3%	14.7%	80.0%	20.0%	85.7%	14.3%		
Writing skills	72.1%	27.9%	62.5%	37.5%	78.6%	21.4%		

Notes: N=122 alumni. Insignificant p-values are omitted. Answers were offered on a 5-point scale ranging from 'Very Important' to 'Not Important.'

Appendix : Table 3
Connecting Alumni Ratings of Active Learning Quality to their Views of the University.
Testing for Significant Differences in Distribution of Answers
"I am proud of my degree."
Alumni who strongly agree that they have pride in their degree are more likely to rate active learning as high quality.

	Alumni with Stronger Degree Pride		Alumni with Weaker Degree Pride			
	High Quality *(Top ranking)*	Lower Quality *(All Other Rankings)*	High Quality *(Top ranking)*	Lower Quality *(All Other Rankings)*	Pearson Chi-Square	*p value*
Student participation in class	58.9%	41.1%	22.2%	77.8%	13.859	*0.001*
Professor / Student interaction	75.8%	24.2%	48.1%	51.9%	8.742	*0.013*
Case studies	21.0%	79.0%	11.1%	88.9%		
Team projects	28.4%	71.6%	11.1%	88.9%		
Team projects with outside firms	8.4%	91.6%	3.7%	96.3%		
Opportunities for internships	12.6%	87.4%	3.7%	96.3%		
Computer skills	26.3%	73.7%	7.4%	92.6%	9.528	*0.009*
Mathematical skills	46.3%	53.7%	22.2%	77.8%	7.643	*0.022*
Presentation skills	32.6%	67.4%	11.1%	88.9%	4.908	*0.086*
Reasoning and logic skills	28.4%	71.6%	18.5%	81.5%		
Writing skills	33.6%	66.4%	25.9%	74.1%		

"I received a better education than most of my peers."
Alumni who strongly agree that they received a better education are more likely to rate active learning as high quality.

	Alumni with Stronger View of Education		Alumni with Weaker View of Education			
	High Quality *(Top ranking)*	Lower Quality *(All Other Rankings)*	High Quality *(Top ranking)*	Lower Quality *(All Other Rankings)*	Pearson Chi-Square	*p value*
Student participation in class	73.1%	26.9%	44.8%	55.2%	14.952	*0.005*
Professor/Student interaction	84.6%	15.4%	65.6%	34.4%		
Case studies	30.8%	69.2%	15.6%	84.4%	10.381	*0.034*
Team projects	38.4%	61.6%	20.8%	79.2%		
Team projects with outside firms	15.3%	84.7%	5.2%	94.8%		
Opportunities for internships	26.9%	73.1%	62.5%	37.5%	10.193	*0.037*
Computer skills	42.3%	57.7%	16.7%	83.3%	10.651	*0.031*
Mathematical skills	69.2%	30.8%	33.3%	66.7%	13.990	*0.007*
Presentation skills	50.0%	50.0%	21.9%	78.1%	8.642	*0.071*
Reasoning and logic skills	42.3%	57.7%	21.0%	79.0%	8.164	*0.086*
Writing skills	57.7%	42.3%	25.0%	75.0%	16.596	*0.002*

"I believe Wingate University did an excellent job building a relationship with me."
Alumni who strongly agree that they have a relationship with the school are more likely to rate active learning as high quality.

	Alumni with Stronger View of Relationship		Alumni with Weaker View of Relationship			
	High Quality *(Top ranking)*	Lower Quality *(All Other Rankings)*	High Quality *(Top ranking)*	Lower Quality *(All Other Rankings)*	Pearson Chi-Square	*p value*
Student participation in class	59.7%	40.3%	41.7%	58.3%		
Professor / Student interaction	83.9%	16.1%	55.0%	45.0%	15.95	*0.003*
Case studies	27.4%	72.6%	10.0%	90.0%		
Team projects	30.6%	69.4%	18.3%	81.7%		
Team projects with outside firms	9.7%	90.3%	5.0%	95.0%		
Opportunities for internships	14.5%	85.5%	6.7%	93.3%		
Computer skills	25.8%	74.2%	18.3%	81.7%		
Mathematical skills	54.8%	45.2%	26.7%	73.3%	14.29	*0.006*
Presentation skills	38.7%	61.3%	16.7%	83.3%	8.67	*0.070*
Reasoning and logic skills	32.2%	67.8%	20.0%	80.0%		
Writing skills	40.3%	59.7%	23.3%	76.7%		

"I credit a significant part of my professional success to my degree."
Alumni who strongly agree that they credit success to their degree are more likely to rate active learning as high quality.

	Alumni with Stronger Credit for Success		Alumni with Lower Credit for Success			
	High Quality *(Top ranking)*	Lower Quality *(All Other Rankings)*	High Quality *(Top ranking)*	Lower Quality *(All Other Rankings)*	Pearson Chi-Square	*p value*
Student participation in class	63.3%	36.7%	47.2%	52.8%		
Professor / Student interaction	83.3%	16.7%	64.8%	35.2%		
Case studies	26.7%	73.3%	16.5%	83.5%		
Team projects	36.7%	63.3%	20.9%	79.1%		
Projects with outside firms	16.7%	83.3%	4.4%	95.6%	7.81	*0.099*
Opportunities for internships	20.0%	80.0%	7.7%	92.3%		
Computer skills	33.3%	66.7%	18.7%	81.3%		
Mathematical skills	40.0%	60.0%	40.7%	59.3%		
Presentation skills	40.0%	60.0%	24.2%	75.8%		
Reasoning and logic skills	46.7%	53.3%	19.8%	80.2%	10.64	*0.031*
Writing skills	53.3%	46.7%	25.2%	74.8%	8.78	*0.067*

Notes: N = 122 alumni. Answers were offered on a scale ranging from high to low quality