AC 2011-962: CLASSROOM LEARNING ACTIVITIES TO SUPPORT CAPSTONE PROJECT ASSESSMENT INSTRUMENTS

Jay McCormack, University of Idaho

Jay McCormack is an assistant professor in the mechanical engineering department at the University of Idaho where he is an instructor for the college’s interdisciplinary capstone design course. Dr. McCormack received his PhD in mechanical engineering from Carnegie Mellon University in 2003.

Denny C. Davis, Washington State University

Dr. Davis is Professor of Bioengineering and Director of the Engineering Education Research Center at Washington State University. He has led numerous multidisciplinary research projects to enhance engineering education. He currently leads projects creating and testing assessments and curriculum materials for engineering design and professional skills, especially for use in capstone engineering design courses. He has been a Fellow of the American Society for Engineering Education since 2002.

Steven W. Beyerlein, University of Idaho, Moscow

Dr. Beyerlein serves as the coordinator for an inter-disciplinary capstone design course in the College of Engineering at the University of Idaho. In this endeavor, he collaborates with five other colleagues from the departments of Mechanical Engineering, Electrical Engineering, Computer Engineering, Biological Engineering, and Computer Science. He is engaged in multiple research projects associated with engine testing, alternative vehicle development, design pedagogy, and program assessment.

Howard P Davis, Washington State University

Dr. Davis received degrees from The Evergreen State College (BA 1976), WSU (BS 1981, MS 1988) and the University of Oregon (Ph.D. 1993). He is currently a Clinical Assistant Professor in the Gene and Linda Voiland School of Chemical Engineering and Bioengineering. He has been the president and CEO of IPM, a medical device company and Total Dynamics LLC a software company. He is also on the board of directors of Developing World Technologies, a company started by former students of the capstone class that he teaches. His interests include engineering and entrepreneurship pedagogy and assessment, technology development and clinical applications of biomedical instrumentation.

Michael S. Trevisan, Washington State University

Dr. Michael S. Trevisan is Professor of Educational Psychology and Associate Dean for Research and External Funding for the College of Education. For more than 20 years, Dr. Trevisan has conducted work in measurement and evaluation, and is published widely in these areas. For the last several years he worked with Dr. Denny Davis to develop engineering education design assessments for a variety of engineering disciplines, throughout the undergraduate experience.

Susannah Howe, Smith College

Susannah Howe is the Design Clinic Director in the Picker Engineering Program at Smith College, where she coordinates and teaches the capstone engineering design course. Her current research focuses on innovations in engineering design education, particularly at the capstone level. She is also involved with efforts to foster design learning in middle school students and to support entrepreneurship at primarily undergraduate institutions. Her background is in civil engineering with a focus on structural materials; she holds a B.S.E. degree from Princeton, and M.Eng. and Ph.D. degrees from Cornell.

M. Javed Khan, Tuskegee University

M. Javed Khan is Professor of Aerospace Science Engineering at Tuskegee University. He received his Ph.D. in Aerospace Engineering from Texas A&M University, MS in Aeronautical Engineering from the US Air Force Institute of Technology and his undergraduate in Aerospace Engineering from Karachi University. His research interests include vortex dominated flows, aircraft design and engineering education. Address: Aerospace Science Engineering Department, Chappie James Center, 100 Luther Foster Dr., Tuskegee University, Tuskegee, AL 36088, mjkh@tuskegee.edu; Tel: 334 727 8637

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Dr. Patricia Brackin, Rose-Hulman Institute of Technology
Paul R. Leiffer, LeTourneau University

PAUL R. LEIFFER, PhD, PE Paul R. Leiffer is a professor in the School of Engineering and Engineering Technology at LeTourneau University, where he has taught since 1979. He is currently co-developer of the program in BioMedical Engineering. He received his B.S.E.E. from the State University of New York at Buffalo and his M.S. and Ph.D. degrees from Drexel University. Prior to joining the faculty at LeTourneau, he was involved in cardiac cell research at the University of Kansas Medical Center. His professional interests include bioinstrumentation, digital signal processing, and engineering ethics. Email: paulleiffer@letu.edu

Phillip L Thompson, Seattle University
Classroom Learning Activities to Support Capstone Project Assessment Instruments

Abstract

The capstone design course is the ideal location for assessing student professional skills and teamwork for ABET and other learning outcomes. For this reason, the Transferable Integrated Design Engineering Education (TIDEE) created a comprehensive set of assessment instruments and a supporting web-based deployment system. To compliment these assessments, the TIDEE group developed a set of classroom learning activities that accompany the assessment instruments. The learning activities are to be used by instructors and students to prepare for assessment activities and supplement learning in lecture environments. The learning activities (known as a module) are typically composed of an in-class guide for instructors, in-class and pre-class activities for students, and the post-class assessment activity. The complete sets of assessment activities and modules are available online. Instructors using a subset of the modules indicated that the modules are generally beneficial for students and instructors assessing professional skills and teamwork in the capstone course.

1. Introduction

The Transferable Integrated Design Engineering Education (TIDEE) consortium has developed a set of formative and summative assessment instruments that focus on aspects of team and individual performance in the context of engineering design. These assessments specifically focus on the professionalism, ethics, and the abilities needed to function on multi-disciplinary project teams, communicate effectively, and to pursue self-directed, life-long learning. The combination of instructional materials and assessments has recently been formalized as an Integrated Design Education Assessment and Learning System (IDEALS). The system is available in a web format that facilitates data collection from students and feedback from the instructional staff.1

In order to help instructors use TIDEE resources to promote professional skills in engineering project courses, the authors of this paper have inventoried best practices in learning activity design, classroom facilitation, and team discussion that surround nine different professional development and teamwork assessments. This pedagogical knowledge has been synthesized in a set of engaging and transferable IDEALS modules that include pre-class, in-class, and post-class portions as well as accompanying resources for the instructor (instructor guide) and the students (handouts). Each module is designed to support the application of a particular assessment instrument as part of the module or in a designated follow-on module. The structure of each module adds value to project work, cultivates professional skills in an authentic context, and achieves closure with minimal investment of project time. This paper maps available modules to existing assessment instruments, describes our methodology for realizing the modules, and evaluates module effectiveness from a faculty point of view, against design specifications.
2. IDEALS Assessment Instruments

The IDEALS learning model is based on a synthesis of learning and motivation theories applied to a team-based design project context that incorporates formative and summative assessment with learning experiences. The IDEALS model integrated learning and assessment cycle is presented in Table 1. The IDEALS assessments consist of instruments in five categories: 1) teamwork, 2) professional responsibility, 3) professional development, 4) design process, and 5) solution assets. Each assessment instrument consists of a student writing assignment and a scoring rubric for instructors. In order to facilitate the management of multiple student assignments, assignments to large numbers of students, and assignments of significant size, a web-based system was developed for both student and faculty use where students log into the system to complete each given assignment. When submitted, instructors can log into the system to see the student responses and provide feedback through web-forms that consist of the appropriate scoring rubric and comment boxes. The teamwork and professional development assessments have been more thoroughly tested. Instructional modules are not yet created for the design process and solution asset assessments.

The list and descriptions of IDEALS assessments in the areas of teamwork, professional responsibility, and professional development are shown in Table 2. Each family of IDEALS assessments consists of at least one or more formative assessment (noted with [F]) and a summative assessment (noted with [S]).

Table 1. IDEALS Learning Model for Team-Based Project Environments

<table>
<thead>
<tr>
<th>IDEALS Model</th>
<th>Example of Occurrence</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>INITIATE</strong></td>
<td>A professional (e.g., teamwork, self-directed learning, ethical) challenge arises in the context of a team-based design project; this delays progress or limits performance.</td>
</tr>
<tr>
<td><strong>DEFINE</strong></td>
<td>Through <strong>formative assessment</strong> (planning), students assess the situation, define important needs, set goals, and create a plan for achieving strong performance.</td>
</tr>
<tr>
<td><strong>EXECUTE</strong></td>
<td>Students take action, in concert with team and project goals, to implement their plan toward achievement of strong processes and high quality work products.</td>
</tr>
<tr>
<td><strong>ASSESS</strong></td>
<td>Through <strong>formative assessment</strong>, students self-assess, peer-assess, or jointly assess progress toward goals and revise plans as needed to enhance achievements.</td>
</tr>
<tr>
<td><strong>LEARN</strong></td>
<td>As students implement their plans and think reflectively, they practice knowing-in-action and achieve results more characteristic of professionals.</td>
</tr>
<tr>
<td><strong>SHOW</strong></td>
<td>Through <strong>summative assessment</strong>, students document (show, explain, extend) their achievements in work products, skill development, and learning.</td>
</tr>
</tbody>
</table>
Table 2. The IDEALS assessments and for each module family

<table>
<thead>
<tr>
<th>FAMILY</th>
<th>MODULE</th>
<th>ASSESSMENT AND DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>TEAMWORK</td>
<td>Teamwork Planning</td>
<td>Teamwork Planning [F] Create a contract regarding: roles, relationships, joint work, individual work, team communication.</td>
</tr>
<tr>
<td></td>
<td>Team Member Citizenship</td>
<td>Team Member Citizenship [F] Rate members of team on contributions. For each member, explain a strength, define steps to improve.</td>
</tr>
<tr>
<td></td>
<td>Teamwork In-Progress</td>
<td>Teamwork In-Progress [F] Rate team processes; identify successes, challenges; revised team contract.</td>
</tr>
<tr>
<td></td>
<td>Teamwork Achieved</td>
<td>Teamwork Achieved [S] Rate and apportion member contributions; describe member contributions and impact; explain an effective team process; describe learning and its future impact.</td>
</tr>
<tr>
<td>PROFESSIONAL RESPONSIBILITY</td>
<td>Professional Responsibility Formation</td>
<td>Professional Responsibility Formation [F] Rate 7 professional responsibilities relative to project; define plan to improve performance in a new area.</td>
</tr>
<tr>
<td></td>
<td>Professional Responsibility Achieved</td>
<td>Professional Responsibility Achieved [S] Rate importance, achievement in 7 professional responsibilities; evaluate success in a professional challenge; address a future professional challenge</td>
</tr>
<tr>
<td>PROFESSIONAL DEVELOPMENT</td>
<td>Professional Development Planning</td>
<td>Professional Development Plan [F] Identify a need; create a plan for developing needed professional abilities.</td>
</tr>
<tr>
<td></td>
<td>Professional Development In-Progress</td>
<td>Professional Development In-Progress [F] Describe progress achieved; define a plan for additional professional development.</td>
</tr>
<tr>
<td></td>
<td>Professional Development Achieved</td>
<td>Professional Development Achieved [S] Rate importance, achievement of 12 abilities; describe an achievement, impacts, and application.</td>
</tr>
</tbody>
</table>

3. Curricular Modules

As part of a recent NSF proposal, the TIDEE project team created a set of modules to accompany each of the professional development, professional responsibility, and teamwork assessment instruments. The modules contain pre-class, in-class, and post-class activities and accompanying resources for the instructor (facilitation plan) and in-class handouts for the students (lesson plan). Each module is designed to support the application of a TIDEE assessment instrument (formative and summative) as part of the module or in a designated follow-on module. The goal of the module is to setup and supplement student learning in the assessment area before and during class as well as prepare students to complete the assessment activity itself. Design specifications for the IDEALS curricular modules are listed in Table 3. These specifications were used to guide module development and balance the needs of students, instructors, and educational researchers. These modules for outcomes including professional development (self-initiated learning, professional responsibility (professional ethics), and teamwork are being pilot-tested during the 2010-2011 academic year. Initial feedback on the value of the modules is shown in section 4.
Table 3. Specifications for the TIDEE curriculum modules

<table>
<thead>
<tr>
<th>TIDEE modules…</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>link to and add value to existing TIDEE assessments</td>
<td></td>
</tr>
<tr>
<td>are relevant to capstone project work (activities contribute to the project)</td>
<td></td>
</tr>
<tr>
<td>are short enough for closure within one hour (one class)</td>
<td></td>
</tr>
<tr>
<td>are suitable for use inside/outside class by individuals/groups</td>
<td></td>
</tr>
<tr>
<td>include a feedback mechanism (from instructor or peers)</td>
<td></td>
</tr>
<tr>
<td>use existing reference material (i.e. do not require extensive content development)</td>
<td></td>
</tr>
<tr>
<td>are engaging and interesting to students</td>
<td></td>
</tr>
<tr>
<td>can stand alone (activities can build on each other, but they can be used individually)</td>
<td></td>
</tr>
<tr>
<td>support diverse classroom research activities</td>
<td></td>
</tr>
</tbody>
</table>

3.1 Module Creation Process

Sub-teams within the TIDEE group created the modules through three development phases in which 1) initial ideas were first shared with the group to gather references and best practices, 2) the sub-team put together an initial draft of the module components and gathered feedback from a review by the group, and 3) the sub-team presented a refined final draft of the proposal. The module drafts were prepared using common templates for the student and instructor views, derived from the specifications as a guideline for the instructor and student portions of the module. The theoretical foundations of the IDEALS learning system can be found in an earlier paper published by the authors. The templates are shown in Figure 1. The modules were reviewed internally for usefulness and against the specifications established in the previous section.
Template for Lesson Plan (Student view)

**Title:**

**Instrument supported:** Name of the related IDEALS instrument

**Purpose:** Paragraph used to motivate the use of the module.

**Learning objectives:**
2-3 objectives that can be accomplished by completing the module.

**Preparation (pre-class):**
What should students do before class to be prepared for the in-class tasks.

**Tasks (in-class):**
The in-class agenda for students.

**Resources:**
Links to other documents that support the activity

**Follow up (post-class):**
What should students do to complete this module after class? This often includes completion of assessments and discussing instructor feedback.

Template for Facilitation Plan (Faculty view)

**Timing and location:**
When should this module be used? What kind of venue should be used: workshop, team meeting, lecture, etc.?

**Preparation (pre-class):**
- Pre-class email
- Scoping or modification to fit time frame
- Special logistics
- Assigning IDEALS assessment

**Delivery (in-class):**
- Activity startup (the in-class framing and motivation for the activity)
- Intervention tips: What might go right/wrong and how to intervene.
- Activity closure

**Follow up (post-class):**
Instructors provide feedback through TIDEE website and disseminate general findings to class.

**Figure 1.** The templates for instructor and student portions of the IDEALS module.
3.2 Module Set

The complete set of curricular modules is shown in Tables 4, 5, and 6. The student and instructor portions of these modules as well as specified handouts are available on the TIDEE IDEALS website. An example of the Teamwork Planning module (faculty guide and student activity worksheets) as well as the assessment and scoring rubric for the Teamwork Planning assessment are included at the end of this paper in the appendix.

Table 4. TIDEE IDEALS curricular modules related to general assessment processes.

<table>
<thead>
<tr>
<th>Module</th>
<th>Purpose</th>
<th>Timing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Design Context</td>
<td>Design projects are a context for student learning and for creation of useful design solutions. This lesson provides students background information about the global challenges facing engineers, the abilities needed to address these challenges, and the processes used for effective engineering design. Discussion of these issues will help students think about their design experiences in a larger context, which will help prepare them for engineering practice.</td>
<td>Use this module early in the term. Use it before any IDEALS teamwork or design assignments.</td>
</tr>
<tr>
<td>Transferring Knowledge</td>
<td>This module provides the motivation for extending knowledge and skills gained within the capstone course to future careers with the goal of transferring learning beyond the undergraduate setting.</td>
<td>Use this module during the last 3 weeks of the capstone course or of undergraduate study.</td>
</tr>
</tbody>
</table>

Table 5. TIDEE IDEALS curricular modules related to teamwork.

<table>
<thead>
<tr>
<th>Module</th>
<th>Purpose</th>
<th>Timing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Teamwork Planning</td>
<td>Effective teams must learn to create and maintain a supportive, productive team culture. However, many new teams struggle in defining specifications that represent “teamwork”, or they fail to adequately communicate these intentions or gain teammate commitment to them. This exercise guides a team through discussions of teaming issues and the establishment of consensus team operational procedures. A team’s ability to reach a high level of performance will depend upon a well-articulated, consensus team contract that embraces perspectives and needs of all members.</td>
<td>This module should be the first teamwork assignment. It produces a team contract.</td>
</tr>
<tr>
<td>Team Member Citizenship</td>
<td>The purpose of this exercise is to prepare students to be more effective in giving constructive feedback to one another. It introduces students to professional considerations for which giving and receiving feedback is important, and it provides them tools for improving their own abilities in this area.</td>
<td>Use this module early in the term. Use it after team formation but before other IDEALS assignments.</td>
</tr>
<tr>
<td>Teamwork in Progress</td>
<td>The performance of a team depends heavily on well-articulated procedures for keeping members working together and committed to their collective success. Although your teams probably defined an operational plan earlier, effective teams periodically revisit their plans and refine them based on current conditions. In this activity, you will guide teams through a review of their performance, and then help them to improve execution and/or definition of procedures that enable better team performance.</td>
<td>This module should follow after the Team Contract. It reviews a team’s progress in light of its team contract.</td>
</tr>
<tr>
<td>Teamwork Achieved</td>
<td>The purpose of this “summative” assessment is to evaluate team performance at a given point in time to determine performance relative to defined teamwork expectations. This assessment gathers information from individual students to document their (self and peer) evaluations of teammates, their valued teamwork performances and effective processes, and their own abilities to recognize and transfer teamwork skills and knowledge to future applications. Collectively, information obtained from members of the same team provides evidence of teamwork on that team, and more broadly, information from all students gives evidence of the ability of the class to achieve desired levels of teamwork performance and understanding.</td>
<td>This module is intended as a summative assessment for teamwork. It documents teamwork at important points in time, such as for end-of-term grading purposes.</td>
</tr>
</tbody>
</table>


Table 6. TIDEE IDEALS curricular modules related to professional development and responsibility.

<table>
<thead>
<tr>
<th>Module</th>
<th>Purpose</th>
<th>Timing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Professional Development Planning</td>
<td>Increasingly, professionals are required to plan their careers rather than have them detailed by their employers. Part of planning one's career is setting goals and finding ways to achieve them. With goals in hand, one must then identify and develop specific technical, interpersonal, and individual abilities essential to reaching these goals. The purpose of this assignment is to prepare students to create a professional development plan that advances development of critical attributes needed to support success in their capstone design project.</td>
<td>This module should follow team formation and project initiation. It is the first module for Professional Development. Use this module early in the class term after teams have formed and begun work on their projects. Suggested pre-class activities should help team members get to know and understand one another. More importantly, this is the time to make the case for professional development throughout the capstone design class.</td>
</tr>
<tr>
<td>Professional Responsibility Formation</td>
<td>People today encounter many professional and ethical issues that affect themselves, teammates, clients, and the public. In this module, you will engage your students in the application of professional codes of ethics to their projects. This engagement heightens their awareness of professional responsibilities they carry and helps them find ways to better fulfill these responsibilities.</td>
<td>Use this module when teams face real challenges in their projects. Use it prior to the Professional Responsibility Achieved module.</td>
</tr>
</tbody>
</table>

4. Module Assessment

To better assess implementation of the IDEALS modules, faculty interviews were conducted on an on-going basis during Fall 2010. The interviews were designed to gather general information about the modules as well as information about module design and classroom facilitation. Members of the IDEALS team agreed to a set of thirteen questions that would be asked at the completion of each module, following instructor feedback to students. Interviews were conducted via telephone and lasted approximately 20 to 30 minutes.

A total of five interviews were conducted with instructors from four institutions. In most cases, the instructor was speaking on behalf of themselves and others who co-taught the course. Two faculty members from one institution completed the interview together. Interviews focused on the following modules: Team Contract, Team Member Citizenship, Professional Development Planning, and Professional Responsibility Formation. One faculty member completed interviews for two separate modules. Interviews are scheduled to continue in Spring 2011.

Preliminary results show the modules properly support the associated assessments, both from a student perspective as well as from a faculty perspective. Similarly, instructors indicated the modules add value to capstone project work. One faculty member noted: “Clearly [the Team Contract module] adds value to the development of teams and that is an important part of the course.” Instructors agreed that the modules aligned well with course outcomes, project learning, and assessment activities. One faculty member noted: “definitely the activity and the assessments align…all are interrelated at a base level…so overall, there is a fairly strong link.” Similarly, most agreed that there is suitable consistency between modules in their structure and
implementation. All respondents thought the modules could effectively be used on a stand-alone or ala carte basis and noted that they were able to customize the modules efficiently for their program needs. Most instructors indicated the modules did not require a great deal of motivation to be used effectively. In addition, instructors remarked that the module protocols were consistent and organized. Finally, faculty indicated the value gained from using the modules was adequate to justify the time they and their students had invested.

5. Conclusion

The TIDEE group created the IDEALS learning systems consisting of a set of modules in the areas of teamwork, professional development, and development planning. Modules are composed of assessment activities as well as in-class and pre-class activities and supplementary learning resources. These complimentary classroom learning materials were created using a set of specs and a resultant template to ensure usability and desirability for all stakeholders. Modules were created for a selection of assessments and to support the assessment process and subsequent transfer of knowledge to professional settings. These modules are available on the TIDEE IDEALS website. From a post use interview, instructors agreed that the modules aligned well with course outcomes and the value gained from using the modules was adequate to justify the time they and their students had invested. The instructors also indicated that modules could effectively be used on a stand-alone or ala carte basis and noted that they were able to customize the modules efficiently for their program needs. The TIDEE group will continue to develop additional module materials for the additional IDEALS assessments and will refine the module material based on user feedback.

6. Acknowledgements

The authors would like to acknowledge support from the National Science Foundation, Division of Undergraduate Education grants DUE 0717561 and DUE 0919248 that have enabled this work. Our respective institutions have also been supportive of TIDEE activities in our capstone design courses.

References

1 https://ideals.tidee.org
TEAMWORK PLANNING

Instructor Guide

Purpose
Effective teams must learn to create and maintain a supportive, productive team culture. However, many new teams struggle in defining specific actions that represent “teamwork”, or they fail to adequately communicate these intentions or gain teammate commitment to them. This exercise guides a team through discussions of teaming issues and the establishment of consensus team operational procedures. A team’s ability to reach a high level of performance will depend upon a well-articulated, consensus team contract that embraces perspectives and needs of all members.

Learning Objectives
Upon successful completion of this lesson, students will be able to:
1. Explain the importance of major components of a team operational plan
2. Articulate specific team practices that represent the needs of the team collectively, and its members individually
3. Justify roles and member assignments that fit the team, project, and individual members.

Preparation (pre-class)
You must prepare your students well for a productive major team experience. Many have had previous team experiences, but few have thought carefully about actually building an effective team.

Prior to a guided in-class exercise, you should choose to do one or more of the following:
1. (optional) Assign students to a short (1-day to 2-week) “short-term team” assignment to serve as a common experience from which to prepare for the long-term team.
2. (optional) Ask students to prepare (before class) a list of team characteristics that give evidence of an effective team, and another list describing an ineffective team.
3. (optional) Ask students to review a sample set of team bylaws and identify elements that relate to creating an inclusive team climate, doing work together, working alone in support of the team, and communicating team information. A bylaws template is provided: Sample Team Bylaws (file: RS-Sample_Bylaws-2010_04_09).
4. (optional) Ask students to submit a project bid portfolio that identifies their personal information related to project selection: project interests, personality profile, technical strengths, teaming strengths, and weekly time periods available for team meetings. (Research into using the Myers-Briggs personality test, as the basis to form teams is a good starting point for those that are unfamiliar with the concepts.) This information may be used by the instructor for tentative assignments of students to project teams.

If you plan to assign students to complete the IDEALS online Team Contract assignment as a post-class team exercise, then you must set up this exercise on the IDEALS website: http://tidee.org. This requires that you have entered a class roster on the TIDEE website and identified the students for different teams. If the student assignments to teams have not been made prior to class, this set-up step should be done...
immediately after the class to allow adequate time for students to complete their assignments. More information is available from the IDEALS Introduction document downloadable from the website.

Tasks (in-class)

Use your class time to establish a foundation for team interactions that will launch teams for a productive long-term (several week or longer) project. Essential steps in this process include: identifying members of teams, facilitating discussions among members regarding team operations, and beginning to formalize a team agreement that clarifies expectations for all members.

1. **Form teams.** Assign students to project teams. This may be done in a number of ways, depending upon your objectives. Generally, the best teams are formed by: matching abilities to project needs, providing diversity in skills and perspectives on each team, and not pairing people who cannot work with one another. It is usually best not to place a single “minority” on a team because that person may be intimidated and not contribute fully. Team assignments may be made by using the instructor’s own criteria, by students bidding for team positions, or by other means.

2. **(optional) Examples of high performing teams.** Present the students with examples of high performing teams in order to demonstrate their value in terms of quality of product created, quality of individual experience, and potential for personal growth. An effective method is to show a high performing team executing their task as part of a video. A suggested video includes the ABC Nightline special that documents the design process at the design firm IDEO.

3. **Establish meeting times/places.** Ask teams to identify weekly times that all members agree to meet together. If no suitable times are identified, this is strong justification for moving members to other teams. Teams should also identify meeting locations that are convenient and comfortable to all members.

4. **Perform Team Contract activity.** Ask teams to discuss Team Contract Parts worksheets (attached) to begin discussions of issues that will be addressed in a Team Contract homework assignment. Depending upon time available, you may ask teams to complete the worksheet together or subdivide the worksheet for individuals or pairs to draft responses to different parts.

5. **Discuss team test cases.** Handout the Team Contract Test Cases exercise to each team. Depending upon time available, ask each team to discuss one or more cases and be prepared to report findings to the class. When team discussion time elapses, ask each team to present their findings. After each team reports, ask others to confirm, expand upon, or modify the recommendations. Complete the class discussion with references to creating a “team contract” that would address the test cases.

Follow-up (post-class)

Assign each team to prepare a team contract that represents a consensus plan for operationalizing their understanding of effective teamwork. They should complete the Team Contract assignment after logon to [http://tidee.org](http://tidee.org). Each member may logon and add or edit information for their contract until one of them clicks “submit and lock” for the assignment. Thus, encourage each team to identify who will submit the assignment and when.

**Additional Follow-up**

Teams rarely gain maximum benefit from their initial team contract deliberations. Therefore, you should plan periodic interusions (or use teachable moments) to direct students back to their team contract. Suggestions for facilitating this type of improvement include:

1. Encourage teams to have a copy of their team contract (or bylaws) available whenever they meet. Encourage them a few weeks into their project to review and revise their team contract. You may make a new assignment to selected teams or to all of your teams on the IDEALS website.
2. When a team problem arises (e.g., member conflict, lack of leadership, slackers), ask the team to review their team contract and to show you how they committed earlier to deal with the problem. If the contract addresses the problem adequately, refer to their list of consequences or offer to help them follow through. If the contract is inadequate, ask them to (as a team) revisit the team contract and revise it to address the problem. Again help them implement the contract to solve their problem. Examples of ways to resolve conflicts include using an official documentation process for contract violations, a sequence of actions leading to reporting violations to instructors, or something as simple as violators bringing refreshments to the next team meeting.

3. Use the other IDEALS teamwork assessments to raise issues related to team performance and direct the teams to revise their team contracts accordingly. The Teamwork-In-Progress assignment is designed specifically for reviewing team performance in the light of the team contract. The Team Member Citizenship assignment will reveal individual member issues that may need team attention, and every member has the opportunity to suggest remedial action.

Worksheets
1. Sample Bylaws Template (file: TPLW-Bylaws_Template)
2. Team Contract Parts (file: TPLW-Tm_Contract Parts)
3. Team Contract Test Cases (file: TPLW-Tm_Test_Cases)

Resources
4. IDEALS Introduction (file: GF-IDEALS_Intro)

Assessment and Feedback
1. Team Contract Assessment (file: TPLA-Tm_Contract_Assess)
2. Feedback on Team Contract (file: TPLF-Tm_Contract_Fdbk)
Sample Bylaws Template

The purpose of Bylaws is to communicate rules of operation to members of the organization (team). Note that explanations are in blue *italics*. Suggested content is in black Arial font.

**Mission:**
The purpose of the mission definition is to provide an explanation of the team functions.
The mission of the _(team name)_______ is to . . .

**Section 1—Name**
A. This organization shall be known as ________________________________.
B. __________________________

**Section 2—Membership**
The purpose of this section is to define who is part of the team and the specific roles needed to manage team business.
A. Members of the team include:
B. No member shall purport to represent the team unless so authorized by the team.
C. Each member shall be provided a copy of the team bylaws.
D. Officers of the team shall include those listed below with their designated responsibilities. (spell out specific responsibilities of each officer position).
   1. Team Chief
      a. Call meetings
      b. Facilitate meetings
      c. __________________________
   2. Deputy Team Chief
      a. __________________________
   3. Secretary/Recorder
      a. __________________________
      b. __________________________
   4. Liaison
      a. __________________________
      b. __________________________
E. Removal of members

**Section 3—Decision Making**
The purpose of this section is to explain how decisions are made by the team. The following suggestions are offered.
A. Eligibility to vote
B. Voting methods (oral, written, etc.)
C. Voting outcomes (majority, majority+1, etc.)
Section 4—Meetings

The purpose of this section is to make known to the team and others when meetings are held and guidelines for meetings. The following suggestions are offered.

A. All affairs of the team shall be governed by Robert’s Rules of Order, unless otherwise specified.
B. Meetings shall be held ______________ (when).
C. Unless otherwise noticed, all meetings will be held at ______________.
D. Special meetings of the team may be called by ______________ (how).
E. Approved minutes of meetings and sign-in sheets to record attendance, must be kept for all meetings.
F. Meeting discussions will be conducted in a conversational format with special regard for a dialogue that is respectful and considerate of all members in attendance.
G. A meeting agenda, defined by ______________, will guide meeting topics and timing.
H. The length of meetings shall be no longer than 60 minutes unless a special event is planned.
I. All meetings will be publicized to members using: phone calls, team websites, e-mail, and texting.
J. Notices shall be distributed not less than _______ days before the meeting date.
K. Failure to receive notice does not invalidate a meeting, but the efforts must be made in good faith.

Section 5—Committees or Work Groups

The purpose of this section is to discuss the formation, responsibilities and disbanding of any standing or special i.e. ad-hoc work groups. The following suggestions are offered.

A. The team chief, with other team leaders, may appoint ad-hoc groups to help conduct specialized business of the team.
B. Work groups shall report to the team and these reports shall be entered into the minutes.
C. Committees can be standing or ad-hoc in nature.

Section 6—Amendments

The purpose of this section is to define the process by which these by-laws can be amended. The following suggestion is offered.

A. These by-laws may be amended by a two-thirds majority vote of those present at a regular team meeting, providing that a resolution proposing the amendment has been adopted at a preceding regular meeting and that notice of the proposed amendment has been given in the call for the meeting at which the amendment shall be voted upon.

Section 7—Effective Date (Required)

The purpose of this section is to state the date of the initial adoption of these by-laws. Statement of an effective date is required.

A. These by-laws of the ____________________ team shall become effective on ____________________.
B. Dates of amendment must be recorded in minutes of meetings at which amendments were approved, together with a revised set of bylaws.
Team Contract Parts

Purpose
Teams often define and attempt to live by their established operating procedures. The purpose of this exercise is to identify the principal issues for which guidelines or procedures need to be established in a “team contract.” By discussing these issues openly and frankly, your team will be able to forge a plan that fits your team’s needs—leading to better team performance and team member satisfaction.

Learning Objectives
Upon successful completion of this lesson, you will be able to:

1. Identify the major types of issues that need to be addressed in a team contract
2. Describe similarities and differences in member perspectives regarding desirable team behaviors
3. Begin to articulate specific expectations regarding team and member behaviors.
4. Articulate a rationale for assigning members specific team roles.

Tasks
1. As a team, review the twelve types of team processes summarized below. Rotating among members, have each person put into their own words what they understand one of the processes to be, until all twelve processes have been reworded.

<table>
<thead>
<tr>
<th>Area</th>
<th>Team Processes</th>
<th>Area</th>
<th>Team Processes</th>
</tr>
</thead>
<tbody>
<tr>
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<td></td>
<td>Producing competent consensus outputs</td>
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<td>Building shared knowledge assets</td>
</tr>
</tbody>
</table>

2. Complete Part A of the attached worksheet to document what issues team members perceive to be important to team effectiveness in each of the four areas: team relationships, joint achievements, individual work, and team information. If a personality inventory (e.g. Myers-Briggs) has been performed prior to this discussion, discuss how members’ personality types might impact team relationships, joint achievements, individual work, and team communication.

3. Complete Part B of the worksheet to identify important considerations for assigning team members to specific responsibilities.

4. Be prepared to report your team’s discoveries to others in the class.
Worksheet: Team Contract Issues

Part A: Areas of Concern in Teams

Team Relationships
List issues of concern related to within-team relationships. These may include managing team climate, gaining member commitment, resolving conflicts, etc.

Joint Achievements
List expectations or procedures that should be defined to achieve synergies when doing work together (e.g., goal setting, project management, meetings).

Individual Contributions
What expectations should be defined to ensure that desired work is done independently by individual members for the sake of the team (e.g., making assignments, work standards, member skill development)?
**Team Information/Communication**

List expectations or procedures needed to ensure that team information management and communication within and outside the team will support team success.

---

**Part B: Assigning Roles and Responsibilities**

**Team Roles**

Considering what the team must accomplish, what member roles (e.g., project manager, client liaison, leader, website manager, budget contact) are most important to support team performance and project success?

---

**Assigning Responsibilities**

Considering the team’s project, member attributes and desires, and learning targeted in this class, define a rationale for assigning roles to your team members. If role rotation is used, when and how should the rotation occur?
Team Contract Test Cases

Purpose
Effective teams create and maintain a team culture that supports enjoyable, productive achievement of team and individual goals. This exercise gives your team opportunities to test your “team-readiness” and to identify areas of concern that need to be addressed. This understanding will aid you in developing useful team operating procedures.

Learning Objectives
Upon successful completion of this lesson, you will be able to:
1. Recognize some problems that your team may encounter
2. Identify possible ways to avoid or resolve team problems
3. Identify existing communication and collaboration practices that should be used, refined, or discarded by your team to support good teamwork.

Team Test Cases
Because difficult situations arise in nearly every team, your team needs to be ready to solve a variety of problems. To begin this process, discuss the commonly occurring cases described below. After addressing the question posed, complete the attached worksheet to better understand the solution.

Case #1: Client Unavailability - Your project client is a challenge to work with. She is frequently unavailable to meet with the team and is unresponsive to queries about design selection and preferences. What should be done to ameliorate the difficulties in client-team interaction and to ensure maximum client and team satisfaction with the project?

Case #2: Teammate Procrastination - One of the members of your three-person team is frequently late when completing assigned tasks. When work is completed, it is done so in a rushed manner. Ignoring this team member will add significant burden to others on the team, but waiting around for him will put the project at risk. What will jump start this underperforming team member?

Case #3: Member Differences - Two team members are in constant conflict about the quality of work produced. Member A is meticulous and particular about every detail of the project. His work is very good, but he proceeds very slowly. Member B is responsible and does not cut corners, but he strives to finish project work quickly by not being as meticulous. How can this difference be resolved?

Case #4: Member Autonomy - Several members of a design team are striking out on their own path. They are resistant to following suggestions by mentors with respect to their process, fabrication, and teamwork. When they do take part in recommended activities, it is done to “get it over with” and get back to doing things their way. What can be done to ensure that resources to the team are leveraged in a responsible manner?
Worksheet for Team Test Cases

Case #1: Client Unavailability
Impacts of problem on team and project:

Possible root causes of problem:

Ways to prevent problem:

Ways to resolve problem:

Case #2: Teammate Procrastination
Impacts of problem on team and project:

Possible root causes of problem:

Ways to prevent problem:

Ways to resolve problem:

Case #3: Member Differences
Impacts of problem on team and project:

Possible root causes of problem:

Ways to prevent problem:

Ways to resolve problem:

Case #4: Member Autonomy
Impacts of problem on team and project:

Possible root causes of problem:

Ways to prevent problem:

Ways to resolve problem:
Team Contract: Defining an Operational Plan for Your Team

Team Name: ___________________________ Date: _____________
Members: __________________________________________________

Purpose
This exercise guides your team through discussions that forge a "contract" among your members. You will negotiate shared understandings and record them for all members to see. This exercise also helps you receive instructor feedback on your contract to make it more effective.

Part A: Importance of Team Processes
1. Discuss what is important to your team. Be sure that each member shares his/her perceptions on what makes a good team.
2. In the table below, check an importance level for each process to rate your team’s perception of its importance to team productivity. Use the definitions given below for rating importance.

<table>
<thead>
<tr>
<th>Rating</th>
<th>Definition of Importance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low</td>
<td>Managing this process will not significantly affect the productivity of the team.</td>
</tr>
<tr>
<td>Medium</td>
<td>Managing this process may affect team productivity, but it is not crucial to productivity.</td>
</tr>
<tr>
<td>High</td>
<td>Managing this process is crucial for the team to be highly productive.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Area</th>
<th>Team Process Name</th>
<th>Importance of Process</th>
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<tbody>
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<td>Building shared knowledge assets</td>
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Part B: Team Operating Procedures

Prepare a team contract (or set of team bylaws) that defines your team’s organizational structure and commits all members to agreed-upon operating procedures. This “contract” should emerge from substantive team discussions and from full member agreement. The team contract must be prepared as a formal agreement signed by all members and referenced regularly in the course of team business.

The team contract must address each of the following issues:

- **Roles and Responsibilities**
  Define roles that will be assigned within the team and the responsibilities of the person in each role. Define also who is assigned the role and any plans for review or reassignment of roles to achieve team and member goals. Specifically address roles for managing team progress and budget, conducting meetings, documenting team information, and communicating with project stakeholders. Also address issues of back-up for members needing help or encountering unexpected challenges.

- **Team Relationships**
  Define relationships that are expected among team members and the methods employed to establish and maintain these supportive relationships. Specifically address your establishment of an inclusive and supportive climate, gaining strong member commitments to success of all members, and ways in which conflicts will be handled constructively.

- **Joint Achievements**
  Define what is expected and methods the team will use to achieve high quality work done together (i.e., when members are working together on the same outcome). Specifically address establishing shared goals, planning and monitoring progress toward team goals, and conducting effective team meetings.

- **Member Contributions**
  Define what is expected from team members when conducting work individually. Define how individual work assignments will be made, by whom, and with what definition of expectations. Explain how work quality and timeliness will be monitored and enforced (be specific). As appropriate, describe a process by which the team will allocate credit and/or project assets based on member contributions. Also describe how members will be supported in their efforts to develop skills and abilities needed for the project.

- **Information Management**
  Define what is expected from team members regarding the recording and sharing of team information (e.g., ideas, drawings, meeting minutes, work status, problems, advisor communication). Specifically address the ways and frequency of keeping members and outside stakeholders informed. Also define how project information will be recorded and made available to members, but also guarded to protect confidentiality and support patentability.

A template for your team contract is attached. You may modify it to fit your team needs and preferences. Be sure to provide adequate detail to inform people of expectations and to provide a basis for evaluating teamwork and resolving differences. When your contract is completed and signed by all members, scan it to a pdf document for submittal to the instructor and for ongoing team reference.

[Upload the pdf document to http://ideals.org or other URL].

A preparatory tool in the Teamwork Planning module
Copyright © 2010 Integrated Design Engineering Assessment and Learning System (IDEALS)

Rev: July, 2010
Team Contract  (template)

Section 1: Team Name and Mission
This team shall be known by the name:

The mission of this team is to . . .

Section 2: Membership
Membership on this team includes the following people . . . . Others may join the team by . . . . Members may leave or be removed from the team by . . . .

Members of this team shall be responsible to . . . . Members may not . . . .

Section 3: Roles and Responsibilities
Roles are assigned to members of the team to provide structure for team activities and to authorize individual members to conduct designated business in the name of the team. Roles are assigned (how) and for periods of (what) for the purposes of (what). Individual will be assigned to roles based on (what considerations). In the event of a role vacancy, the team will . . . . Roles and associated responsibilities are defined below.

3a. Team Leader/Manager/Chief: ___(person’s name, if appropriate)_____________
The team leader is to (general description). Specific responsibilities of this person are to (list with specific details).

3b. (additional role): (name)

Section 4: Team Relationships
Relationships among team members must support full and respectful engagement of all members for the benefit of the entire team. To this end, team members will . . . .

Section 5: Joint Work
5a. Purposes of Joint Work
Team members will work together to establish collective goals and to produce decisions and work products that advance teamwork and project success. When working together, members will . . . .

5b. Team Meetings
Team meetings are an important example of working together. Meetings of the entire team will be held (when) at (where), or as called by ______. In order to make team meetings productive and rewarding for all members, they will be conducted . . . .

Section 6: Individual Work
Team members are expected to work alone in many cases to complete work important to the team. Work assignments will be made (how and by whom). Assignments will include definitions of expectations that include . . . .

Work quality, alignment with team needs, and timeliness are vital to the success of the team. To ensure that team member contributions provide value desired by the team, . . . . Individuals failing to meet expectations will face the following consequences: ______. The team will assist members in their success by . . . .
Section 7: Documentation and Communication
The team must maintain timely and accurate documentation of its individual and collective achievements, while also communicating needed information to one another and key project stakeholders.

7a. Documentation
Team members will maintain the following records of their work . . . . (in what form). Confidentiality and legality of records will be ensured by . . . .

7b. Communication among Members
Team members will keep one another informed about (what) by (what)

7c. Communication with Outside Stakeholders
Outside persons, including __________, will be kept informed about (what) (when). When confidential information is involved, . . . .

Section 8: Ownership of Team Assets (This may be optional)
An initial allocation of 10% preferred shares will be set aside for the initial team membership. The initial distribution of this percentage will be equally divided. An additional 10% of preferred shares will be allocated to team members for contributions over the course based on performance which will be valued by . . . (state process for valuation)

Section 9: Conflict Resolution
The team will strive to resolve conflicts quickly and to the satisfaction and benefit of everyone involved. To this end, the team will . . . .

Section 10: Amendments
Amendments to this team contract may be made with the approval by all members of the team. Proposed amendments must be . . . . The amended contract must be distributed to all members and submitted to the instructor before becoming effective.

Section 10: Affirmation of Compliance
We, the members of this team, affirm that we have established this contract with input and consensus of all members. By our signatures, we commit to compliance with the contract for the benefit of all members and the team as a whole.

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<tr>
<th>Name</th>
<th>Signature</th>
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</table>
### Part A: Importance of Team Processes (compiled)

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<th>Importance* to Team</th>
<th>Importance* to Class</th>
</tr>
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*Importance ratings:*

1 = Low: will not significantly affect the productivity of the team
2 = Medium: may affect team productivity, but it is not crucial to productivity
3 = High: is crucial for the team to be highly productive

### Part B: Team Operational Plan

<table>
<thead>
<tr>
<th>Scoring Scale for Team Contract (Operational Plan)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 = Novice</td>
</tr>
<tr>
<td>2 = Beginner</td>
</tr>
<tr>
<td>3 = Intern</td>
</tr>
<tr>
<td>4 = Competent</td>
</tr>
<tr>
<td>5 = Expert</td>
</tr>
</tbody>
</table>

#### Roles and Responsibilities
- Few important roles addressed; missing or weak justification for role assignments
- Some important roles missing; incomplete, vague definitions and justifications
- Most important roles addressed; fairly useful definitions and justifications
- All important roles addressed; complete, sound definitions and justifications
- Insightful selection & assignment of roles; explicit definitions of responsibilities

#### Team Relationships
- Absent or poor plan to reach inclusiveness, member commitment, conflict resolution
- Unclear, weak plan to get inclusiveness, member commitment, conflict resolution
- Fairly clear, plausible plan for inclusiveness, member commitment, resolving conflicts
- Clear, practical plan to get inclusiveness, member commitment, conflict resolution
- Feasible, insightful plan for inclusiveness, member commitment, growth from conflict

#### Joint Achievements
- Absent or poor plan to define goals, manage project work, work together
- Unclear, weak plan to define goals, manage progress, work together
- Fairly clear, plausible plan to define goals, manage progress, work together
- Clear, practical plan to define goals, manage progress, work together
- Inspiring, ongoing review of goals, management plan, member collaboration

#### Member Contributions
- Absent or poor plan to allocate work, enforce expectations, support member growth
- Unclear, weak plan to allocate work, enforce expectations, support member growth
- Fairly clear, plausible plan to allocate work, enforce expectations, support growth
- Clear, practical plan to allocate work, enforce expectations, support growth
- Clear, insightful plan to allocate work, gain inspiring member growth & performance

#### Team Information
- Absent or poor plan to communicate inside & outside team, prepare useful project records
- Unclear, weak plan to communicate inside & outside team, prepare useful project records
- Fairly clear, plausible plan to communicate inside & outside team, document project
- Clear, practical plan to communicate inside & outside team, document project
- Effective, flexible plan to communicate in & outside team, prepare defensible records

Comments or suggestions for improvement: