Teaching Systems Analysis and Design Using the Process Game

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ABSTRACT

The teaching of systems analysis and design to students with no background in IS development is notoriously difficult. Most students have great difficulty identifying with both the reasons for a development process and its importance. Many different techniques exist to illustrate both the need for process and the effect of poor process. We propose a fun and simple in-class exercise called "The Process Game", a variation on the popular card game Rummy, which can be used to introduce both of these concepts to students. Experience indicates that students readily grasp the effect of changing specifications and processes on achieving the final goal. A pre-test and post-test experiment is proposed to measure the student subjects' understanding of the concept of process in systems analysis and design, along with the importance of following a defined process.

Keywords: Teaching, systems analysis, process learning, experiential learning.

INTRODUCTION

It is a well known adage that experience is the best teacher. The teaching of systems analysis and design to students with no background in IS development is notoriously difficult. Most students have great difficulty identifying with both the reasons for a development process and why it is important. Adding an experiential component to the teaching of software systems analysis and design is also a difficult task as many of the concepts require an in-depth project, case study, or background.

Individuals attempting to teach systems analysis and design to students at all levels, from secondary school to corporate offices, have faced the same dilemma from the beginning: "How can I introduce this subject to my students in such a way that they grasp both the subject itself and its importance to the success of all types of information systems development projects?" The failure to grasp these facts has been shown to be a major contributor to the poor success rates of these projects (Standish 2004).

This paper proposes a method which uses a game to teach students the importance of one aspect of good analysis and design practice, communication, and shows the effect of less than optimal communication on the achievement of project goals. The balance of this paper consists of a brief review of earlier research on teaching systems analysis and design, an introduction to the game, a research question suggested by the use of the game, a proposed experiment to test the perceived effectiveness of the game, and a discussion of our future research agenda.

BACKGROUND

The struggle to teach the concepts of systems analysis and design (SA&D) to students who find it difficult to internalize either the concepts or the processes has been the subject of extensive scholarship spanning the information era. As early as 1982, Golden (1982) was describing how industry leaders were decrying the poor state of the then-current methodologies for teaching SA&D and the steps educators were taking to address the problems. Later, Olfman and Bostrom (1992) proposed expanding the viewpoint of the role of the analyst taught in the classroom to include facilitation skills and creative thinking skills. They also proposed the addition of experiential learning to the classroom. Larmour (1997) surveyed present and former students seeking to identify those areas where SA&D training was adequate and those areas where improvements could be made.

As the methodologies used in industry to develop information systems applications evolved, the course focus in SA&D also changed. Kendall et al. (1996) made a case for expanding the traditional SA&D to include experiential elements as proposed by Olfman and Bostrom (1992).

The move to the object paradigm in industry should be reflected in a change of focus for modern SA&D courses. Although the evidence about the movement of industry to OO is substantial, there is still an ongoing debate with academia concerning whether to teach traditional structured design or OO (Mahapatra et al. 2005). Since the object paradigm seeks to create a representation of the problem space where object characteristics and behaviors model those of the actual objects, it is imperative that new SA&D students learn to use the object paradigm effectively. Brewer and Lorenz (2003) urged that "educational institutions must also begin educating analysts to create informative models based on OO principles" (54). To fully implement the teaching of object principles in the SA&D classes, many different approaches are being proposed, including Appreciative Inquiry (Avital 2005).

THE PROCESS GAME

As a possible remedy to the problem of students failing to grasp the reason and importance of using a defined process in systems analysis and design, we propose the use of a short, hands-on workshop called "The Process Game" to teach students about the importance of good communication and the consequences of insufficient communication. The game is fun, easy to play, and doesn't require an in-depth project or any type of case study. The entire workshop can be completed in less than an hour. The game uses a variation of a well-known card game - something most students have experience with. In our experience, it has consistently proven to drive the point home about the importance of communication. This workshop has been presented in the classroom at the undergraduate level and at several professional conferences. Each time the game is played, students comment that it helped them to see the importance of communication and how a solid process can assist in situations where communication is difficult.

The basic idea of the process game is to divide the students into a number of groups. Each group has a different communication method. Each participant in the group gets an incomplete set of rules for the card game. A few participants in the group get the remaining rules, but the game is set up so that no one individual (except a 'user') has a complete set of rules. Some groups will have a user who has a complete set of rules and variations of the game. The goal of the groups is to figure out how to communicate and play as many rounds of the card game as possible in 25 minutes. After the game is played, each group will have a representative stand up in front of the class and explain their communication mechanism and the problems they had playing the game. After all of the groups have debriefed the class, the instructor must relate the communication methods to real world applications.

Variations Among Groups

There are 2 dimensions that are varied for each of the groups, communication mechanism and user involvement. The following table describes the mix for each group.

Group	Communication Mechanism	User Involvement
Group 1	Via Email Only	No additional user
Group 2	Via Email Only	Additional user involved
Group 3	Via Telephone Only	No additional user
Group 4	Via Telephone Only	Additional user involved
Group 5	Open Communication	User inserted at last 5 minutes
Group 6	Open Communication	User involved until last 5 minutes

Communication Mechanism Descriptions

Groups designated as "Via Email Only" must communicate only in writing - no hand signals or speaking at all is allowed. One person in the group is selected as the mail server, responsible for routing emails between each player. Players do not hand the emails directly to other players, but hand them to the email server. Emails to more than one person will be routed (passed) by the mail server from one person to the next person. Players must also not email the rules between to other, but can email their interpretation of the rules. Note that students can't see each other's hands, the deck itself, or any discarded cards. This information can only be shared via email, therefore one of the participants in the group must be responsible for managing the cards in the deck.

Groups designated as "Via Telephone Only" can only communicate via telephone (speaking). The group cannot show each other diagrams, papers, write-ups, cards, or use hand signals. The groups can hold conference calls with multiple people. Members of this group cannot just read the rules, but must explain them. As with the Email group, students can't see each other's hands, the deck itself, or any discarded cards. This information can only be shared via telephone, therefore one of the participants in the group must be responsible for managing the cards in the deck.

Groups designated as "Open Communication" have free communication, essentially sharing anything the members have or know. As with the other groups, students in this category can't just read the rules or pass them around, but must explain them.

User Involvement Descriptions

Users get an entire set of rules as well as a section of rules designated as variations. The goal of the user is to introduce a different variation for each round. The variations are not cumulative (only one variation per hand). The user is part of the group and can facilitate or assist in any way he/she would like as long as he/she conforms to the communication mechanism.

The group designated as "Open Communication" with a user involved until the last 5 minutes must not be made aware that the user is going to be pulled from the group at the end, it must be unexpected both on the part of the group *and* the part of the user.

The group designated as "Open Communication" with a user inserted at the last 5 minutes must be told that they have no user - the insertion of the user must be unexpected. In order to accomplish this, a student must be removed from all participation and NOT assigned to any group; keep this in mind when determining the groups. Tell this student that he/she is a user and give the student the entire rule set and the variations. Instruct the student to read the rules and practice if needed. This student will become a relative expert on the game when inserted.

Determining Groups

A group consists of 4 to 6 players. It is important to avoid selecting players who are already in informal social groups as that will effect their communication. Ideally, there should be six groups (24 - 36 students). If there are more than 36 students taking part, repeat the six communication methods - don't create groups larger than six participants. If there are less than 24 students, limit the group communication by eliminating Group 6, Group 5, Group 4, and then Group 3, in that order. The game requires at least two groups (8 participants).

Rule Distribution

The rules for the card game are divided into three segments. There is an incomplete set of rules that is distributed to everyone in the group. There are two sets of additional of rules that are distributed to other players in the group. This ensures that nobody in the group has all of the rules. If there are more than 4 players per group, the two sets of additional rules are copied and distributed to four players in the group. For example, if there are six players, two people will have only basic rules, two people will have the basic rules and the first set of additional rules, and two people will have the basic rules and the second set of additional rules. The game cannot be played without employing all of the rules, so distributing the rules insures that the group must communicate. Although all of the groups are actually playing the same game, it is important to tell the groups that each group may have a different game to play so that the groups don't listen in to another group's game.

Playing the Game

The first step in the game is to distribute the instructions for the process game, but not the rules for the card game. These rules describe each group's communication mechanism and user involvement. The actual rules of the card game will be distributed when play begins. As you distribute the instructions, allow the participants to read them, but don't allow them to discuss the instructions until you give them the signal to start organizing.

The groups are given a signal that they have 3 minutes to organize themselves using any means of communication they'd like. Instruct them to determine who is the group leader (if they want one), who is the user (if applicable), and anything else that they need to decide (mail server, names for mail, scribe, etc).

After 3 minutes, distribute the rules, making sure that everyone gets a copy of the partial rules and the additional sections of the rules are distributed. The user instructions are also distributed. The participants are instructed not to read the rules until the instructor signals. Once all of the rules are distributed to all of the groups, the instructor gives the signal to start the game. Tell the participants that they can spend this time organizing more (within the parameters of the communication mechanism), but at the end of 25 minutes, the game ends and the participants must stop all activities.

After the game is over, each group will spend 2 - 5 minutes talking about what happened. The instructor may have to guide the participants to describe the group's communication mechanism and the problems inherent as well as the effects of a user with ever-changing requirements.

The last step of the process game is for the instructor to relate the communication mechanisms to real world situations. Group 1 and Group 2, where communication is only via email, can be related to a geographically dispersed organization. Email is often used as the primary form of communication when a branch office is located in a country such as Australia or India and the main office is in the United States making organized meetings difficult because of time zone considerations. Group 3 and group 4 use only telephone communication and no written documentation. This type of communication can be likened to agile processes where documentation is marginalized and oral communication is emphasized - i.e. extreme programming. Group 5 and 6 are mainly affected by user involvement, which is typical in many large organizations where the user is in high demand.

RESEARCH QUESTION

The Process Game, as a game, provides a fun-based means of interacting with others in various defined ways. The Process Game, as a teaching tool, is designed to expose students to the importance of having defined processes to follow in seeking to accomplish a task. The use of the game in a SA&D class to accomplish this goal suggests the following research question:

R_0: Does the use of the Process Game have a improve students' understanding of the use of process in systems analysis and design?

The pursuit of an effective means to illustrate to students the importance of using a defined process in SA&D has been the focus of a great deal of reasoned thought and research, as illustrated earlier. Our proposal to use a modification of a familiar game setting to draw students into an experiential learning environment

is a new approach, to the best of our knowledge. After playing the game, they can evaluate the benefits realized by having defined communication process to exchange information.

PROPOSED EXPERIMENT

Research questions themselves are generally not testable. As a consequence, it is necessary to define a hypothesis that can be tested with an experiment. The testable hypothesis for our research question is:

H_0: Playing the Process Game will have a positive impact on the student's perception of the importance of process in systems analysis and design.

The Process Game itself does involve any specific outcomes, the value of which can be used as a construct to represent any change in the students' understanding of the importance of process. It is necessary therefore to design a different type of measure that will generate the necessary construct. We intend to create a short questionnaire to be given to the students before and after participating in the Process Game. The questionnaire will list ten project related tasks, one of which is communication, that the students will assign a value representing its importance to the project. Our test for the hypothesis will be to evaluate the changes in the assigned values pre- and post-test.

CONCLUSION

We are currently conducting pilot tests of the test instrument and the experimental process. If we can secure sufficient numbers for statistical validity, we intend to report the full results of our experiment at the conference. If not, we will report the results of the pilot study.

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(Note: Complete Directions for the Process Game are available on request)