# Extended ANSAC Assessment Requirements for Some Soft Skills for Construction Management Programs

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Abstract

Construction engineers and managers work cooperatively with many professionals and workers to implement designs.  So, it is logical to teach construction students in a group environment.  Also, most construction students have natural talents to learn effectively in an applied atmosphere. However, assessing individual learning in a group and in active learning mode needs special techniques. Assessment provides an environment for constant improvement. A good assessment incorporates complex thinking and problem solving, addresses important disciplinary content, invokes authentic or real-world applications and uses tasks that are instructionally meaningful.  Learning is not only a one-way transmission of information from teacher to students.  Effective instruction engages students actively in their learning.  Learning to be meaningful and effective it must have clear goals. Assessment is a key part in defining these goals. The good teachers constantly assess how their students are performing, gather evidence of the progress and problems, and adjust their instructional plans accordingly. The Applied and Natural Science Commission (ANSAC) of ABET has extended requirements for some of the soft skill assessments, that our construction management program now must fulfill. It stipulates: Student Outcome: 5. An ability to understand ethical and professional responsibilities and the impact of technical and/or scientific solutions in global, economic, environmental, and societal contexts. 6. An ability to function effectively on teams that establish goals, plan tasks, meet deadlines, and analyze risk and uncertainty. The objective of this project is to develop new and refine available tools for assessing some of the soft skills that would fulfill ANSAC requirements. It is expected to finalize a set of tools, as outcomes, and have them tested in the classrooms by the end of the project.

Introduction and Background

Construction is an interconnected process.  The construction engineers and managers work cooperatively with many professionals and workers to implement designs.  So, it is logical to teach construction students in a group environment.  Also, most construction students have natural talents to learn effectively in an applied atmosphere. However, assessing individual learning in a group and in active learning mode needs special techniques.

The Applied and Natural Science Commission (ANSAC) of ABET has extended requirements for some of the soft skill assessments, that construction management programs now must fulfill. It stipulates: Student Outcome: 5. An ability to understand ethical and professional responsibilities and the impact of technical and/or scientific solutions in global, economic, environmental, and societal contexts. 6. An ability to function effectively on teams that establish goals, plan tasks, meet deadlines, and analyze risk and uncertainty.

The Objective of this project was to develop new tools and refine available tools for assessing some of the soft skills that would fulfill ANSAC and other college requirements. It is expected to finalize a set of tools, as outcomes, and have them tested in the classroom by the end of the project.

The need for college students to be actively involved in their own learning has received wide acceptance [1].  The value of teamwork and ability to solve problems in a group environment for engineering and technology students is undeniable. Construction engineers and managers work cooperatively with many professionals and workers to implement design into reality.

Assessment is the process by which evidence for congruence between a program's stated goals and objectives and the actual outcomes of its programs and activities is assembled and analyzed in order to improve teaching and learning [2]. Although classroom teachers have been testing students on their mastery of subject matters for centuries, there is a growing concern that traditional classroom tests are frequently used as summative evaluations to only grade students and not as effective feedback tools. Assessment of students' learning is considered as both a means and an end [3]. However, tests are effective ways to bound goals and objectives of the course. Research suggests that students concentrate on learning whatever they think will be on the test. As McKeachie and his colleagues observe whatever teachers' goals and no matter how clearly they present them, students' goals are strongly influenced by tests that determine grades [4]. No matter how clear the teacher is about the "big picture"; students are unlikely to share that view unless tests and other assessment measures point them toward it.

Learning in Teams

A team is a group of people actively cooperating in an organized way to achieve a goal. Learning in groups depends upon the synergy of the group. The assumption is the whole is more than the sum of the parts. Learning from each other and supplementing each other's strong attributes is the key learning in groups. The relative effectiveness of learning in different environments has shown the superiority of the learning in groups[5]. Students working in cooperative learning groups, relative to the other situations learn more. They also have more positive attitudes regarding the subject area. In a group environment student are more likely to acquire critical thinking skills, cognitive learning strategies and process skills that are essential in the work place [5]. As a team becomes involved in a lesson, the different information, perceptions, opinions, reasoning, theories, and conclusions of the members lead to disagreement. With constructive management such controversies promote questioning, an active search for more information, and finally a restructuring of knowledge. This cooperative process results in greater mastery of the subject matter, retention of materials learned and more frequent use of critical thinking and higher level reasoning[6].

Active Learning for Construction Students

Meta-cognition is a term used by cognitive psychologists to describe students' understanding of their own learning skills, performance, and habits[7]. Two broad aspects usually included are (1) awareness and knowledge of self-as-a-learner, and (2) self-control and self-regulation of cognition. The ability of students to monitor their learning while it is in process to see if they really do understand the lecture or text. Examples of monitoring strategies are self-questioning, paraphrasing and summarizing. These monitoring activities help make students more active participants in their own learning and give them more control over their learning. The students are confronted with tasks to complete, a time deadline, teammates, and instructor who wander around asking questions.

Most of the construction students are traditionally tactile learners. The hands-on approach in learning usually is the method of choice for the construction students. Engineering and technology courses always contained learning-by-doing components. However, to maximize the student's natural talents many construction courses are taught as "active learning in a group environment." The classes are typically divided into teams of three students. The teams are continuously involved in problem solving in the classroom, supplemented by short lectures. The students use various assessment tools and techniques as part of the learning process.

Assessment:  A Learning Component

Assessment provides an environment for constant improvement.  The essence of assessment is that it asks students to create something of meaning.  A good assessment incorporates complex thinking and problem solving, addresses important disciplinary content, invokes authentic or real-world applications and uses tasks that are instructionally meaningful.  Learning is not only a one-way transmission of information from teacher to students.  Meaningful instruction engages students actively in their learning.  Learning to be meaningful and effective; it must have clear visions.  Assessment is a key part of this vision.  The good teachers constantly assess how their students are performing, gather evidence of the progress and problems, and adjust their instructional plans accordingly.  The students in the construction courses continuously participate in group assessment, giving the instructor an opportunity to adjust the goals and instruction methodology.  For example, in Construction Methods and Materials course, repeated references to lack of adequacy of the textbook promoted the instructor to provide additional handouts and increase frequency of short lectures and subsequently change the text in the following semester.  So assessment in a true sense is not only the evaluation of performance of the students, but the evaluation of the course as well as the instruction.  Assessment is one component of the Teaching-Learning-Assessment-Improvement loop.

*Individual Assessment in Group Environment*

Individual accountability is a key factor in any learning and assessment environment.  The ultimate goal of the program is to prepare each of the students for a professional construction position. Each student is monitored and assessed frequently.  Individual accountability is promoted by keeping the teams small, by rotating the roles of the team members, and by giving short quizzes at the end of every session.  To promote positive interdependence, individual quiz grades are averaged or summed to obtain a grade for the team that eventually affects every member of the team.

*Peer Assessment*

Peer evaluation and assessment has been a part of the United States higher education for a long time.  However, using peer evaluation or students are quite uncommon.  At Farmingdale construction students are able to evaluate their peers in terms of their input for successful assignment completion.  It is not only the peers' capability or their understanding of the subject matter but also their role of helping other students to learn.  So, such assessment says more about validity of cooperative learning than just evaluating individuals.

*Self-Assessment in Group Environment*

In any course students are likely to learn more if they are capable of clearly articulating their goals and making connections between those and course goals and requirements[1] .  Self-assessment is crucial to learning progress.  Most students do have learning goals, although they may find it difficult to articulate them.  The information about students' goals can be very useful to teachers in planning and continuous improvement.

*Tools of Assessment in Group*

To validate learning in groups, a number of specialized tools are needed. These tools must have enough depth and breadth that will help accurately assess learning of the teams and their numbers.  The main characteristics of these tools are their multidimensional input in the assessment process.  Farmingdale's Construction students use these to evaluate their peers, evaluate themselves as a group as well as individual successes or failures.  The faculty uses them to do the same for their students, individually and

in group performance.  The following is a brief discussion of these tools as used in the Farmingdale Construction courses.

*Assignment Assessment Form*

The purpose of this form is to evaluate the assignment and use it as a learning tool.  These forms are filled up by the individuals and given to the team leader, who in turn assembles some of the common concerns and takes a few minutes to review with the team members before placing them in the team portfolio.  The instructors randomly select some of the assignment forms for their review.

*Learning Journal*

This is a free format self-assessment and learning tool.  Students are required to write at least half a page (more is encouraged) summary of events at the end of each class.  Here students could write down any relevant matters to the days' assignments and topics.  They may also write their feelings of the class assignment or group members, any improvement, the observed, suggestions and perspective.  A copy of the journal page is placed in the team portfolio.  The original is kept in the student's own portfolio. Because of its true free format no specific aspects or questions are asked to the student except mentioning the date and the main topic of the day.

*Weekly Report*

The team leader, with the help of members, is responsible for completing this report.  The purpose of this form is to assess the team's performance for the week.  It also helps evaluate the assignments for the group. This report is given to the instructor weekly, the instructor must briefly comment on the report and then it is returned to the team to include in the team's portfolio.

*Peer Evaluation Reports*

Each member of the team evaluates other members of the team weekly.  The purpose of this report is to get an insight of the team members of each others strength and weaknesses for given assignments.

*Weekly Quizzes*

This is a traditional testing component of the overall assessment package.  Construction students need to be trained in the technical context area thoroughly.  The quizzes are kept short and relevant.   The subject matter and topics are covered from the previous week's learning assignment.

*Portfolio Review*

There are two types of portfolios considered for the overall assessment.  The team portfolio is kept by the team leader, where most of the reports and quizzes are kept for the whole semester.  The individual portfolio is basically the individual's learning journal, but individual students are free to add any other relevant papers that may help the instructor to help evaluate comprehensively.

Conclusion

A key to learning is a well-designed assessment process.  The assessment, however, has no value without student's actual learning of the subject area.  So, a well-designed lesson plan and a well-developed series

of problems is actually the foundation of the assessment.  As mentioned before the assignment must be supplemented by short and focused lectures.  The assignment must be designed so that the students must spend some time outside the class working in teams.  The other main component is individual student's preparation before coming to the class.  The syllabus given at the beginning of the course must contain the relevant reading assignment for the students.  One of the purposes of this non-traditional approach is to make the student more responsible for their learning.  The experience has shown that the "free loaders" and slackers in the group are dealt within the group.

Bibliography

1. Cross, Patricia K. and Angelo, Thomas A. (1988). "Classroom Assessment Techniques A Handbook for Faculty."   National Center for Research to Improve Postsecondary Teaching and Learning, the University of Michigan, Ann Arbor, Michigan.
2. Commission on Higher Education, Middle State Association of Colleges and Schools (CHE/MSA 1991). Framework for Outcomes Assessment
3. Nichols, James O. (1995).  "The Departmental Guide and Record Book for Student Outcomes Assessment and Institutional Effectiveness."  Agathon Press, New York
4. McKeachie, W.J., Pintrich, P.R., Lin, Yi-Guang, Smith, D. (1986).  "Teaching and Learning in the College Classroom:  A Review of the Research Literature."  National Center for Research to Improve Postsecondary Teaching and Learning,  The University of Michigan, Ann Arbor, Michigan.
5. Johnson, David W. and Johnson, Roger T. (1989).  "Cooperation and Competition:  Theory and Research."  Interaction Book Co., Edina, Minnesota.
6. Johnson, David W., Johnson, Roger T., and Smith, Karl A. (1991).  "Active Learning:  Cooperation in the College Classroom."  Interaction Book Co., Edina, Minnesota.
7. Brown, A.L., Bransford, J.D., Ferrara, R.A., and Campione, J.C. (1983).  "Learning, Remembering and Understanding". Handbook of Child Psychology Volume III:  Cognitive development 4th ed., 77-166.  John Wiley, New York.

# Course Level Assessment  Fall 2019 and Spring 2020
# CON 496 Capstone Project

**Student Outcome:  5.  An ability to function effectively as a member or leader on a technical team that establish goals, plan tasks, meet deadlines, and analyze risk and uncertainty**

| Performance Indicators | Percentage Exceeded Standard (Scored above 80%) | Percentage Met Standard (Scored 75-80%) | Percentage Did Not Meet Standard (Scored below 75%) | Assessed by/Target | SEMESTER |
|---|---|---|---|---|---|
| 1. Team members will establish goals, tasks, and deadline for each task | 7% | 59% | 34% * | Faculty member will evaluate goals, tasks, and deadlines based on the nature of the project and time available using a 10-point scale. The faculty member will further assess the actual completion of the tasks against the planed deadlines **//**70% of students rated as meets most expectations or above for establishing goals, tasks and deadlines and actually meeting or exceeding those established deadlines | **Spring 2020** |
| | 18% | 64% | 18% | | **Fall 2019** |

| | Percentage | Percentage | Percentage | | |
|---|---|---|---|---|---|

| Performance Indicators | Exceeded Standard (Scored above 80% ) | Met Standard (Scored 75-80%) | Did Not Meet Standard (Scored below 75%) | Assessed by/Target | SEMESTER |
|---|---|---|---|---|---|
| 2. Team members will have a plan for handling uncertain events and risk management | 7% | 76% | 17% | Faulty members will evaluate the plan using a 10-point scale. The team members will evaluate the team and peers using a rubric handling unexpected events **//**70% of students rated as meeting or exceeding most of expectations for planning for handling uncertain events and risk | **Spring 2020** |
|  | 12% | 65% | 23% |  | **Fall 2019** |

**Action Needed/ Closing the Loop:** No action needed at this time

- Due to disruption during COVID-19 closedown of campus planned activities could not be achieved as scheduled

# Course Level Assessment Fall 2019 and Spring 2019
# CON 496 Capstone Project

**Student Outcome:  6.     An ability to understand ethical and professional responsibilities and the impact of technical and/or scientific solutions in global, economic, environmental, and societal contexts.**

| Performance Indicators | Percentage Exceeded Standard | Percentage Met Standard | Percentage Did Not Meet | Assessed by/Target | SEMESTER |
|---|---|---|---|---|---|

| | (Scored above 80%) | (Scored 75-80%) | Standard (Scored below 75%) | | |
|---|---|---|---|---|---|
| 1. Students will show their knowledge when not to affix their signatures upon any plans and document in which they have no knowledge of or lack the ability to properly analyze and approve said documents | 52% | 41% | 7% | Take Home Test on Ethics using NSPE documents (Case 97-6) **//**70% of students score 75% or better | **Spring 2020** |
| | 53% | 35% | 12% | | **Fall 2019** |
| 2. Students will show their understanding of conflict of interest | 59% | 31% | 10% | Take Home Test on Ethics using NSPE documents (Case 94-5) **//**70% of students rated as meets most expectations or above for planning for handling uncertain events and risk | **Spring 2020** |
| | 70% | 18% | 12% | | **Fall 2019** |

**Action Needed/ Closing the Loop:** No action needed at this time

| **Performance Indicators** | Percentage Exceeded Standard (Scored above 80%) | Percentage Met Standard (Scored 75-80%) | Percentage Did Not Meet Standard (Scored below 75%) | Assessed by/Target | **SEMESTER** |
|---|---|---|---|---|---|
| 3. Students will show their knowledge of Relationship between Technology and Society | 4% | 61% | 35% | Part of the Term Paper evaluation **//**70% of students score 75% or better for the specific part | **Spring 2020** |
| | 6% | 76% | 18% | | **Fall 2019** |

| | | | | | |
|---|---|---|---|---|---|
| | | | | of the term paper | |
| 4. Students will show their knowledge of impact of technical and/or scientific solutions in global, economic, environmental, and societal context | 4%<br><br>6% | 74%<br><br>76% | 22%<br><br>18% | Based on Term Paper**//**70% of students score 75% or better on the relevant term paper | **Spring 2020**<br><br>**Fall 2019** |

Appendix - B

# Guide To Assessing Teamwork and Collaboration

Teamwork is the concept of people working together toward a common goal.

Collaboration is a structured, recursive process where two or more people work together toward a common goal—typically an intellectual endeavor that is creative in nature—by sharing knowledge, learning and building consensus. Collaboration does not require leadership and can sometimes bring better results through decentralization and egalitarianism.

Assess the work using each of the four criteria below:

| | | | |
|---|---|---|---|
| **Team members actively participate in the task or project to accomplish a common goal.** | The team did not define the task and few members participate actively. There is no follow-up. | Team informally defined the tasks but not all members understand them so not all members are able to make meaningful contributions. The follow-up is sporadic. | Team clearly defined the tasks to be accomplished, assigned aspects to various members and anticipated future needs. The team engages in follow-up activities to monitor progress. | Team has an extensive project management plan that outlines the tasks to be accomplished, resources that are needed, due dates, assigned aspects to various members and anticipated future needs. The team engages in regular follow-up activities to monitor progress and provide feedback to team members. |
| **Team members participate in decision-making.** | Because there is no decision-making process, individuals make decisions, and they do not reflect the thinking or the desires of the team. | Decision-making procedures were established informally, leading to inconsistency in implementation and a failure to involve all members in decision-making. | Clear procedures for making decisions are established and clearly articulated. Decisions, the process by which they were made, and the involvement of members are also clearly articulated. | All team members mobilize personal strengths to set forth their ideas and to negotiate a fit between personal ideas and ideas of others, using contrasts to spark and sustain knowledge advancement of the entire team, acknowledging that each member has a significant role to play and personal responsibility in decision-making. |
| **Team adjusts to unforeseen circumstances.** | The team seems to be thrashing about. Activity plans (if they exist) are unfocused, and thus there is no ability to adjust and make corrections. | The team is not always able to adjust as needed to meet goals. Realization of the need for mid-course corrections sometimes comes too late. | When working to achieve goals, the team is able to adjust plans as needs arise. There is a clear understanding of the nature of mid-course corrections and why they were needed. | Team members know that working to achieve goals requires flexibility in thought and action, being creatively adaptive, "unfreakable" in the face of challenging problems and changing situations. |

| Team members use their diversity to build strength. | | |
|---|---|---|
| The team atmosphere is competitive and individualistic rather than cooperative and supportive. | There is a general atmosphere of respect for team members, but some members may not be heard as much as others. Acknowledging others' work is serendipitous rather than planned. Some members may not feel free to turn to others for help. | Every team member is treated with respect. All members listen to all ideas. The work of each person is acknowledged. Members feel free to seek assistance from others or to ask questions. |
| | | Team members recognize each other as legitimate contributors to the shared goals; they build on each other's ideas and take responsibility for the overall advancement of knowledge of the team. They see diversity as a strength that helps to strengthen the overall outcomes. Team members encourage diverse points of view, openly negotiate emerging understandings and provide and accept specific feedback to and from each other to improve team processes and project outcomes. |

**References:**

Conference Board of Canada. Employability Skills 2000+. Retrieved March 25, 2008 from http://www.conferenceboard.ca/education/learning-tools/pdfs/esp2000.pdf

Conference Board of Canada. Innovation Skills Profile. Retrieved March 25, 2008 from http://www.conferenceboard.ca/education/learning-tools/pdfs/ISP_brochure.pdf

Sinetar, Marsha. (1991). *Developing a 21st century mind.* New York: Villard Books.