

EXPERT PANELS AS A MEANS OF ENGAGING STUDENTS IN THE APPLICATIONS OF HUMAN FACTORS

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Large class sizes make it difficult to provide meaningful and engaging opportunities to connect students to real world applications and consequences of human factors research. In an effort to address this, students in a senior year human factors class participated in a weekly expert panel, either as a panelist or as an audience member. The expert panel exercise mimics news conferences, panels and other media settings in a way that engages students and provides time-efficient opportunities to demonstrate how human factors principles are reflected in real world incidents and accidents. Initial experience with the expert panel has been promising and appears to be a valuable means of promoting a deeper understanding of applications of human factors knowledge in large classes.

INTRODUCTION

Finding ways of engaging students in the human factors classroom can be challenging. Demonstrating the application of key human factors principles and knowledge to real world examples is an important step in engaging students and kindling interest in the theories and explanations behind human behavior. Demonstrating the connection between theory and practice often involves studying example cases of accidents or incidents.

As class sizes increase it becomes more and more challenging to engage students without consuming ever increasing amounts of class time. Having students prepare individual presentations is inefficient in its use of classroom time in large classes. Written case study assignments provide limited opportunities for interaction between students. Group assignments provide opportunities for interaction but it is not always clear that all students are engaged and participate.

In order to encourage interaction between students, provide opportunities for in-depth application of human factors principles, and facilitate the development of confidence in their ability to apply, present, and defend a human factors analysis of critical incidents and events, a novel teaching technique was introduced in a senior year human factors course called "Cognitive Ergonomics." The

new teaching technique involved student participation in "Expert Panels."

Modeled after academic conference panels, news conferences, and/or testimonials before congress, the expert panels provided opportunities for students to critically analyze an accident or incident using course concepts. Participation in the panel forced students to be prepared to publicly defend and discuss their viewpoint and analysis. Student response to the expert panels was positive and reflected a greater engagement with lecture material.

This paper describes an initial implementation of expert panels and student comments and feedback. Lessons learned and suggestions for alternate implementations are also discussed.

BACKGROUND: ENGAGEMENT IN HUMAN FACTORS EDUCATION

The theoretical aspects of advanced human factors classes, in particular the abstract cognitive concepts and psychological theories, can make engaging students a critical challenge for educators. Stone and Moroney (1998) have described multiple activities that can be used as part of undergraduate human factors courses including: hands-on classroom exercises such as pseudo-entrance exams, design projects, and the use of case studies. Other examples of engaging activities have included evaluating power-plant interfaces

(Rantanen and Gonzalez de Sather, 2003) and designing common objects such as an “Exit” sign (Dyck, 2007). In large classes, however, managing such activities can be challenging and an onerous burden on the instructor. Furthermore, it can be difficult to create opportunities that provide a variety of desired learning experiences including the application of human factors principles, the development of effective communication skills, and practice cooperating and operating as part of a team.

THE EXPERT PANEL

Examining the causes and circumstances of accidents and incidents is an important tool for learning how system design impacts user decision making. The critical analysis of such incidents provides an engaging means of illustrating the application of underlying theoretical constructs and concepts covered in the human factors classroom.

In the expert panel exercise, a subset of students deeply investigate one accident or incident involving human factors issues and present themselves as an expert resource for the rest of the class. The expert panel exercise was developed to provide an opportunity for students to demonstrate an:

- ability to relate concepts of interest in the course to real world events and incidents,
- ability to articulate and communicate insights into sources of design failure, and
- ability to demonstrate practical understanding of the concept of interest by suggesting design improvements.

Each week a “vignette” from the book, “The Atomic Chef: And Other True Tales of Design, Technology, and Human Error” (Casey, 2006) was selected that had a close relation to that week’s lecture topics. This book presents 20 examples of incidents or accidents highlighting the importance of understanding the match between human capabilities and the systems they control. For example, in a week where the lecture discussed

theories of decision-making, the story selected described the public policy decisions made during the ill-fated initial introduction of the polio vaccine (“Safer than Safe”).

Each week, all of the approximately 60 students in the class were expected to read the story while six students, grouped into three pairs, formed the expert panel.

The expert panel exercise comprised two parts:

- A pre-class investigation and written submission
- An in-class question and answer session with the panel of student experts

Pre-class Investigation

In the first part, each pair of students reviewed the short story and jointly prepared a 2 page written submission covering four key areas:

- a brief summary of the incident / accident,
- a discussion of how that week’s lecture topics related to the incident,
- a summary of similar incidents or accidents based on their own independent research,
- suggested design changes that would improve system operation and/or mitigate the potential for such an incident occurring again.

Students worked in pairs and received half of their mark based on the written submission.

In-class Expert Panel Session

Each week the last 20 minutes of a class were dedicated to an expert panel session. That week’s expert panelists moved to the front of the room and sat facing the remainder of the class in a single row on a raised platform.

Each expert panel session had three parts:

- An introduction and summary of the incident by the instructor
- An initial series of guiding questions posed by the instructor to each panelist
- An open forum with questions from other students in the audience

The instructor would begin the session by providing a brief 5 minute overview of the incident, covering the major factual details. This was designed to ensure that all students in the audience had at least a rudimentary understanding of the story background.

This was followed by a question from the instructor to each pair of panelists. Both members of each group were expected to independently answer the question providing audience members a broader range of opinions and perspectives. The guiding questions were designed to focus the discussion on the key issues surrounding the incident and provided an opportunity to ensure that all panelists had at least one opportunity to contribute to the discussion. For example, a question posed during the week on decision-making was: "What role did each policy maker's biases and heuristics play in this case?"

The heart of the discussion occurred when the questioning was turned over to the remainder of the students in the class. Non panel members were expected to have read the short story but not have done any additional readings. Approximately 10 minutes were provided for questions from the audience regarding the incident itself, what design modifications had occurred or were recommended, and any other aspect of the incident that prompted discussion and insight.

RESULTS & FEEDBACK

No formal evaluation of the efficacy of the "expert panels" has been conducted but anecdotal feedback from students as well as solicited comments indicate it was well received and relatively effective

at engaging students. Students clearly put effort into their preparation and engaged fully in the exercise as panelists. Both panelists and audience members were engaged as in no cases during the term was there a shortage of questions and on multiple occasions the discussion prompted was cut short only due to the limitations of classroom time. Multiple students identified the expert panels as "fun" in standard course evaluations and described the exercises as adding to their understanding and engagement with the class material.

Comments received during an end-of-term survey were also consistent with the engagement of students by the expert panel. As one student wrote "It was a valuable exercise as it helped us to apply the concepts that we learned in class to real life, and thus helped to reinforce those concepts. It also was a type of a motivational factor, showing us why we need to learn cognitive ergonomics."

The requirement to be prepared to face unknown questions from the class clearly motivated some of the students. For example one student commented: "having the added pressure of presenting in front of our peers forced us to make sure that we knew our topic and concepts thoroughly, causing us to discuss/debate the application of the concepts further. We may not have done this if we didn't have to present in front of a class."

Additional comments validated the value students placed on hearing a variety of perspectives on incidents. While far from conclusive, the overwhelming feedback suggested that the expert panel can be a valuable tool for the teacher of large classes and helps engage students in the practical applications of human factors.

DISCUSSION: LESSONS LEARNED AND IMPLEMENTATION CHALLENGES

Discussion Questions

Developing an effective set of initial guiding questions is an important consideration in implementing the expert panel exercise. Separate questions for each pair of panelists provided

multiple opportunities to highlight specific issues in the incident connected to that week's lecture topics.

In general, questions posed by student audience members were on-topic, relevant, and informative. Many times, the questions posed by students prompted interesting discussions between panelists who had differing perspectives or between the panelists and the audience who were having some underlying assumptions challenged by the experts.

Ensuring that student questions are relevant and on-topic is one of the challenges of the exercise. Encouraging and requiring equal participation by all members of the audience can also be challenging as is ensuring that audience member participation is not dominated by the same class members. Variations addressing these challenges could include requiring audience members to submit questions beforehand, randomly selecting students to ask questions, and/or using modern electronic class management technologies such as online discussion boards to promote class self-management of the questions to be posed.

Timing Relative to Course Content

A significant challenge in implementing the expert panel exercise is identifying an appropriate timing of the panel relative to the classroom content the incident or accident revolves around. The initial implementation had the panel exercise in the last 20 minutes of the second lecture of each week. This made the exercise topical and offered a close link between the lecture material and the subsequent discussion in the expert panel exercise. Unfortunately this also denied the students on the panel the benefit of being able to reflect upon and incorporate the lecture into their own perspectives of the incident. Scheduling the exercise for a later date (e.g. a following week or separate tutorial session) would partially address this concern but loses the close connectivity between lecture discussion and the example incident.

Evaluation

Assessment of the written submission is relatively straightforward however evaluating student

participation as a panelist is much more challenging. Student performance as a panelist was evaluated across a range of factors including participation, their knowledge of the case, their ability to demonstrate reading/research beyond the case, and their capability to work cooperatively with other panelists. The initial round of guided questions ensured that each student had at least some opportunity to speak and participate. However, the unstructured and dynamic nature of the interactions between panelists and variety of opportunities to respond makes it difficult to individually assess each student's contribution. No attempt was made to evaluate student participation as an audience member. Introducing such evaluations and improving the evaluation process for student panelists will be addressed in future implementations.

Panel Size

From the initial experience, six panelists is likely an upper bound on the number of panelists for which such an exercise is effective. While the initial round of questions guaranteed at least a minimum participation level for each panelist, the ability of each panelist to contribute to the discussion would likely be compromised with an expanded panel. Steps were taken to emphasize to the panelists that their role was that of a collective. Students were explicitly cautioned throughout the term that the object of the assignment was to work cooperatively, in the same way as if they were on a panel at an academic conference, or as a panel at a news conference. For the most part students respected each other and showed learning in 'cooperative' turn taking and an ability to build on each other's answers.

SUMMARY

The expert panel exercise is an opportunity for students to focus on one incident or accident textbook in depth and to practice communication and teamwork skills. By empowering students to develop expertise in a particular topic area, the remainder of the class benefits from the range of unique perspectives and insights into a problem

area. Particularly in large classes where effectively engaging students can be challenging, expert panel exercises provide a promising opportunity to promote interest in the applications of human factors principles and knowledge.

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