AC 2010-1825: THE CREATION AND VALIDATION OF MEASURES FOR ETHICS IN CROSS DISCIPLINARY STUDENT TEAMS

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The Creation and Validation of Measures for Ethics

In Undergraduate Cross-Functional Teams

Abstract

This paper is a progress report on the ethics component of a collaborative effort involving team- based project programs at four universities: the IPRO program at Illinois Institute of Technology, the Integrated Product Development program at Lehigh, the Enterprise program Michigan Tech, and the EPICS program at Purdue. The ethics component has the following specific goals: 1) development and validation of instruments to measure ethical proficiency of undergraduate students on multidisciplinary teams; and 2) identifying and developing best practices for creating ethical awareness of the student. Two ethics measures have been developed at IIT and pilot studies started: one presenting ethical situation vignettes with multiple choice answers based on a previously validated method; the other to study ethical climate. These measures have been revised based on initial small pilot studies and are presently being administered at multiple sites.

Introduction

Many business organizations have been changing their approach to problem solving from a structure with predominantly mono-disciplinary interaction sequentially with each other to multidisciplinary cross-functional teams who work longitudinally from idea creation to client satisfaction[1]. Cross disciplinary teams consist of members with different functional experiences and abilities, and will likely come from different departments within the organization. This shift to multidisciplinary teams has created a need for everyone to develop new skills such as communication with fellow members from other disciplines and an awareness of a broader set of ethical principles. Many organizations adopting the cross disciplinary team approach have found it necessary to provide focused employee training to enhance effective team functioning[2]. Recent work has been done to explore the dimensions that attribute to success in these teams. [3]

As colleges and universities became aware of this change, many of them created new courses to better prepare their students to meet these new challenges. The undergraduate equivalent to cross disciplinary teams usually involves students in different academic majors; the extent of academic heterogeneity (e.g., different engineering specialties or including students in engineering, architecture, psychology, business, etc.) varies, and, with that variability, the challenges in teamwork processes – and recognizing ethical issues and determining how to deal with them. Ethical issues may concern the team process itself, or the decisions made about the problem the team is addressing.

Faculty who teach the undergraduate team-based courses mentioned above have observed, anecdotally, that many students have a poor grasp of ethical issues that are relevant to their projects.[4] This is a progress report on the ethics component of a collaborative effort involving team- based project programs at four universities: the IPRO program at Illinois Institute of Technology, the Integrated Product Development program at Lehigh, the Enterprise program Michigan Tech, and the EPICS program at Purdue. The ethics component has the following specific goals: 1) development and validation of instruments to measure ethical

proficiency of undergraduate students on multidisciplinary teams; and 2) identifying and developing best practices for creating ethical awareness of the student.

In two of our programs, students have been asked to reflect on their experience, specifically to "Identify the ethical issues relevant to your project group. Explain each of these issues, and how you dealt with them." Many students said there were no ethical issues or provided overly simplistic descriptions of team functioning, for example, classroom participation: students would come to class and use their computes for non-project related matters; attendance: students would hardly come to class and leave early; and failing to complete deadlines: students would miss deadlines without contacting the group. It seems particularly difficult for students to identify ethical issues that involve how their design decisions may impact the ultimate end users.

These reflective essays have provided a useful tool to begin the measurement of student understanding of ethical issues. However, we do not have a standardized, reliable and validated rubric for coding such responses, and they are time and expert-intensive to use widely as measures. When administered on-line, resistance from students is often substantial.

For these reasons, our team set out to identify psychometrically sound tools with which to measure the ethical competencies desired among our undergraduate students. Other types of tests such as Defining Issues Test (DIT) [5] are generally considered by the educational research community to be inappropriate because the subject is low in fidelity and too far removed from the situation, meaning that the situations are unrealistic. Additionally, the DIT is cumbersome to interpret, requiring the assistance of a professional trained in interpreting the test results.

So far, after consulting with other experts in ethics, we have not identified measures that we consider appropriate to use with our teams. Thus, we have been developing measures that we hope will be appropriate and useful to measure something like "ethical competence" at the undergraduate student level. We are doing this in order assess our varied educational programs, and to identify the best practices in different contexts.

This report focuses on measures being developed at IIT, using the InterProfessional (IPRO) program as our primary partner. Our partner program at Purdue, the Engineering Practice in Community Service (EPICS) is also developing an ethics curriculum and measures; they are reporting elsewhere on their work.

Measures Under Development and Preliminary Results

Ethical decision-making (EDM)

Our approach is based on that used by Mumford[6] to explore ethical decision making behavior in educational research. We are now in the process of supplementing the reflections with a quantitative measure involving situational judgments that provides plausible scenarios involving ethical issues followed by a set of viable responses; students select the response that most closely describes their likely course of action in the situation. By presenting situations that they realize might actually occur, rather than hypothetical ones, the tendency to select "socially desirable" answers is diminished. Concerns included research integrity, group interactions, professional etiquette, consequences for the team, and others.

Each question consists of an ethical dilemma followed by six possible responses. While all responses are plausible, two options are designed to capture highly ethical responses, two are moderately ethical response options, and two are marginally ethical responses to the dilemma. Students are instructed to select the two actions they would most likely make.

Below is a sample question:

> You are the public relations director of a non-profit organization and works closely with other members of the leadership team. Your close friend is the treasurer of the group and has been displaying behaviors that reflect poorly on the team. She has often been late to meetings, plays on the computer instead of listening to the discussions at meetings and makes promises to members of the organization that the leadership team has not approved and would be unable to fulfill.
>
> You have brought these issues to the friend's attention. After seeing no changes in behavior, you take the matter up with the president. At the next regularly scheduled meeting the president brings up all the issues you mentioned and some of her own that she has seen and calls for an immediate vote to terminate the treasurer without giving an opportunity to defend herself. You are shocked by this unilateral action.
>
> What would you do? Choose two of the following:
>
> a. Speak up in defense of the friend
>
> b. Vote against terminating but say nothing in public
>
> c. Vote for termination but say nothing in public
>
> d. Request a halt to the vote to discuss it further with the team
>
> e. Bring the issue up with the president after the meeting to voice concerns
>
> f. Abstain from voting, citing conflict of interest

Two pilot studies have been conducted with this instrument. The first involved a qualitative interview about how students were responding to seven dilemmas such as the one described above. Respondents included 10 students who had previously completed one or two semesters of a team based project in the IPRO program. The goals were to learn their thought processes in answering the questions, identify possible ambiguities in wording, and gauge the believability of the dilemmas and appropriateness of the six possible "answers". The feedback was used modify the questions. We then wrote three additional questions to broaden the scope of the survey.

The second study used five of the 10 questions selected at random and were answered on-line by 54 self-selected student volunteers who had just finished a team project course. An analysis of difficulty and reliability estimate led to the removal of two scenarios; the remaining eight questions had a reliability of 0.71, which is considered psychometrically acceptable. Additional scenarios will be created and subjected to the same reliability screening.

Ethical Climate

Another topic of interest to us is the "ethical climate" in project teams. Climate in organizations is defined by Denison[7] as the shared perceptions that individuals within a team or organization hold toward an aspect of the organization. Typically, climate is measured "for something" i.e. a climate for service, safety, and in our case ethics. Although most of the research on ethical climate has been reported in business and industrial/organizational psychology literature, it seems reasonable and important to measure it in our undergraduate project teams. We expect that our students' perceptions about appropriate ethical behavior will be influenced by program assignments, faculty member guidance, and intra-team discussions.

Victor and Cullen[8,9] have led the research on organizational ethical climate and have created validated measures which are widely used. On the basis of their research, they organized responses in terms of three different loci of analysis: the individual, the local unit (e.g. team, or division) and the cosmopolitan level (e.g. society in general), and across three different ethical criteria: egoism, which puts the individual first, benevolence, which puts team members and other individuals need above their own, and principle, a preference for following laws and codes. By examining patterns of responses, they identified five "climate types", which they termed instrumental, caring, independence, rules, and laws & codes. We will do similar assessments when we have collected sufficient data across sites.

We have modified the original 26-item Victor and Cullen Ethical Climate Questionnaire by consulting with several former IPRO students and removing six items they considered irrelevant. The modified 20 item questionnaire was piloted at IIT with 54 IIT/IPRO students in December, 2009. The questionnaire uses a six point Likert scale ranging from "totally agree" to "totally disagree." The measure had an overall reliability estimate of 0.87 with the following subscales: laws & professional codes 0.86, institutional rules 0.85, instrumental 0.79, benefit to the team 0.76, and independence 0.65.

The dimensionality of the 20 items from the Ethical Climate Questionnaire for Cross-disciplinary Teams was analyzed using a principle components factor analysis. A factor analysis is a statistical method that describes the variability of a measure and combines similar variances into common factors. These factors reflect measureable dimensions within a survey. Three criteria were used to determine the number of factors to rotate: the a priori hypothesis that there are five unique dimensions, the scree test, and the interpretability of the factor solution. A scree test shows the variance of each factor in a graphical representation, such as in Figure 1. Values above one indicate a unique and interpretable factor. The scree plot and factor solution indicated that there are five components. The factor correlations were low, so orthogonal rotation was appropriate. Orthogonal rotation assumes that the factors are uncorrelated. This method also emphasizes the interpretability of the factors, making the data easy to interpret. Based on this reasoning, five components were rotated using a Varimax rotation procedure. The rotated solution, as shown in Table 1, yielded five interpretable factors. The first factor accounted for 17.05% of the item variance. The second factor accounted for 16.35% of the item variance. The third factor accounted for 15.87% of the item variance. The fourth factor accounted for 14.09% of the variance. The fifth factor accounted for 11.12% of the variance.

The data provide initial evidence that ethical climate is relevant to undergraduate research teams. The ECQ needs a few further revisions in order to successfully evaluate the ethical climate of undergraduate teams. The analyses indicate that four items should be removed from the questionnaire because they do not clearly load onto single factors. There are five clear factors, representing the different types of ethical climate. However, it seems that a few of the items did not adequately sample the last two ethical types. We will include additional items of caring/ benefit to the team and independence in the next revision of the measure.

Our original intent was to use r_{wg} when deriving the plan on how to analyze the measure of ethical climate. The statistic r_{wg} is a method of calculating the level of agreement within a group of people.[10] Climate is a group level phenomenon and r_{wg} is the most common method to measure the consensus of a group's attitude. Although we received many responses, the greatest number of responses for any team was 5 or fewer. We decided this was not adequate for a team sample size to compute r_{wg}. Data collection is still in progress and for a future research project we will be using r_{wg} to measure the differences in ethical climate between the various teams. In our next endeavor we will analyze the measure using r_{wg} to measure the differences in ethical climate between the project teams. We would like to be able to determine if a link exists between a team's ethical functioning and certain outcome variables such as performance, commitment and satisfaction. Future researchers should also validate the ECQ for undergraduate teams. As we prepare students to enter the workforce, we need to give them the tools to handle the challenges of their new environments.

Discussion: Identifying Accomplishments, Challenges and Next Steps

At this point, we are pleased that we have created several measures which we can use to assess the kinds of ethical reasoning used by undergraduate students when thinking about realistic applied problem solving in the work domain, and the perceptions they have about the ethical climate of their project. We are working on measures that might capture their level of ethical reasoning, in terms of developmental models, and the ways in which they use common or "standard" models of ethical decision making. We recognize that the challenges are very complex, particularly when we are trying to go beyond the undergraduate situational ethics such as plagiarism, cheating on exams, and irresponsible/ negligent/ covering behavior in teams.

There are a number of challenges to integrating different approaches for both measure and curriculum development across schools. The cross-disciplinary expertise of our four-program research team has clarified these issues. Our research team has faced issues similar to the undergraduate teams that are being studied. Because individuals come from different disciplines and professions, our team has had to learn how to communicate effectively. The terminology across fields is sometimes very different; sometimes the same word can have different meanings in different fields (i.e. *authentic*). Additionally, the conceptualization of the issues has been problematic. For example, everyone had to work together to develop similar definitions of "ethical awareness". Moreover, the team needs to be cognizant of individual program needs. The team works to create measures that will work across institution, but the schools are also concerned with the measures fitting well with their program. Finally, the team has dealt with incongruities in approaches to teaching and thinking about ethics. After a period

of storming, the team has worked on transparency and communication. Many issues have been overcome and the team is currently running more efficiently.

We have several steps ahead. First, the EDM and EC measures are being administered at the four partner sites at the end of the spring 2010 semester. This will provide us with data across sites that can give us some understanding of "baseline data". Because we will also be collecting data about the kinds of experiences that might affect EDM and EC measures (e.g., whether the students perceive that emphasis was placed on ethics during team discussions, whether the individual participated in any "ethics training" modules, whether they participated in a Reflection exercise that emphasized ethics, etc.) we can begin to identify the "best practices" that are linked to more positive outcomes.

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Table 1

Factor loadings and communalities based on a principle components analysis with Oblimin rotation for 20 items from the adapted version of the Ethical Climate Questionnaire (ECQ) (N = *54)*

	Dimensions					
	Laws and Codes	Institutional Rules	Instrumental	Benefit to team	Independence	Communality
People are expected to follow their own personal and moral beliefs	**.60**	-.05	.34	-.33	.56	.82
People look out for each other's good	**.58**	-.08	-.06	.56	.30	.74
People are expected to comply with the law or rules and professional standards over and above other considerations	**.78**	.15	.01	.33	.14	.77
Our major concern is always what is best for the other person	**.75**	.51	.05	-.01	-.02	.82
People are expected to strictly follow the team charter or professional standards	**.86**	.32	-.11	.09	.03	.86
Successful people strictly obey the IPRO team policies	**.43**	.40	.15	.41	.13	.55
It is very important to follow strictly IPRO's rules and procedures	.14	**.95**	.04	-.01	.06	.93
The first consideration is whether a decision violates any laws or rules	.30	**.45**	-.19	.43	.26	.58
Everyone is expected to stick by IPRO rules and procedures.	.25	**.83**	.02	.25	-.01	.81
The law or ethical code of my profession is a major consideration	.30	**.65**	-.06	.37	.36	.79
People are out mostly for themselves	.23	-.08	**.74**	.28	-.07	.68
People are expected to do anything to further the team's interests	.23	-.26	**.56**	.39	.08	.60
There is no room for one's own morals or ethics	.02	.28	**.61**	.56	.30	.76
Each person decides for oneself what is right and wrong	-.18	.01	**.76**	-.13	.28	.70
People protect their own interest above other considerations	-.08	.08	**.76**	-.01	-.02	.78

The most important concern is the good of all the people in the team.	.14	.42	.03	**.69**	-.06	.67
Our major consideration is what is best for everyone in the team	.37	.36	.26	**.56**	-.08	.82
Each person is expected, above all, to work efficiently	.01	.04	.26	**.81**	.22	.78
People are guided by their own ethical principles	-.07	.14	.50	.21	**.71**	.82
It is expected that you will always do what is right for the end users and possible consumers and public	.21	.18	-.14	.18	**.82**	.80

Figure 1

Scree Test for Ethical Climate Questionnaire