2006-1045: EVALUATION OF A TEAMWORK EFFECTIVENESS INTERVENTION WITH INTERPROFESSIONAL PROJECT TEAMS

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Abstract All undergraduate students in Illinois Institute of Technology are required to complete two InterProfessional (IPRO®) projects as part of their General Education Requirement. One of the important meta-objectives of the IPRO program is the development of individual skills need to assure team competency. A Teamwork Functioning survey followed by a very brief intervention protocol for developing team effectiveness is now in its third semester of implementation; results from the first two semesters (Trial 1 and Trial 2) are reported here. During Trial 1, students from a subset of eleven teams completed the Survey in week 5, received prompt feedback of their own responses compared with other teams, had a facilitated discussion on how to improve team functioning, and created an Action Plan for improvement; at the end of the semester they again completed the Survey. The remaining 23 teams participated only in the last step by completing the Teamwork functioning survey at the end of the semester. Results indicated that the Intervention Teams significantly improved their perceived teamwork functioning. During Trial 2, all teams completed the Teamwork Survey about four weeks after teams were formed, and again at the end of the semester (week 15). Although results showed an overall improvement in perception of team functioning between weeks 4 and 15, the Intervention subset overall did not show a larger increase than the "control" teams. One interpretation of this result is that simply assessing teamwork functioning may provide sufficient intervention to prompt teamwork improvement. Future efforts, guided by the current semester's results, will focus on how to identify teams that are most in need of intervention and the most efficient and effective way to provide it.

Introduction

Although the Accreditation Board for Engineering and Technology's *Engineering Criteria 2006-2007* [1] and many employers emphasize the need to develop effective teamwork skills, there is little consensus about the best strategies for developing such competencies among undergraduate students. There are some excellent guidelines on incorporating teamwork into existing courses [2]. Another approach to developing teamwork skills is the Interprofessional Projects Program (IPRO®) at our university. The IPRO program aims to build ethical, teamwork/communication and project management skills in undergraduate students that enhances their performance in project based real-world work settings. Even when promising strategies have been identified, the other major challenge is to develop ways of measuring whether the intended learning goals are being met. An important guide to developing self-report instruments to measure the professional outcomes specified by the ABET criterion 3 has been provided by Immekus, Tracy, Yoo, Maller, French, & Oakes [3]. They pointed out the importance of either identifying existing measures that are appropriate for assessing progress toward meeting the ABET EC 2000 Criterion 3 standards, now reaffirmed in the most recent standards [1]. They suggested (a) identifying existing measures that are appropriate for assessing progress, (b) modifying existing measures, or (c) developing new measures. We have chosen to modify an existing measure for teamwork effectiveness and a strategy for improving team excellence.

This report will summarize a method for assessing teamwork competencies and an intervention designed to develop teamwork effectiveness adapted from a protocol developed for business teams, and a preliminary evaluation of the effectiveness of the programs.

The IPRO Program

The IPRO Program was developed out of a long-range planning process (during 1994-95) which recognized that the "extra-technical" requirements being incorporated into ABET accrediting criteria [1] are desirable competencies for all students. Pilot projects were developed from 1995-1999, and offered as electives. Since 2000 all undergraduate students at our university are required to participate in at least two IPRO projects, each worth 3 credit hours. During the past several years we have been moving toward a program of systematic evaluation of the various components of the IPRO Program, and studying how to enhance the fulfillment of learning objectives common to all the projects.

Students are enrolled in engineering, science, business, law, architecture, psychology, humanities and design programs; the largest groups are in engineering, computer science, and architecture. Most students take IPRO projects as juniors or seniors, though a few sophomores and first year students enroll. Some graduate students, particularly in law, business and design also elect IPRO projects. The fact that this is a General Education requirement for undergraduates is a distinctive feature; we are not aware of any other university with such an ambitious, wide-reaching undergraduate program. Students select projects of their choice; some do so on the basis of published descriptions, some use reputation of the project and/or faculty member among students, and some students sign up (by their own admission) for anything that fits their schedule. Each semester the program involves 300 to 400 students across 30 to 40 teams. Team sizes range from 7 to 15 students. One (or more) faculty supervisors work with each team; some projects have external sponsors who contribute to the IPRO Program. Most teams include members from at least three different academic departments, in order to satisfy the criteria of being "multi-disciplinary" learning experiences.

The content or focus of the projects vary, including service learning, international and entrepreneurial experiences Students are given an opportunity to solve real world problems at local, state, national or international level. The students work on problems posed by sponsoring corporations, new ventures, government agencies, non-profit organizations, and faculty and student researchers. Projects are proposed by faculty, students or sponsors, who provide a description of the goals and methods to be used and a description of student skills they wish to attract to the project. These proposals are reviewed and ranked by a group of faculty, students, and IPRO staff members. This process has been developed in order to optimize the variety and quality of projects offered. There is an effort to distribute projects across academic disciplines, though this is not always possible (e.g., there are many architecture majors but few faculty available to lead architecture-rich projects).

All teams participate in IPRO Day at the end of the semester, when they present a coherent description of their project, and discuss their project via an Exhibit. The presentations and exhibits are judged by a panel of 3-6 judges (drawn from faculty, IIT graduates, sponsors, and graduate students); some teams also are judged on their website or technical achievements.

Significant cash prizes are awarded to the winning teams, and winners in each track are published. This creates incentives for the teams to do well enough to be competitive with the other teams.

Projects are designed to have a single-semester cycle, though some projects continue (in some form) for more than one semester. Many projects begin with the majority, or all, of the students new to the project. There is rarely a "group process" into which new members can be assimilated.

These features make the IPRO projects quite distinctive kinds of groups in which to study teamwork – and to teach teamwork skills.

Team Selection For the pre-pilot, feasibility study, five teams were selected to receive the intervention because the faculty leader was very interested in the process. We recognized that we would need to demonstrate the usefulness of even this minor intervention before introducing it as a required (or optional) part of the IPRO program overall. For the first pilot (Trial 1, spring semester 2005) the original goal was to get most of the IPRO faculty join the study (in either an intervention or control mode) and assign their teams randomly to the two modes. Our plan was to randomly select one half of the IPRO teams and request them to receive the intervention; the other half serving as the control group. Unfortunately, very few of the invited faculty advisors agreed to participate. We then enlisted eleven teams (99 students) with cooperative faculty advisors and used the remaining 23 as control teams (218 students). A similar procedure with Trial 2 (fall 2005) resulted in ten intervention teams (77 students) and 24 control teams. The cooperative faculty in Trial 1 included two Senior Lecturers each advising five IPRO teams and one faculty member advising one team; during Trial 2 the same two Senior Lecturers participated with their ten teams. (We recognize that this is not a desirable sampling strategy but it seemed to be the only way to begin the process of assessing a potential intervention.)

Measuring Teamwork

We initially worked with a volunteer consultant (James Austin) from St. Aubin, Haggerty Associates, Inc. and we decided to modify a survey developed by his firm to measure teamwork functioning in industry work groups. The survey was developed on the basis of research by LaFasto and Larson [4] reporting on extensive studies of work groups, in which the seven dimensions differentiating poorly functioning and effective teams were identified. The seven dimensions were: (1) a clear, elevating goal, (2) results-driven structure, (3) competent team members, (4) unified commitment, (5) collaborative climate, (6) standards of excellence, and (7) external support and recognition. The original survey included seventeen Likert-scaled items, with items designed to correspond to these dimensions. We added two dimensions specifically adapted to the IPRO program, with three items assessing the performance of the student team leader and one item regarding the faculty advisor.

The survey measure includes 20 statements; response options are 1 = False, 2 = More False than True, 3 = More True than False, 4 = True. Statements are phrased so that True statements describe teams assessed to be well-functioning in business settings.

The measure used for Trials 1 and 2 is included in the Appendix.

The Teamwork Intervention

Many strategies have been described for improving the functioning of various kinds of teams. Some seem to have good outcomes but involve elaborate, time-intensive combinations of information, role playing, and feedback – approaches that seemed unsuited to our student project teams. We opted to try a modified, very brief version of the intervention developed by St. Aubin, Haggerty Associates, Inc. for use in business settings. Their intervention is most like a "classical intervention" technique based upon four steps: (1) identifying themes that characterize effective team functioning, (2) presenting such themes to the team, (3) identifying strengths and weaknesses, and (4) generating a report using the identified strengths and weaknesses aimed at improving team functioning .[5] The themes were contained in the survey; reports were generated identifying strengths and weaknesses and shared with the teams. A facilitated discussion focused on how the team could modify their behavior to function more effectively and the team and how they could create an action plan for their own team [6].

Intervention Protocol In each trial, Time 1 assessments were made after the project teams had been meeting for 4-5 weeks, to allow time to develop some level of group process. The administration of the Survey was done as part of the regular team meeting, and was accomplished in approximately 10 minutes. Students completed an Informed Consent, in which results were described as anonymous and confidential. The survey results were processed by the University Center for Psychological Services, who provided an SPSS data base and summary indicators for each team. From these data, individualized Team Reports were constructed, showing the five Survey items with the highest mean scores for the team ("Strengths"), the five items with the lowest scores ("Areas for Development"), and the mean scores, distribution of responses for each of the items, and the mean score for the total intervention cohort to enable peer comparisons. For Trial 2, the mean scores for all teams were provided. A copy of one Team Report is included as Appendix 2.

After the Team Reports were generated, each of the participant teams scheduled a 45 minute feedback session to review and discuss the results. These discussions were led by a person trained and experienced in facilitating group discussion. We decided that this person should not be the faculty advisor, since some sources of tension arise with the role or style of that person; and that it not be an undergraduate student. Some faculty advisors chose to remain for the discussion; others decided not to attend. The discussion leader (usually one of the evaluation specialists for the program) distributed the reports to each of the team members, emphasizing that the results reflected simply how they, collectively, evaluated their team experience at that point. Discussion questions centered on whether results were surprising or expected, and whether there were any ratings that were hard to interpret. Discussion of strengths focused on understanding what behaviors were reflected in the ratings. Similarly, discussion of problematic areas focused on factors that might have already changed, or could change in the future. The final step in the intervention was to have students make a three-column spread on the board, with headers for "Continue", "Stop" and "Start" doing in order to enhance their team functioning by the end of the semester. The facilitator made sure that each student had an opportunity to contribute to each column. This became their Action Plan. One student was designated to

transcribe the notes, and send them to all team members, the faculty advisor, and the IPRO office.

Ideally, the facilitated discussions should be done soon after the initial teamwork assessment. For Trial 1, because we were only dealing with data for 11 teams, surveys were collected during the 5th week and we scheduled feedback discussions during the 6th or 7th weeks. For Trial 2, because we surveyed all 34 teams and wanted to use the norms from all teams, most of the data collection was accomplished during week 5, but the intervention teams did not have a discussion of their results until week 8.

From the time of the discussion to the end of the semester, decisions related to the teamwork intervention protocol were made exclusively by the team members and their faculty advisors. We have no direct knowledge of the extent they may have used the Action Plan as a guide. In the last week (Time 2) all teams completed the same Teamwork Functioning Survey that they had done after the first 4-5 weeks.

Results

Data Available We are reporting here on Teamwork Effectiveness surveys collected during two semesters (spring and fall of 2005), with a total of 68 teams involving approximately 532 students. Unfortunately, not all students completed one or both surveys, despite our good efforts to encourage participation; because the surveys are not individually identified, it is impossible to match up responses for Time 1 and Time 2. The number of surveys available for Trial 1 and Trial 2 are shown in Table 1.

As the table shows, during Trial 1 we collected Teamwork Surveys from the Control teams only at the end of the semester. During Trial 2 we collected the surveys from all teams at Time 1 and Time 2.

Table 1. Teamwork Survey Samples

	Trial 1 (spring '05)	Trial 2 (fall '05)	Total
Number of Teams			
Total	34	34	78
Intervention	11	10	21
Control	23	24	47
Number of Students	301	231	532
Intervention Time 1	111	77	188
Intervention Time 2	83	72	155
Control Time 1	NA*	112	112
Control Time 2	218	159	377

* Teamwork Effectiveness surveys were not collected from the Control teams at Time 1

The Teamwork Measure The modified Teamwork Function survey has robust internal reliability as measured by the Alpha statistic; values range from .88 to .93 for the administrations. Evidence of construct validity was established by the team who initially constructed the measure [4]. Additional evidence comes from the facilitated discussions with the intervention teams; while teams often indicated that "things had changed" (for the better) since the survey was administered, very few challenged the interpretations or meanings of the survey results as a reflection of their team.

Least and Most Challenging Aspects of Teamwork In order to better understand the ways in which students are experiencing IPRO teams, we examined the overall reports of items in the survey, to identify consistent issues about which our teams seems to feel comfortable, and areas in which they feel challenged and presumably need most help. There were substantial consistencies for the two semesters, both early in term and at the end of the term. Teams feel most confident about there being a clear need for their team project, and that their student team leader is fair, open to new ideas, and personally committed to the project. These results suggest that overall the processes of selecting IPRO projects, and of identifying student leadership, are effective. Overall, students are less confident that they have adequate methods in place for monitoring individual performance and giving feedback, or that they have the resources available to them to accomplish their projects. They are not confident that "team members are willing to devote whatever effort is necessary to achieve Team success"; in fact, during discussions many students challenged this statement as inappropriate for the academic context. They usually feel that, given the demands of courses in their major and part-time employment, they are willing to work hard but will not "do whatever is necessary." The teams also are not, overall, likely to feel that their Team is "sufficiently recognized for its accomplishments." These results suggest that these should be developmental goals for the program as a whole.

The Impacts of the Teamwork Interventions. In order to assess the possible impact of our facilitated discussion intervention on team functioning, we compared the Teamwork survey responses at Time 1 (approximately 4 weeks after team formation) and Time 2 (approximately 15 weeks after team formation). During Trial 1 (spring) we administered the Teamwork survey at the end of the semester to all team members, providing a Time 2 comparison of the Intervention and Control Teams. During Trial 2 (fall) we decided to administer the survey at both times to all teams, but provide the facilitated discussion only to the Intervention teams. Independent sample T-tests were used to compare Intervention and Control Groups; paired sample T-tests were used to compare responses at Time 1 and Time 2.

Average scores (Mean and Standard Deviation) for the overall Team Excellence survey, and the eight dimensions are shown in Table 2. This is a composite table showing results from the Intervention and Control teams, at Time 1 and Time 2, for Trials 1 and 2. The table indicates the level of significance of differences between the Intervention and Control teams for each time and each trial, and the statistical difference between Time 1 and Time 2 assessments.

As this shows, for Trial 1 the Intervention teams improved significantly from Time 1 to Time 2 testing, and at Time 2 they felt their teams were functioning more positively than did the Control teams [7]. However, results for Trial 2 indicate that all teams generally improved from the first assessment to the second assessment (but not at a statistically significant level).

Table 2
Teamwork Excellence Dimensions for Intervention and Control Teams:
Trial 1 (Spring '05) and Trial 2 (Fall '05) Semesters

	Trial 1	**Spring**	**Sig**	**Trial 2**	**Fall**	**Sig**
	Intervent	Control	I-C	Intervent	Control	I-C
Dimension	Mean (SD)	Mean (SD)		Mean (SD)	Mean (SD)	
Average Time 1	3.20 (.59)	----		3.13 (.57)	3.19 (.69)	ns
Average Time 2	3.30 (.38)	3.17 (.50)	<.02	3.22 (63)	3.33 (.68)	ns
Significance Time 1 – Time 2	<.001			Ns	Ns	
Clear goal Time 1	3.27 (.82)	----		3.25 (.72)	3.34 (.78)	ns
Clear goal Time 2	3.51 (.49)	3.37 (.69)	<.05	3.36 (.59)	3.52 (.61)	.058
Significance	<.003			Ns	<.001	
Results-driven structure Time 1	3.12 (.67)	----		3.03 (.59)	3.09 (.68)	ns
Structure Time 2	3.14 (.49)	3.08 (.63)	ns	3.12 (.51)	3.26 (.60)	ns
Significance	ns			Ns	<.001	
Competent team members Time 1	3.15 (.71)	----		3.17 (.58)	3.11 (.70)	ns
Team members Time 2	3.49 (.51)	3.29 (.63)	<.01	3.26 (.54)	3.25 (.63)	ns
Significance	<.001			Ns	<.001	
Unified commitment Time 1	3.08 (.76)	----		3.12 (.65)	3.10 (.68)	ns
Unified commitment Time 2	3.20 (.60)	3.11 (.66)	ns	3.11 (.60)	3.28 (.67)	.055
Significance	ns			Ns	<.001	
High standards of excellence set by team Time 1	3.15 (.79)	----		2.98 (.62)	3.16 (.72)	<.05
Excellence Time 2	3.38 (.54)	3.18 (.75)	<.01	3.23 (.65)	3.28 (.68)	ns
Significance	<.003			<.001	<.022	
External support & recognition Time 1	3.02 (.72)	----		2.95 (.57)	2.94 (.76)	ns
External support Time 2	3.07 (.70)	2.90 (.85)	<.05	2.94 (.65)	3.09 (1.5)	ns
Significance	ns			Ns	Ns	
Student team leader Time 1	3.43 (.80)	----		3.41 (.72)	3.41 (.77)	ns
Student team leader Time 2	3.54 (.56)	3.48 (.64)	ns	3.54 (.57)	3.43 (.67)	ns
Significance	ns			<.04	Ns	
Faculty leader provides right amount of autonomy Time 1	3.18	----		3.28 (.81)	3.38 (.83)	ns
Faculty leader Time 2	3.51 (.49)	3.37 (.69)	ns	3.10 (.96)	3.48 (.74)	<.001
Significance	<.001			Ns	ns	

Because data were (unfortunately) not collected for the Control teams at Time 1 during Trial 1, we can compare initial attributions of the teams only for Trial 2. For Trial 2, at Time 1 the only statistically significant difference between the control and intervention teams was that the control teams were more likely to indicate they already had high standards of excellence for themselves and were willing to expert pressure on themselves to improve performance (items 13 and 14 in the questionnaire). It is difficult to estimate how important this initial difference was. By the end of the semester, the control teams and the intervention teams were equal on this dimension

We looked more closely at the dimensions included in the Teamwork Survey. As shown in Table 3, by the end of the semester, the Intervention teams in Trial 1 were more likely to feel they had a clear, elevating goal, had competent team members, held themselves to high standards of excellence, and received more external support and recognition. These are certainly among the results we would like to see for the intervention. However, during Trial 2, the Control Teams reported more unified commitment, and were more likely to feel their faculty leader provided the autonomy necessary for learning and achievement. During Trial 1 there were no differences between the sets of teams on four of the dimensions, and during Trial 2 there were no differences on six of the eight dimensions.

Table 3 also lists the dimensions that showed improved team functioning, an important analysis since we recognize that most (if not all) teams go through a normal developmental process. Indeed, both intervention teams and control teams feel more confident about their project goal, about the competence of their team members, and about setting high standards of excellence for themselves. During Trial 1, the intervention teams were also more likely to increase their ratings of their faculty leaders; during Trial 2 they increased ratings of student leaders.

We are now collecting data for Trial 3, during the spring semester of 2006; we have ten intervention teams and 24 control teams. Results from these teams will provide clarification on the potential for this minimal intervention.

Table 3
Teamwork Excellence Scores for Intervention and Control Teams

A. Dimensions Showing Different Functioning at End of Semester Between Intervention and Control Teams

Better Functioning of Intervention Teams	Better Functioning of Control Teams
Clear, elevating goal (Trial 1)	Unified commitment (Trial 2)
Competent team members (Trial 1)	Faculty leader provides autonomy (Trial 2)
High standards of excellence (Trial 1)	
External support & recognition (Trial 1)	

B. Dimensions Showing Improved Team Functioning

Intervention Teams	Control Teams (Only Trial 2)
Clear, elevating goal (Trial 1)	Clear, elevating goal
	Results-driven structure
Competent team members (Trial 1)	Competent team members
	Unified commitment
High standards of excellence (Trials 1, 2)	High standards of excellence
Effective student team leader(s) (Trial 2)	
Effective faculty leader (Trial 1)	

Discussion

We have described what may be the most challenging situation for those interested in developing effective teamwork skills among a group of individuals. While most of the literature dealing with assessing and nurturing multi-disciplinary teamwork has developed within the context of real work challenges, we (and many others) are trying to prepare the workers before they reach the "world of work." We are dealing with undergraduate students, most of whom are in their early phases of adult development. While they have selected an academic major, most of them are not yet launched into a job which they may hope will become a career. A survey of the undergraduate students at IIT indicates that they are signing on to an IPRO Project because it is a requirement, and/or because they hope to gain something from the experience. Students select projects for a wide variety of reasons, and it is difficult to shift them out of a project once they are enrolled (for various academic/bureaucratic reasons). The faculty advisors are expected to guide their somewhat-randomly-selected teams toward technical proficiency, a valuable product (for a client, IPRO-Day judges, and themselves), and to help all the students develop the range of "soft" skills captured by the goals of teamwork, project management, ethical decision-making, communication and capacity to become a lifelong learner. This is an ambitious educational agenda.

We have carried out other evaluations that indicate that the IPRO Program is largely effective, as judged by the students, faculty, alumni, and IPRO-Day judges who have been and are now involved with the Program. This particular report has focused on one significant challenge: how to facilitate the development of effective teamwork given the diversity of students, teams, faculty, sponsors, and particular circumstances. We have given a very minimal intervention a trial – and the results are somewhat promising. Trial 1 testing provided strong support for the efficacy of the intervention; Trial 2 did not.

How do the circumstances between the semesters differ? The first possibility is that the two semesters are not, in fact, equivalent. During the Trial 2, we in effect had two interventions: administering the Teamwork Effectiveness Survey around week four after team formation is a form of intervention, possibly leading students to think more carefully about these dimensions than they might have otherwise. This might better be conceptualized as "Intervention Lite" rather than a "non-intervention" or control situation. The intervention teams had the benefit of additional processing of their team issues with the facilitator, but this appears to have had no measurable impact. The second possibility is that there is enough variability in initial team strengths to mask possible effects of the intervention. In fact, at least two of the teams in the intervention group would be considered quite dysfunctional (by most measures, even for short-term academic teams); while their issues were discussed and Action Plans were formulated, it is unlikely that these teams benefited sufficiently to make a difference by the end of the semester. Third, the timing of the intervention may be important. During Trial 2 the intervention discussions were not carried out until week 8 of the semester, one or two weeks later than for Trial 1. (During Trial 3 we have managed to have survey collection in week 5 and intervention discussions during week 6, by processing the data for the intervention teams as soon as it is received and using norms from prior semesters.) Finally, perceived faculty guidance styles may be important. The intervention teams were all guided by two primary faculty members, though in

most cases a second faculty member shared the team guidance. We will check out this possibility by more careful analysis of results team by team.

An intervention such as this has more potential to address some aspects of team functioning than others. The improvements noted in team functioning during Trial 1 concerned the internal workings of the team itself. It is notable, however, that the intervention seemed ineffective in addressing the most troubling issue of whether all team members "are willing to devote whatever effort is necessary to achieve Team success." Discussion sessions made it clear that students consider this to be an unrealistic goal, given their other academic (and personal) demands – and that they are not "compensated" for their project work (as they are, or will be, in employment). Finally, we can note the issue of "sufficient recognition for team accomplishments." This remains an issue of disquiet for many students. While the students who are recognized (and rewarded) by the honors ensuing from IPRO Day judging feel good, those who feel they have worked hard on important projects but are not so recognized feel let down. We probably need to include additional, ongoing mechanisms of recognition, from the sponsors, the university community as a whole, from the faculty advisors, and from the IPRO Program staff to enhance the IPRO project experience. Some aspects that have been identified as central to effective team function are beyond the scope of student participants to effect, even though we can encourage them to be creative about possible strategies for effecting desired outcomes. For example, the importance of the initial project conceptualization, to a client or some other interested stakeholder, is usually set before a student signs onto the project. Fortunately, most of the IPRO students believed that their project was worthwhile, though there were some who came to appreciate the importance of the project as they became more involved.

The intervention described is a relatively minimalist, cost-effective intervention, with an average time investment for the intervention teams of one hour during the semester. This makes it possible to implement on a larger scale, provided that the necessary production support is available for survey reproduction, distribution, collection and analysis, and that appropriate skilled personnel are available to conduct the facilitated discussions during a short time frame.

We recognize several limitations in the current implementation and assessment process. (1) The intervention teams were not randomly selected, and thus the results may be biased by including teams whose faculty guides and student leaders were willing to cooperate. (2) The intervention may be very effective for some teams, but not needed for others. Further analyses of our data will help us identify teams that benefited more, with the intention of developing "early warning" systems that will allow us to provide teamwork intervention on a timely basis only for those teams likely to benefit. (3) The intervention described is probably more effective for addressing a subset of the issues of less functional teams, primarily those dealing with internal team negotiations; one of the most troubling issues is dealing with less-committed/ productive team members. Other matters, such as selecting worthwhile projects, identifying competent student team leaders, helping faculty to provide the right amount of autonomy so the students learn and achieve results, and arranging appropriate resources and recognition are probably best left to the program organizers.

Conclusions

The Teamwork Effectiveness Intervention for undergraduate student multidisciplinary project teams described in this report has shown some promise. It is a brief intervention, requiring approximately one hour of team participation time. The measure used to assess teamwork functioning has good reliability and evidence of validity. Further work with this tool is warranted.

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APPENDIX 1
TEAM EXCELLENCE SURVEY

TEAM EXCELLENCE				
****Responses to Questions 17-19 pertain to (circle one):*** Team OR Subteam Leader	**Rating Explanation:** **T = True** **MTTF = More True than False** **MFTT = More False than True** **F = False**			
	Rating Codes:			
Instructions: **Describe your Team according to the items below. Check the number in the column that corresponds to your choice: T=4, MTTF=3, MFTT=2, F=1**	**T 4** **MTTF 3** **MFTT 2**			
Statements:	**1**	**2**	**3**	**4**
1. There is a clearly defined need that justifies the existence of our Team.				
2. Our goal is compelling enough that I can derive a sense of identity from it.				
3. Each member's relationship to the Team is defined in terms of role clarity and accountability.				
4. We have an established method for monitoring individual performance and providing feedback.				
5. Our decision-making process encourages judgments based on factual and objective data.				
6. Team members possess the essential skills and abilities to accomplish the team's objectives.				
7. Each individual on the Team demonstrates a strong desire to contribute to the Team's success.				
8. Team members are capable of collaborating effectively with each other.				
9. Achieving our team goal is a higher priority than any individual objective.				
10. Team members are willing to devote whatever effort is necessary to achieve Team success.				
11. We help each other by compensating for individual shortcomings.				
12. As a Team, we embrace a common set of guiding values.				
13. Our Team has high standards of excellence.				
14. Our Team exerts pressure on itself to improve performance.				
15. Our Team is given the resources it needs to get the job done.				
16. Our Team is sufficiently recognized for its accomplishments.				
17. Our Team Leader exhibits personal commitment to our Team's goal.				
18. Our Team Leader is fair and impartial toward all Team Members.				

19. Our Leader is open to new ideas and information from Team Members.				
20. Our faculty Leader provides the right amount of autonomy to learn and achieve results.				

Adapted from a measure developed by St. Aubin,Haggerty Associates, Inc.

APPENDIX 2
SAMPLE REPORT FOR INTERVENTION TEAMS
[spacing altered]

TEAMWORK EFFECTIVENESS
FEEDBACK REPORT

IPRO PROGRAM FALL 2005

TEAM # 999

Number of students responding: 11

Surveys Completed during Week 5
Discussion of Surveys Week 8

Dr. M. Huyck, Institute of Psychology
Anthony Gaddini, IPRO Scholar

NOTE ON THIS REPORT: Responses from your team are presented as means (average) scores for all the students responding. In addition, we provide the number of students who said that a statement was True, Mostly True, Mostly False, or False.

The means for your team are compared with:

- the means for all the IPRO teams who completed the questionnaire in October, 2005 (181 students in all), and
- a grand mean for students responding to the questionnaire over three semesters (314 students) at the end of the semester.

We have organized the responses to indicate the Strengths of your team, and the items on which you indicate some need to Improve your functioning. You can use this information to identify strategies for making your team even more effective.

During our discussion, your team identify that you will:

- CONTINUE doing because the practices are effective
- STOP doing because the practices are interfering with your team effectiveness
- START doing to improve your teamwork by the end of the semester

STRENGTHS OF TEAM 999: October, 2005

ITEM	Team Mean	All Fall 05 Teams	3-Semester Mean	T	MT	MF	F
1. Clearly defined need	3.91	3.42	3.11	10	1	0	0
19. Our Leader is open to new ideas and information from Team members.	3.80	3.46	3.48	7	3	1	0
18. Team leader is fair and impartial	3.60	3.45	3.48	8	2	0	0
7. Each individual on the Team demonstrates a strong desire to contribute to the Team's success.	3.55	3.04	3.11	7	3	1	0
8. Team members are capable of collaborating effectively with each other.	3.55	3.24	3.17	7	3	1	0
9. Achieving our team goal is a higher priority than any individual objective.	3.55	3.30	3.28	6	5	0	0

AREAS TO IMPROVE FOR TEAM 999: October, 2005

ITEM	Team Mean	All Fall 05 Teams	3-Semester Mean	T	MT	MF	F
16. Our team is sufficiently recognized for its accomplishments. .	2.55	2.87	2.95	0	6	5	0
14. Our Team exerts pressure on itself to improve performance.	2.64	2.97	3.06	1	5	6	0
6. Team members possess the essential skills and abilities to accomplish the team's objectives.	3.09	3.15	3.16	2	8	1	0
13. Our team has high standards of excellence.	3.09	3.20	3.16	2	8	1	0
15. Our Team is given the resources it needs to get the job done.	3.09	3.02	3.06	2	8	1	0

TEAM EFFECTIVENESS: TEAM 999, October 2005
(n = 11)

ITEM	Team Mean	Fall 05 Teams	3-sem Mean
1. There is a clearly defined need that justifies the existence of our Team.	3.91	3.42	3.11
2. Our goal is compelling enough that I can derive a sense of identity from it.	3.45	3.22	3.30
3. Each member's relationship to the Team is defined in terms of role clarity and accountability.	3.18	3.09	3.10
4. We have an established method for monitoring individual performance and providing feedback.	2.91	2.90	2.95
5. Our decision-making process encourages judgments based on factual and objective data.	3.36	3.22	3.20
6. Team members possess the essential skills and abilities to accomplish the team's objectives.	3.09	3.15	3.16
7. Each individual on the Team demonstrates a strong desire to contribute to the Team's success.	3.55	3.04	3.11
8. Team members are capable of collaborating effectively with each other.	3.55	3.24	3.17
9. Achieving our team goal is a higher priority than any individual objective.	3.55	3.30	3.28
10. Team members are willing to devote whatever effort is necessary to achieve Team success.	3.18	2.92	3.06
11. We help each other by compensating for individual shortcomings.	3.45	3.15	3.09
12. As a Team, we embrace a common set of guiding values.	3.27	3.13	3.12
13. Out Team has high standards of excellence.	3.09	3.20	3.16
14. Our Team exerts pressure on itself to improve performance.	2.64	2.97	3.06
15. Our Team is given the resources it needs to get the job done.	3.09	3.02	3.06
16. Our Team is sufficiently recognized for its accomplishments.	2.55	2.87	2.95
17. Our Team Leader exhibits personal commitment to our Team's goal.	3.40	3.31	3.22
18. Our Team Leader is fair and impartial toward all Team Members.	3.60	3.45	3.48
19. Our Leader is open to new ideas and information from Team Members.	3.80	3.46	3.48
20. Our faculty Leader provides the right amount of autonomy to learn and achieve results.	3.27	3.33	3.39
Valid N (range for items)	11	179-181	224-315

MHH: 10/19/05