

Evaluating Attitudinal Student Surveys to Improve Construction Management Programs: A Case Study

James P Bradtmueller, PhD, Sean P Foley, PhD, and Daryl L Orth, PhD
Northern Kentucky University
Highland Heights, Kentucky

In 2007, the Department of Construction Management at Northern Kentucky University began including a much more extensive senior exit survey of its graduating students as part of the final interview process just prior to degree completion. The purpose of this exit survey is to gather candid feedback that can be used to improve the quality and effectiveness of the Department's curriculum. The original hardcopy form was posted on the internet via SurveyMonkey™ in 2008. The intent of this research is to conduct an in-depth analysis and evaluation of the online senior exit survey information collected to date to determine the following: (1) what the students perceive to be the Department's primary strengths, weaknesses, and opportunities for improvement; (2) if students' perceptions of their educational experience are changing from year to year, and, if so, what are the trends; (3) whether or not mean student responses about their education experiences are different based on their graduating grade point average; and (4) how best to incorporate these results into the existing program to improve the curriculum. Results indicated little statistically significant year-to-year differences, but responses based on GPA groupings were statistically significant in almost half of the survey questions.

Key Words: senior survey, student survey, exit interview, curriculum improvement, accreditation

Introduction

Based on the recommendations from a previous American Council for Construction Education (ACCE) accreditation review, the Department of Construction Management at Northern Kentucky University (NKU) began conducting a much more extensive survey (as compared to previously utilized surveys) of its graduating students as part of the final interview process just prior to degree completion. The intent of this senior exit survey is to gather candid feedback that can be used to improve the quality and effectiveness of the Department's curriculum. While not mandatory, each graduating senior is strongly encouraged to participate in the survey. Starting in spring 2007, the Department began giving graduating seniors an NKU Construction Management hardhat as a symbol of appreciation for their commitment and to help build brand image. The students are also allowed to wear these during their commencement ceremony making the hardhats highly popular. Providing the hardhats has helped to ensure nearly 100% participation in the survey because they are given to the graduating seniors during their one-on-one exit interview with a tenured professor after having completed the online survey.

The expanded survey began in hardcopy form in 2007 and was then put onto the internet via SurveyMonkey™ in 2008. Up to this point, these results have been reviewed for general trends and anecdotal information (primarily means produced from the Likert scales). The exit survey has largely remained unchanged since its inception, with only minor changes to improve clarity and to collect additional information from transfer students associated with matriculation agreements. The survey includes questions pertaining to post-graduation student employment, and their overall satisfaction with the Construction Management program, campus facilities, and student advising. The survey also assesses the students' perceptions of their preparedness with respect to the following topics: communication skills; design/engineering concepts and associated mathematics capability; management concepts and philosophies; construction materials and methods; estimating, plan reading and bid process; budgeting/cost

accounting, cost control and close-out; scheduling and project control; safety; project administration; and construction surveying and layout. The survey also requests that the students indicate what they believe to be the top four strengths and top four weaknesses of the NKU Construction Management program.

The results analyzed in this paper consist of sixteen groups of survey questions, where these are denoted by *QG#* for the particular Question Group (e.g., QG1 represents Question Group 1). In total, there are 67 individual questions and most of these are presented in Tables 1 and 2 of Appendix A (questions Q1.2, Q1.3, Q2.1, Q2.2, Q4.1 – Q4.3, Q6.1, Q7.1 - Q7.4, Q8.4, Q9.1, Q15.5, Q15.7, Q16.1 and Q16.2 were not included because of space limitations, but these didn't show any statistically significant differences in the results). The nomenclature for the individual questions is *Q#.#*, where this identifies the Question Group number and then the question number (e.g., Q2.1 represents the first question of Question Group 2). The full survey of graduating seniors also consisted of additional information pertaining to previous academic achievement and student job placement, but these will not be considered in this study. One part of the analysis consisted of evaluating survey results from calendar year 2008 through the spring semester of 2011. In the case of calendar year 2011, the results from the students graduating in the spring semester were considered to be representative of the entire calendar year. The responses to the survey questions were primarily based on a Likert scale of 1 to 5, where 1 = poor, 2 = below average, 3 = average, 4 = above average, and 5 = excellent. Between groups of questions, there were opportunities for the students to enter any comments that they might want to include on that particular subject.

Study Objectives

The objectives of this study include the following:

1. In general, to evaluate student perceptions of the NKU Construction Management curriculum and determine if this feedback could be used to improve the curriculum.
2. To evaluate student responses over time to determine if any trends were occurring in which the students perceived that the quality of the program was increasing, decreasing, or unchanging.
3. To evaluate student perceptions of the NKU Construction Management curriculum when the results were categorized into groups based on student grade point average (GPA) upon graduation.
4. How to effectively incorporate these results into the existing program to improve the curriculum.

Literature Review

There exists an ongoing conversation regarding the assessment of construction management curriculums. This conversation covers a wide breadth of topics from specific requirements for ACCE accreditation (ACCE, 2011 and Olsean & Burt, 2010) to industry desired competencies for recent construction graduates and the need to align a program curriculum with that need while balancing the requirements of the ACCE and the appropriate content to ensure a well-rounded education (Benhart & Shaurette, 2011; Lee et al, 2011). While student input is very important in terms of their attitude towards their education, Sylvester (2011) posits that attitude surveys alone are not robust enough to be the basis for curriculum revisions, but rather suggests that standardized national exams (for instance, the Level I Constructor Qualification Exam) should be used to measure student learning.

While it is true that attitude surveys alone should not form the basis for changes in program curriculum, these surveys and their results do give voice to students who interact with the curriculum, professors, and the institution on a regular basis. Ferguson (2004) and Lee et al (2011) advocate for a wide spectrum of inputs including those from industry, alumni, and current students.

The authors realize that the specific responses being analyzed in this article are strictly the perception of students as they are preparing to graduate and, in many cases, enter the workforce for the first time. By utilizing the senior exit survey of student perceptions as *one* macro-level indicator (Fenwick, 2001), this survey and its results do provide a perspective of the Construction Management program that combined with other perspectives (employer and alumni surveys) can be utilized to help inform strategic changes to the curriculum. Utilizing these perspectives, coupled with quantitative objective results of standardized exams as suggested by Sylvester (2011), will make a richer analysis of the program's curriculum and improve overall student interaction with respect to advising, professional development (including job searching), and mentoring.

Statistical Methods and Results

Over the time period considered, a total of 188 students participated in the survey. As might be expected, not all students answered all questions, but the minimum number answering any one particular question was 177 students. A one-way analysis of variance (ANOVA) technique was employed to analyze the data categorized into factor levels of: (1) calendar year and (2) ranges of graduating GPA based on all coursework completed towards this degree at NKU. For the former, years 2008, 2009, 2010, and 2011 consisted of 42, 43, 73, and 30 students participating, respectively. When investigating responses based on ranges of graduating student GPAs, six factor levels were identified and are as follows (the corresponding number of students is shown in parentheses): 2.0 to 2.5 (N = 21), 2.5 to 2.8 (N = 34), 2.8 to 3.1 (N = 43), 3.1 to 3.4 (N = 43), 3.4 to 3.7 (N = 29), 3.7 to 4.0 (N = 15). A few students were not included in this analysis because they did not provide their name with which to match their graduating GPA. For each question considered, the mean response for each of these categories is presented in Tables 1 and 2 of Appendix A by year and graduating GPA, respectively. Additional analyses were conducted using Hsu's multiple-comparison-with-the-best (MCB) test on questions having treatment means showing statically significant differences as is discussed further below.

Analysis by Calendar Year

Using a one-way analysis of variance, an *F* test was conducted on each survey question to determine if the mean response for each year could be considered statistically different from those of the other years. In this case, the null (H_0) and alternate (H_a) hypotheses are as follows:

H_0: the mean student response for each year is the same (i.e., $\mu_{2008} = \mu_{2000} = \mu_{2010} = \mu_{2011}$)

H_a: not all of the μ_i are equal

For this alternate hypothesis, the risk, α, of making a Type I error was set at 0.05. This level, therefore, indicates that for each survey question there is only a 5% chance of declaring that the mean annual responses are not all equal when in fact there is no real difference among them.

Comparing an α risk of 0.05 to the probability values (*p*) in Table 1 indicates that responses to only two questions meet this criteria (Q3.3 and Q3.4). Question Q3.3 ($p = 0.050$) pertained to *Assistance by faculty in employment search* where mean student responses for calendar years 2008 through 2011 were 3.59, 2.98, 3.04, and 3.14, respectively. Hsu's MCB test with a 5% family error rate was then used to further indicate that the response to this question for year 2008 was significantly higher than those for the other years. Similarly, Question Q3.4 ($p = 0.007$) *Academic advice and counsel from advisor* had mean student responses for years 2008 through 2011 of 3.90, 3.26, 3.16, and 3.17, respectively, and the Hsu's MCB test also indicated that 2008 mean was significantly higher than those for the other years. Question Q3.1 ($p = 0.060$) *Access to CMGT faculty* is also related to these questions and the MCB test indicated that the mean 2008 response of 3.93 was significantly higher than all of the other years, where the lowest was 3.33 in 2011. One of the primary causes for this downward shift in student perceptions of academic support is owing to a change starting in 2009 where the construction management students were

transitioned from being counseled by Department faculty to being mandated to use the College's academic advising service. This change was not well received by the students because it required more advanced appointment scheduling and the advisors were new to handling the Department and its associated articulation agreements.

In general, most of the survey questions show a downward trend in mean responses from 2008 to 2011. Even though these are not statistically significant changes at an α level of 0.05, a general trend is clearly evident. It is postulated that the downward shift in both the economy and construction industry has correspondingly had a negative effect on the perceptions of the graduating seniors over this particular time period. In contrast, 16 questions, or 24% of the survey, showed relatively little year-to-year change with good confidence as evidenced by probability values of *p* equal to 0.85 or higher. Considering responses averaged over the four-year period, 50.7% of the questions had a mean rating of 3.7 or higher, 38.8% averaged at least 3.8, 16.4% showed a mean ranking of 3.9 or higher, and 13.4 % of the questions had a mean of 4.0 or higher. The lowest four-year question mean was 3.18 for Q3.3 *Assistance by faculty in employment search* and the lowest mean for any single year was 2.98 for this same question in 2009. By comparison, the highest four-year question mean was 4.16 for Q6.4 *Ability to learn on my own* and for any single year it was 4.38 (2008) for Q2.3 *Size of CMGT classes*. In terms of Question Groups, QG16 (safety) had the highest four-year mean response at 3.98, followed by QG10 (estimating, plan reading and bid process) at 3.94, and QG6 (teamwork, cultural awareness, ethics, and self-learning) and QG16 (construction surveying and layout) both at 3.91. The lowest four-year mean responses for question groups were QG2 (NKU course access, class size and academic support services) at 3.44, QG3 (construction management faculty access, evaluation fairness, employment assistance and academic counseling) at 3.50, QG4 (construction management and business software and broad general education) at 3.51, and QG12 (budgeting/cost accounting, cost control and close-out) at 3.52.

Analysis by GPA Range

In comparing student responses to the survey questions as a function of their graduating GPA, mean responses were determined based on the GPA Range factor levels that were evaluated. Again, an *F* test was conducted via a one-way analysis of variance of each survey question to determine if the mean response for each GPA Range could be considered statistically different from those of the others. For this scenario, the null (H_0) and alternate (H_a) hypotheses are as follows:

H_0: the mean student response for each GPA Range is the same (i.e., $\mu = \mu_{2.0\text{-}2.5} = \mu_{2.5\text{-}2.8} = \mu_{2.8\text{-}3.1} = \mu_{3.1\text{-}3.4} = \mu_{3.4\text{-}3.7} = \mu_{3.7\text{-}4.0}$)

H_a: not all of the μ_i are equal

For this alternate hypothesis, the α risk of making a Type I error was again set at 0.05. Comparing an α of 0.05 to the probability values (p-value) in Table 2 indicate that 29 of the 67 questions meet this criteria. Thus, we are 95% confident that the mean responses of at least some of the GPA Ranges are not equal to each other and that statistically significant differences exist among them. In these cases, Hsu's MCB test with a 5% family error rate was used to determine which factor level means were significantly lower than the highest value for these questions. In some instances the highest mean response was significantly higher than just the lowest mean response, but in other scenarios it was significantly higher than the value for multiple GPA Ranges.

A review of the mean responses for the 2.0 to 2.5 GPA Range shows that this factor level had the highest value for 74.6% (50 of 67) of the survey questions. Additionally, of the remaining 17 questions it had the second highest rating 14 times, or 20.9% of all questions. Consequently, the 2.0 to 2.5 GPA Range accounts for the highest or second highest mean response in 95.5% of the survey questions. In contrast, the means of the 2.5 to 2.8 GPA Range have the lowest value in 65.7% (44 of 67) questions. Furthermore, this same range was second lowest in 16 of the remaining 23 questions, or 23.9% of the time. Therefore, the 2.5 to 2.8 GPA Range had either the lowest or second lowest mean response in 89.6% of the questions. Evaluating the responses of the highest academically performing

students in the 3.7 to 4.0 GPA Range – which consists of 15 graduates over the 2008 to 2011 time period – indicates that they had the highest mean rating in 22.4% of the questions (15 of 67) and also the lowest mean rating in another 22.4% of the questions. Most of the questions in which the students in the 3.7 to 4.0 GPA Range had the highest rating include the following: all of QG4 (construction management and business software and broad general education), Q5.2 (effective verbal communication), all of QG7 (communication skills) and all of QG16 (surveying and layout). Conversely, the 3.7 to 4.0 GPA Range had the lowest ratings in the following areas: four questions of QG9 (management concepts and philosophies), Q11.4 (locate and analyze pricing), Q11.5 (identify appropriate codes), Q11.8 (develop detailed project proposals and documentation), three of QG12 (budgeting/cost accounting, cost control and close-out), Q13.2 (develop a procurement time table), and four of QG14 (Safety). By comparison, the 3.4 to 3.7 GPA Range never had the highest rating for any of the questions and it had the lowest values only three times (Q3.1, Q7.3 and Q8.2). This range, however, was higher than the 3.7 to 4.0 GPA Range in 40.3% (27/67) of the questions. Similarly, the 3.1 to 3.4 GPA Range had the highest mean response for two questions (Q2.3 and Q6.1) and the lowest for six questions (Q1.2, Q3.3, Q3.4, Q12.2, Q12.5, and Q16.2), and was higher than the 3.7 to 4.0 GPA Range in 41.8% (28/67) of the questions.

Conclusions & Future Steps

The student responses to the senior exit interview have been statistically analyzed thoroughly and evaluated both as individual questions and collectively as question groups. It is the opinion of the authors that these findings can indeed be used as effective assessment tools to assist in improving the Construction Management program. The Department is currently conducting a complete reevaluation of its curriculum and the results from this study will aid in identifying where strengths of the program lie and where opportunities exist to make it more effective. Furthermore, the results will be made available to all Department instructors for their own evaluation and response.

Regarding results based on calendar years 2008 to 2011, only two areas showed statistically significant changes in mean responses of student ratings. Both of these were seen as negative and appeared not in the curriculum but rather in the "service" they received outside the classroom. Based on conversations with students during this time, it is posited that the reason for the statistically significant reduction in the students' perception of receiving faculty assistance in finding employment was in part due to the downturn in the economy in the region and across the country. Anecdotally, students stated during their one-on-one exit interviews that this frustration was the main reason for the lower score in this area. Additionally, the Department moved into the College of Business in 2005, where they use centralized advising. Beginning in 2007, entering first year construction management students were advised by the College's advising center thus providing a two-year period to help in transitioning and to provide support and background regarding construction students and the curriculum. In 2009 there was a greater shift of the advising load to this center and by the end 2010 all students received their academic advising from the College of Business advising center. This change was the primary reason cited by students for the dissatisfaction regarding academic advising. It is believed that this perception will improve as students and the advising center become comfortable with each other based on other students in the College generally viewing the advising center as an asset.

When categorized into GPA Ranges, the mean student responses to the survey questions revealed some definite trends. The students in the lowest GPA Range of 2.0 to 2.5 consistently rated most survey questions the highest of any GPA grouping. In contrast, the student in the next highest GPA Range of 2.5 to 2.8 consistently rated most of the questions the lowest of any GPA grouping. While the evaluations of all students are important, the authors feel that the responses of the students with the higher performing GPAs – perhaps those above the median – could possibly provide a more valuable assessment of what they perceive are the legitimate strengths and weaknesses in the construction management program. Further evaluation of just the top two quartiles of student responses might provide additional insight that can be used constructively to improve the Department's curriculum. Evaluating the

mean ratings of the top-performing students in the 3.7-4.0 GPA Range indicates that they have strong opinions about what they perceive to be good and within the curriculum and are willing to express these opinions. Similarly, but perhaps to a slightly lesser extent, the 3.4 to 3.7 and 3.1 to 3.4 GPA Ranges also appear to be willing to express their satisfaction and dissatisfaction with curriculum issues. It must be reiterated, however, that although student perceptions are an important and a valuable asset they are only one part of the curriculum evaluation process.

Another factor that may be influencing the analysis by GPA involves overall admissions standards for the University. Fewer than 10 years ago the University had an open enrollment policy, which allowed any student to enroll and declare a major regardless of the academic preparedness. This has changed twice (the second tightening of admission requirements occurred in 2010 and do not impact this analysis) with a maximum number of acceptable deficiencies and a bar set for college admissions tests. A better caliber of students has begun entering the program and with them come a desire for increased challenge in coursework. This opens future opportunities to conduct analysis based by academic year, admissions standing to the University, and GPA, particularly when considering that the standards were enhanced in 2010.

Future research opportunities include a similar analysis of both alumni and employer surveys. These recent surveys contain many of the same questions with minor modifications for the target audiences, e.g., the employers are asked how they would evaluate the graduate's abilities in each of the same areas that the students have provided their input. Once additional survey responses are obtained from both groups and analyzed, the findings can then be correlated to see where similarities and differences occur, thus providing a richer perspective of the program from multiple viewpoints.

References

ACCE. (2011). Document 103, Standards and Criteria for Accreditation of Postsecondary Construction Education Degree Programs. Retrieved October 27, 2011 from http://acce-hq.org/documents/DOCUMENT103REVISIONS0710_001.pdf

Benhart, B.L. and Schaurette, M. (2011). Establishing New Graduate Competencies: Ensuring that Construction Management Curriculums are Delivering "Job-Ready" Employees. Associated Schools of Construction International Proceedings of the 47th Annual Conference, Omaha, NE. April 2011.

Fenwick, T.J. (2001). Using student outcomes to evaluate teaching: A cautious exploration. New Directions for Teaching and Learning, Winter 2001, Vol. 2001 Issue 88, p 63-74.

Ferguson, C. (2004). Stakeholder input helps curriculum revision. Academic Leader, Jul 2004, Vol. 20 Issue 7, p 2-8.

Lee, N., Ponton, R., Jeffreys, A.W., and Cohn, R. (2011). Analysis of industry trends for improving undergraduate curriculum in construction management education. Associated Schools of Construction International Proceedings of the 47th Annual Conference, Omaha, NE. April 2011.

Olsen, D.A. and Burt, R.A. (2010). The "chip voting system": Bridging the gap between industry and faculty during a curriculum revision. Associated Schools of Construction International Proceedings of the 46th Annual Conference, Boston, MA. April 2010.

Sylvester, K.E. (2011). Using the Constructor Qualification Examination to assess student learning. Associated Schools of Construction International Proceedings of the 47th Annual Conference, Omaha, NE. April 2011.

Appendix A

Table 1

Mean responses and significance probability levels based on calendar year

Question Group No., Question No. and Description	All	Calendar Year 2008	2009	2010	2011	*p*
No of students	**188**	**42**	**43**	**73**	**30**	
Q1.1 Quality of non-computer laboratories & classrooms	**3.48**	3.66	3.40	3.50	3.33	*0.257*
Q2.3 Size of CMGT classes	**4.11**	4.38	4.09	4.03	3.90	*0.069*
Q2.4 NKU academic support service (tutoring, etc.)	**3.38**	3.50	3.37	3.27	3.48	*0.510*
Q3.1 Access to CMGT faculty	**3.54**	3.93	3.42	3.44	3.33	*0.061*
Q3.2 Fairness in evaluating student performance (exams, projects, etc.)	**3.94**	4.10	4.05	3.78	3.87	*0.118*
Q3.3 Assistance by faculty in employment search	**3.18**	3.59	2.98	3.04	3.14	***0.050***
Q3.4 Academic advice and counsel from advisor	**3.36**	3.90	3.26	3.16	3.17	***0.007***
Q5.1 Acquiring knowledge/skills for lifelong learning	**3.81**	3.95	3.77	3.74	3.77	*0.520*
Q5.2 Writing clearly and effectively	**3.75**	3.86	3.70	3.70	3.73	*0.771*
Q5.3 Verbally communicating clearly and effectively	**3.84**	3.95	3.84	3.78	3.77	*0.675*
Q6.2 Becoming aware of different attitudes, cultures, etc.	**3.71**	3.93	3.60	3.63	3.72	*0.230*
Q6.3 Developing personal and ethical standards	**3.90**	3.93	3.88	3.90	3.80	*0.922*
Q6.4 Ability to learn on my own	**4.16**	4.19	4.24	4.08	4.14	*0.738*
Q8.2 Understand and critique fundamental engineering designs	**3.66**	3.93	3.65	3.57	3.45	*0.056*
Q8.3 Apply associated mathematics for construction practices	**3.77**	3.90	3.86	3.63	3.72	*0.296*
Q9.2 Apply principles and philosophy of human resource management	**3.65**	3.80	3.60	3.63	3.48	*0.383*
Q9.3 Understand & Apply economic theory to construction management	**3.69**	3.71	3.70	3.69	3.62	*0.975*
Q9.4 Employ accounting practices in business management	**3.50**	3.51	3.44	3.54	3.45	*0.940*
Q9.5 Understand ethical considerations in the construction industry	**3.89**	3.93	3.86	3.89	3.83	*0.955*
Q9.6 Apply leadership concepts to build and manage productive teams	**3.87**	3.90	3.93	3.89	3.69	*0.636*
Q10.1 Apply knowledge of the science of const materials and methods	**3.86**	3.95	3.83	3.81	3.82	*0.845*
Q10.2 Understand and identify the divisions of CSI	**4.02**	4.03	4.05	4.03	3.89	*0.881*
Q10.3 Apply associated mathematics for construction practices	**3.87**	3.90	3.95	3.77	3.86	*0.710*
Q11.1 Interpret plans and other construction documents	**3.97**	4.12	4.05	3.91	3.72	*0.194*
Q11.2 Perform quantity take-offs	**3.87**	3.95	3.98	3.78	3.76	*0.564*
Q11.3 Analyze productivity	**3.67**	3.75	3.55	3.65	3.76	*0.691*
Q11.4 Locate and analyze pricing	**3.63**	3.80	3.48	3.61	3.62	*0.486*
Q11.5 Identify appropriate codes	**3.64**	3.73	3.60	3.66	3.48	*0.706*
Q11.6 Identify site conditions	**3.78**	3.85	3.64	3.81	3.72	*0.684*
Q11.7 Apply value engineering	**3.49**	3.51	3.43	3.51	3.50	*0.974*
Q11.8 Develop detailed project proposals and documentation	**3.71**	3.80	3.60	3.70	3.75	*0.777*
Q12.1 Prepare complete cost control processes	**3.49**	3.41	3.31	3.56	3.70	*0.290*
Q12.2 Establish a budget	**3.58**	3.61	3.34	3.63	3.74	*0.311*
Q12.3 Develop a work breakdown structure	**3.51**	3.51	3.38	3.53	3.63	*0.747*
Q12.4 Prepare cost reports	**3.49**	3.54	3.33	3.51	3.59	*0.650*
Q12.5 Forecast expenditures at the completion of the project	**3.50**	3.54	3.34	3.50	3.64	*0.604*
Q13.1 Prepare logical sequence and time durations for schedules	**3.84**	4.00	3.73	3.87	3.66	*0.355*
Q13.2 Develop a procurement time table	**3.68**	3.71	3.66	3.70	3.57	*0.928*
Q13.3 Establish, monitor progress, and update project plans	**3.84**	3.93	3.73	3.88	3.68	*0.556*
Q14.1 Identify and execute safety standards	**4.00**	4.05	3.90	4.06	3.86	*0.653*
Q14.2 Interpret OSHA construction standards	**4.06**	4.07	4.02	4.03	4.11	*0.973*
Q14.3 Establish safety and health procedures on the job site	**4.02**	4.03	4.00	3.99	4.07	*0.978*
Q14.4 Perform hazardous material and process analysis	**3.79**	3.83	3.62	3.83	3.82	*0.681*
Q14.5 Enforce safety procedures	**4.02**	4.02	3.93	4.03	4.07	*0.910*
Q15.1 Demonstrate knowledge of overall field administration	**3.79**	3.83	3.67	3.83	3.74	*0.721*
Q15.2 Develop a site plan	**3.71**	3.68	3.64	3.77	3.67	*0.905*
Q15.3 Evaluate vendors and subcontractors	**3.61**	3.68	3.44	3.62	3.69	*0.624*
Q15.4 Process payment applications	**3.56**	3.54	3.56	3.57	3.56	*0.999*
Q15.6 Maintain subcontract agreements	**3.54**	3.65	3.39	3.65	3.30	*0.187*

Table 2

Mean responses and significance probability levels based on graduating GPA ranges

	Question Group No., Question No. and Description	Graduating GPA Range						*p*
		2.0-2.5	2.5-2.8	2.8-3.1	3.1-3.4	3.4-3.7	3.7-4.0	
	No of students	**21**	**34**	**43**	**43**	**29**	**15**	
Q1.1	Quality of non-computer laboratories & classrooms	3.90	3.26	3.67	3.35	3.46	3.27	***0.011***
Q2.3	Size of CMGT classes	4.19	4.03	4.07	4.21	4.04	3.76	*0.901*
Q2.4	NKU academic support service (tutoring, etc.)	3.62	3.00	3.50	3.28	3.48	4.19	***0.050***
Q3.1	Access to CMGT faculty	4.10	3.39	3.58	3.44	3.34	3.62	*0.180*
Q3.2	Fairness in eval. student performance (exams, projects, etc.)	4.05	3.56	4.00	4.00	3.90	4.10	***0.019***
Q3.3	Assistance by faculty in employment search	3.55	3.10	3.23	2.90	3.19	4.05	*0.336*
Q3.4	Academic advice and counsel from advisor	3.76	3.18	3.49	3.09	3.24	3.55	*0.134*
Q5.1	Acquiring knowledge/skills for lifelong learning	4.10	3.47	3.81	3.81	3.90	3.76	***0.044***
Q5.2	Writing clearly and effectively	4.00	3.32	3.79	3.84	3.76	4.10	***0.030***
Q5.3	Verbally communicating clearly and effectively	4.05	3.53	3.95	3.83	3.76	4.00	*0.081*
Q6.2	Becoming aware of different attitudes, cultures, etc.	3.90	3.28	3.93	3.72	3.62	3.95	***0.018***
Q6.3	Developing personal and ethical standards	4.10	3.48	4.07	3.93	3.86	3.90	***0.030***
Q6.4	Ability to learn on my own	4.20	3.94	4.26	4.26	4.10	4.10	*0.453*
Q8.2	Understand and critique fundamental engineering designs	3.95	3.45	3.86	3.66	3.39	4.20	***0.049***
Q8.3	Apply associated mathematics for construction practices	3.86	3.45	3.91	3.76	3.75	3.95	*0.131*
Q9.2	Apply principles and philosophy of human resource mgmt	4.00	3.38	3.74	3.79	3.55	3.95	***0.020***
Q9.3	Understand & Apply economic theory to construction mgmt	4.05	3.44	3.74	3.79	3.69	4.00	*0.061*
Q9.4	Employ accounting practices in business management	3.76	3.26	3.65	3.57	3.45	4.05	*0.108*
Q9.5	Understand ethical considerations in the construction industry	4.10	3.68	3.93	4.02	3.79	3.76	*0.250*
Q9.6	Apply leadership concepts to build and manage prod teams	4.00	3.79	4.00	3.86	3.79	4.10	*0.737*
Q10.1	Apply knowledge of the science of const mtls and methods	4.19	3.65	4.09	3.67	3.71	4.00	***0.017***
Q10.2	Understand and identify the divisions of CSI	4.19	3.77	4.16	3.95	4.04	4.19	*0.413*
Q10.3	Apply associated mathematics for construction practices	4.19	3.59	4.00	3.76	3.79	4.08	*0.087*
Q11.1	Interpret plans and other construction documents	4.19	3.69	4.19	3.86	3.93	4.08	*0.090*
Q11.2	Perform quantity take-offs	4.10	3.48	4.16	3.67	3.89	4.00	***0.011***
Q11.3	Analyze productivity	4.14	3.42	3.76	3.60	3.61	3.62	*0.089*
Q11.4	Locate and analyze pricing	4.05	3.35	3.79	3.45	3.79	3.31	***0.036***
Q11.5	Identify appropriate codes	4.14	3.35	3.74	3.52	3.78	3.23	***0.010***
Q11.6	Identify site conditions	4.05	3.39	3.88	3.81	3.86	3.62	*0.077*
Q11.7	Apply value engineering	4.00	3.28	3.72	3.24	3.56	3.15	***0.010***
Q11.8	Develop detailed project proposals and documentation	4.14	3.34	3.88	3.62	3.78	3.54	***0.036***
Q12.1	Prepare complete cost control processes	4.10	3.33	3.62	3.32	3.50	3.08	***0.009***
Q12.2	Establish a budget	4.19	3.39	3.64	3.37	3.68	3.38	***0.022***
Q12.3	Develop a work breakdown structure	4.10	3.36	3.57	3.34	3.58	3.15	***0.030***
Q12.4	Prepare cost reports	4.00	3.27	3.71	3.24	3.54	3.23	***0.012***
Q12.5	Forecast expenditures at the completion of the project	4.10	3.33	3.73	3.15	3.59	3.15	***0.001***
Q13.1	Prepare logical sequence and time durations for schedules	4.33	3.50	3.98	3.76	3.82	3.77	***0.025***
Q13.2	Develop a procurement time table	4.19	3.53	3.84	3.49	3.70	3.23	***0.015***
Q13.3	Establish, monitor progress, and update project plans	4.25	3.56	3.98	3.78	3.74	3.77	*0.097*
Q14.1	Identify and execute safety standards	4.38	3.70	4.09	4.10	3.96	3.62	***0.039***
Q14.2	Interpret OSHA construction standards	4.29	3.76	4.14	4.17	4.14	3.69	*0.111*
Q14.3	Establish safety and health procedures on the job site	4.38	3.63	4.07	4.10	4.14	3.77	***0.035***
Q14.4	Perform hazardous material and process analysis	4.10	3.45	3.81	3.93	3.93	3.31	*0.055*
Q14.5	Enforce safety procedures	4.33	3.73	4.09	4.12	4.07	3.62	*0.068*
Q15.1	Demonstrate knowledge of overall field administration	4.14	3.42	3.84	3.78	3.92	3.69	***0.025***
Q15.2	Develop a site plan	4.05	3.25	3.84	3.68	3.88	3.62	***0.033***
Q15.3	Evaluate vendors and subcontractors	4.15	3.29	3.67	3.56	3.69	3.31	***0.030***
Q15.4	Process payment applications	3.95	3.31	3.56	3.39	3.62	4.00	***0.047***
Q15.6	Maintain subcontract agreements	4.00	3.23	3.72	3.44	3.54	3.31	***0.028***