

**I PRO 301**  
Researching, Designing, Testing, and Evaluating  
I PRO Program Enhancements

**Spring 2008 Midterm Report**

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## **1.0 Revised Objective**

IPRO 301, Researching, Designing, Testing, and Evaluating IPRO Program Enhancements, is designed to improve the IPRO experience for IIT undergraduates. The main areas of ongoing research include examining the relationship between problem context and reflective thinking, assessing the effectiveness of groupware such as iGroups on learning outcomes, evaluating the efficacy of IPRO Games on team functioning, creating an IPRO enrollment forecast, assessing interventions to increase students' ethical awareness, increasing inter-rater reliability during assessment periods, such as judging scores on IPRO day, and developing the innovation and design learning objectives.

### **1.1 Reflective Thinking Subteam**

The objective for the reflections research project, headed by Kristin, has not changed from what was initially established in the project plan. The objective of this subteam is to find the relationship between problem context and reflective thinking skills through a literature review and an analysis of individual reports data. This will be accomplished in the hopes of finding a relationship between reflective thinking skill building and service-learning projects to suggest increased participation in the service-learning IPRO's. Due to an acceptance of this subteam's Frontiers in Education (FIE) abstract, Kristin may require additional attention in the writing or reviewing process. She will also continue working on the literature review to find a relationship between problem context and reflective thinking levels, a data analysis, and any other necessary IPRO deliverables.

### **1.2 Groupware Subteam**

As stated in the project plan the initial objective for the groupware research project, led by Angela, is to determine the effectiveness of groupware on learning outcomes and this objective has not changed since the project plan. As also mentioned in the project plan this research project will include a literature review and an analysis of iGroups data. From the literature review, Angela will evaluate past research on groupware. For the analysis of the iGroups data, she will accumulate the usage data such as the number of e-mails sent and files uploaded by each student. Since this data has been collected from previous semesters and measures how often a student uses the suite, she will analyze the data and correlate it to each individual's IPRO performance. Because the initial abstract submitted to American Society for Engineering Education (ASEE) paper was rejected, Angela doesn't have to complete and submit a paper for groupware for that conference. Therefore, she will continue working on the literature review to help conclude the effectiveness of groupware on learning outcomes, a data analysis, and any other necessary IPRO deliverables.

### **1.3 Teamwork Subteam**

The Teamwork subteam, headed by Margaret, had the original objective of determining the effectiveness of IPRO Games on team functioning. However, while this is still a primary goal, there were some

objectives that needed to be added. First, aside from the literature review of team games, Margaret will also be doing a review of the literature on peer review. The objective of this is to determine if students who attend the games are rated more positively by their peer and whether teams which participated in the games evaluated each other more positively, indicating better team functioning. Second, the abstract submitted to *Frontiers in Education (FIE)* was accepted. Therefore, Margaret will be helping to write the Work in Progress paper needed for the conference.

#### 1.4 Forecasting Subteam

The objective for the forecasting subteam, led by Hannah, has not changed from what was the initially establish in the project plan. The objective of this research project is to create an IPRO enrollment forecast, with seasonality and regression analysis, for the upcoming semesters. As mentioned in the project plan, this will be accomplished by finishing the current literature review and continuing to search for alternative forecasting methods. The literature review has given insight on many basic forecasting techniques and has led to a working forecast model. However, attempts to learn more about forecasting and to implement more complicated and more accurate forecasting models are continuing.

#### 1.5 Ethics Subteam

The objective for the ethics subteam, headed by Treyson, has not changed since the project plan. It is to determine if the development of a Code of Ethics by students, leads to the development of ethical awareness. As mentioned in the project plan, this will include a literature review and an analysis of ethics exams done by other institutions. For the literature review, Treyson hopes to determine how other universities are testing and evaluating the development of ethical awareness.

#### 1.6 Inter-rater Reliability Subteam

The objective of the inter-rater reliability (IRR) subteam, headed by Heling, has not changed from what was initially established in the project plan. The objective of this subteam is to identify and develop effective interventions to improve the inter-rater reliability for the IIT IPRO Day judging process. As mentioned in the project plan, this is done by incorporating mathematic algorithm constructed from the fall 2007 semester into available IPRO day judging data of past semesters and by correlating the numerical results to the types of inventions attempted to evaluate their corresponding effectiveness. Additionally, extensive literature reviews are conducted to find and evaluate potential methods.

#### 1.7 Learning Objective Subteam

As stated in the project plan, the broad objective for the learning objectives research project, directed by Carolyn, is “to develop the innovation and design learning objectives, as well as improve student attainment of said learning objectives.” This objective has not changed since the project plan; more details are included in the results section.

## **2.0 Results to Date**

### 2.1 Reflective Thinking Subteam

The literature review for the reflective thinking subteam has identified several programs and institutions that believe reflections not only assist in service learning, but the projects increase the students' levels of reflective thinking. These articles contribute to the literature review that this subteam is composing. The literature review is an ongoing project that will be completed shortly. Kristin will then begin data analysis on the individual reports from spring '08 that she helped grade. The results should provide evidence about how to enhance reflective thinking, particularly on the question of whether or not service-learning projects distinctively promote reflective thinking.

### 2.2 Groupware Subteam

The Groupware research project has found relevant articles dealing with past research on groupware and learning outcomes. They evaluate groupware in terms of its advantages and disadvantages and then analyze experiments to make a conclusion about the overall research. The literature review is underway and when it's completed, this subteam will begin its data analysis of iGroups. The data includes the number of emails sent and the number of files uploaded in iGroups from previous semesters. These results will address the problem of the sponsor of determining of whether or not iGroups is a useful groupware that enhances an individual's IPRO performance as well as whether (or not) it betters the IPRO program.

### 2.3 Teamwork Subteam

The Teamwork subteam is in the final stages of the literature review of teamwork, and has begun preliminary work on the final paper. Margaret has found that while there are many articles about teamwork games, they tend to be anecdotal rather than experimental. Because of this, she decided that it may be beneficial that she look to books and other printed materials, instead of just articles found on PsychInfo and other databases. While this has not led to any research using experimental designs related to team games, it does help to find theories on why games work to enhance teambuilding.

The Teamwork subteam is in the middle of its literature review of peer review. This part has been a bit slower because of personal issues with a member of the subteam and because the problem was not defined until just a few weeks ago.

The current results of both aspects of the literature will be synthesized into a paper, in which the purpose will be to report on the current state of literature, as well as to help form recommendations for improvements. Margaret hypothesizes that the results of the literature review will yield improvements on a

small scale that will be easy to implement into the current IPRO framework. She hopes that this will help the IPRO Program to further their development and improvements of the program in the years to come.

#### 2.4 Forecasting Subteam

The forecasting subteam has created a forecasting program and created forecasts for the next two academic years. This has been completed after intensive learning of the trend-seasonality regression model. A literature review is in the process and the team has collected enrollment data to complete the forecast. This forecasting model addresses the problem of creating an accurate number of IPROs for next semester. The management of IPRO will be using the current forecasting model for upcoming discussions and years to determine the number of IPROs needed in a given semester.

#### 2.5 Ethics Subteam

The ethic's subteam has found several documents relating to the development of ethics and the "how" of teaching ethics. There has been limited information about the actual testing of ethical awareness. Both qualitative and quantitative results have been tabulated in the measurement of ethical awareness. Of these, the qualitative results have been the most informative as ethical awareness, by its nature, is hard to quantify. Treyson expects to find more quantitative results to base his data from. This work will be in the form of a literature review and an ethical awareness exam. The literature review is in process and the draft exam will be completed soon after. The results of both deliverables will address the problem of the sponsor of identifying if students in IPRO leave the program more ethically aware than they were prior to participating in the IPRO program. Overall, these results will further develop and improve not only the program in the years to come, but will also enhance each students ethical awareness, the goal of this subteam.

#### 2.6 Inter-rater Reliability Subteam

This subteam has successfully obtained IPRO Day judging data for the spring 2006 and fall 2007 semester and has begun to perform the necessary data analysis. More judging data, from the fall and spring 2005, and spring 2006 semesters is in the process of being digitally inputted and will be ready for analysis the week after IIT's Spring Break. The result from all data analysis will be compared to the results of the data analysis done for the spring 2007 (which was done by the previous IPRO 301 IRR subteam last semester) to differentiate any change in IRR and correspond that change to the interventions attempted for the mentioned semesters.

The process of literature review has begun as well. The subteam was able to identify seven potentially pertinent studies/papers relating to the enhancement of inter-rater reliability in educational settings. One of the seven papers, *Learning Object Evaluation: Computer-Mediated Collaboration and Inter-rater Reliability*, was thoroughly read over and studies for it has suggested several feasible methods to improve

IRR by making modifications during the judging process. From the suggestions, the subteam was able to formulate a preliminary list of possible modifications to the IPRO Day judging process, including 1) allow a brief post-scoring discussion session where the session will be facilitated by the chief judge and the scoring items to be discussed will be prioritized by their estimated reliability coefficient; 2) survey all participating judges prior to IPRO day to classify their expertise; 3) assign these judges to the IPRO track that reflect the most out of their expertise; and 4) train all judges of the grading criteria to eliminate any projected knowledge gaps during the judging processing. The subteam is currently assessing the validity of the four methods above through further literature reviews.

The results being produced by this subteam can create a positive impact on the IPRO Day judging process by improving its inter-rater reliability from both computational and social approaches.

### 2.7 Learning Objective Subteam

Some very preliminary data analysis was conducted on the results of the innovation learning objective pilot test administered during team briefings at the beginning of the semester. Student responses indicated a high (much higher than expected) knowledge of prototyping, but were not as strong in brainstorming. These results helped steer the literature review in finding material to help design an intervention for the innovation LO.

The literature review has also been started, with several papers turning up suggestions on teaching models and ways to maximize student retention of design knowledge. Thus far no specifics on an intervention have been proposed, but each new paper offers some insights on what to do (or what to avoid) in teaching design to undergraduate students.

In addition to these results, this subteam had primary responsibility for the team project plan. Other deliverables thus far have included the design and innovation test questions, both of which have now been piloted. An initial data analysis of the innovation test has been completed, giving insight into an approach for the proposed intervention.

Thus far, results have very positive in terms of the results addressing the problem of the sponsor (the IPRO program) and being incorporated into the existing structure. The innovation and design questions were piloted successfully by the fourth week of the semester and administrative attitude is enthusiastic towards the innovation workshop. Once the LO study guides become available, these will easily be uploaded to the existing IPRO website to be available to all students.

## **3.0 Revised Task / Event Schedule**

### 3.1 Reflective Thinking Subteam

No changes have been made in terms of the tasks and event schedule. All deliverables are expected to be produced by projected dates as indicated on the project plan.

### 3.2 Groupware Subteam

No changes have been made for the groupware research team. All the deliverables will be completed on time as specified by the project plan.

### 3.3 Teamwork Subteam

The Teamwork subteam has not changed its event schedule; however, its tasks have now included a literature review on peer reviews and their relationship with team functioning as well as the original literature review task on I PRO games and their effectiveness to teamwork.

### 3.4 Forecasting Subteam

The timeline/ tasks for the forecasting subteam have not changed.

### 3.5 Ethics Subteam

There no changes in tasks and event schedules for this research project. All the deliverables for this subteam will be completed by the due dates specified in the project plan.

### 3.6 Inter-rater Reliability Subteam

No major changes in terms of tasks and event schedules have taken place for this subteam. All deliverables are expected to be produced by projected dates as indicated on the project plan.

### 3.7 Learning Objective Subteam

No major changes have occurred for the learning objectives subteam. Some projects have required more time than expected, but deliverables have all been produced on time, and the soon due deliverables (literature review) will also be produced on time.

## **4.0 Changes in Task Assignment, Designation of Roles, and Team Organization**

No major changes have been made, because the roles that we were given at the beginning of the semester have not changed, nor has the size or scale of our project changed. However, as stated earlier, there was an addition made to the teamwork subteam. This research project will not only be improving I PRO games and their effects on team functioning, but will also be determining the use of peer reviews and how they relate to teamwork. Nonetheless, the overall goal of I PRO 301 has stayed the same, and thus, no other changes were needed.

As originally stated in the project plan, the one thing that makes this I PRO unique is that we are all our own team leaders and we must use resources available to us, such as the I PRO faculty and perhaps even experts in our respective fields of study, editors, and other prominent figures who appear in our research. So rather than simply collaborating as a team, we collaborate amongst each other to exchange information, data and possibly methods to go about searching through the raw data. Essentially, Kristin Bryant heads the reflective thinking subteam, Angela Gandhi heads the groupware subteam, Margaret Kilbilko heads the teamwork subteam, Hannah Kolb heads the forecasting subteam, Treyson Ptak heads the ethics subteam, Heling Shi heads the inter-rater reliability subteam and last but not least, Carolyn Wood heads the learning objectives subteam.

## **5.0 Barriers and Obstacles**

As with any project on the level that we are attempting to accomplish, nothing goes according to plan. Thus, there are several barriers that have come up through out the study of our project. The following is a report from each subteam on the obstacles that they have encountered.

### 5.1 Reflective Thinking Subteam

For the reflective thinking research, one barrier was encountered while searching for pertinent research because there is none or very little research that has been conducted in this particular area. Most people have made assumptions that are unsupported by hard researcher. This barrier has no resolution but it does mean that there is no research to confirm our findings with. On average, however, the greatest obstacle to overcome is the amount of research done not in the exact field of interest, but in one of the related fields. This makes the literature review difficult because, when using search terms, there's no easy way to eliminate quantitative research from descriptive research comparing service-learning and reflections. The best way to overcome this obstacle is to read through the different articles.

### 5.2 Groupware Subteam

For the groupware subteam, a barrier was discovered when searching for past documents and work done by the previous semester groupware subteam. Various information and relevant articles weren't securely saved in iGroups/iKnow. However, the obstacle was resolved when the articles and files were located by contacting the team leader of last semester groupware subteam. On average, however, the greatest obstacle to overcome is the amount of research done not in the exact field of interest, but in one of the related fields. This makes the literature review very difficult because, when using search terms, there's no easy way to eliminate research that compares face-to-face communication with groupware-aided communication. In other words, it is difficult to find very similar scenarios to the one of our project because there is a lot research being done in very similar, but differing scenarios. The best way to overcome this obstacle is to just read or at least skim through the different articles dealing with groupware and learning outcomes and go through the references from those articles in hopes of finding more

relevant literature.

### 5.3 Teamwork Subteam

The biggest barrier for this subteam was a death in the family which led to decreased productivity. This will be overcome by really focusing on the tasks and making up the time lost, using spring break if necessary.

Another obstacle encountered by the Teamwork subteam was the lack of experimental designs used to study the effects of team games on teambuilding. To help overcome this, the subteam turned to the written world of books and manuscripts to help in finding literature that would be relevant and reliable. In relation, the Teamwork subteam also found it difficult to find scenarios outside the business world where games are used for teambuilding. The main problem with business games is that they usually involve simulation rather than just teamwork. The IPRO Program may need games that have a broad theme and do not focus on a certain aspect of teams that may or may not relate to all the IPRO teams.

### 5.4 Forecasting Subteam

Regarding the forecasting subteam, there have been no major barriers. The only obstacle was utilizing Java to create a forecasting program. While the subteam had some experience with Java, a better understanding of it would have been more useful. This new knowledge was learned by the subteam. The main obstacle for the future will be finding the best forecasting method. Since the subteam is forecasting student enrollment, there are many unknowns that deal with human choice. This creates an obstacle for trying to form an accurate model. The team plans on finding research on how other universities forecast enrollment to find an accurate model.

### 5.5 Ethics Subteam

For the ethics subteam, the main hindrance has been the overall lack of data regarding the development of ethical awareness. Due to ethics having a huge maturation factor in individuals, it is extremely difficult to ascertain the development of ethics in a student. Data is scarce and the data that is out there has a tendency to paint too much of a certain result of ethics. For example, the majority of testing results are derived from multiple choice questions or from a true/false format. These types of questions tend to pigeonhole ethics into black/white or right/wrong situations, when in fact, ethics cannot be thought of in that way. All situations that require ethical deliberation are simply not black/white or right/wrong and tend to be more complex than that. A resolution of this obstacle has required more research into ethics exams than originally planned. This team plans on pulling examples from current events to illustrate ethical issues for the exam. This will require finding relevant examples that tie into the text being used. Other than that, no other obstacles have been identified.

### 5.6 Inter-rater Reliability Subteam

One barrier encountered by this subteam is the collection of IPRO Day judging data as some of the older data are stored in paper copies and it will take time to be converted into digital copies for direct data analysis. As mentioned in Section 2.6, all the data will be entered to the database by the staff of the IPRO Office and ready for analysis by the week of March 24<sup>th</sup>. This will give the subteam abundant time to process the data and evaluate the results prior to IPRO Day. No further barriers are projected by this subteam and all planned work is expected to be completed on schedule.

### 5.7 Learning Objective Subteam

Because the LO subteam is the only hold-over from previous semesters, few obstacles have been encountered on these final stretches of LO development. The literature review, especially after obtaining experience and practice with such a review in the previous semester, is progressing smoother than expected. The largest barrier presented has been the outbreak of a bad cold, preventing much work from being completed for approximately one week. Because this subteam had been working ahead and had few concrete deliverables due during this week no significant set backs were encountered and a few days of hard work have put the subteam back on track. No other barriers have been identified at this time.

### **6.0 Midterm Presentation Slides**

See attached uploads.