

Innovative Thinking: Encouraging Creative Diversity with Video Scenarios

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Abstract— This highly participatory Special Session introduces video scenarios as a collaborative approach that enables students to hone innovative thinking skills while experiencing how diverse viewpoints contribute to innovation. The videos present fictitious scenarios involving individuals experiencing a variety of problems for which the audience is challenged to think of creative technology-based solutions. Emphasizing conceptual solutions, decoupled from implementation, allows students with a variety of ability and experience levels to participate equally in the exercises, highlighting the value of all voices in the creative process. It also allows the videos to be used in a wide of range classes from the general education and introductory levels through senior capstones in both computing and engineering. Participants in this special session will experience how video scenarios provide a platform that highlights the influence and value of diversity for creative problem solving while developing and honing innovative thinking skills. By taking part in a variety of activities, the participants will be ready to use video scenarios to easily bring collaborative exercises for innovative thinking into their classes. Videos and discussion prompts are available at www.youtube.com/virt-university in the Creativity College.

Keywords— *innovation, diversity concerns, creativity, individual differences, collaborative learning, experiential learning*

I. INTROCUCTION AND GOALS

This highly participatory Special Session introduces video scenarios as a collaborative active learning approach to encouraging the development of, and appreciation for, the creative interplay of diversity and innovation. Each 3-5- minute video presents a scenario involving fictitious companies or individuals showing or discussing a variety of problems for which the audience is challenged to think of creative technology-based solutions [1], [2]. However, the problems are not presented as an unambiguous set of issues or requirements. Rather, the problems are presented as perceived by the individuals experiencing them, which is in a conversational manner that may be vague, convoluted or incomplete [3]. By presenting opportunities for innovation in the context of diverse individuals with unique needs, video scenarios also highlight the role of a client's ethos on their perception of the

problem and the acceptability of possible innovative solutions. In addition, video scenarios provide a setting in which creative solutions can be identified and developed, decoupled from the need to implement them. This decoupling allows students with a variety of ability and knowledge levels to participate equally in the exercises, highlighting the value of all voices in the innovative thinking process.

Innovation is a process of applying information, imagination and initiative to generate new ideas that can be converted into useful products to meet new requirements, unarticulated needs or existing market needs [4]-[6]. Innovative thinking encompasses the skills that contribute to the process of innovation, including active listening, critical observation and creative problem solving. Beyond gathering requirements, active listening and critical observation extend to identifying both spoken and unspoken needs and opportunities, and developing an understanding the client's ethos. Unlike written specifications, the video scenarios reflect the fact that real world problems have real world people behind them, whose personalities and viewpoints may be even more diverse than their problems. By showing clients discussing or experiencing a variety of issues, video scenarios provide students with the practice of identifying opportunities for innovation in the context of the diverse people whose needs, viewpoints and preferences must also be considered in any solutions.

By presenting opportunities for innovation in context, video scenarios highlight the interplay between diversity and innovation from both the client (problem) side and the consultant (solution) side. From the client side, video scenarios provide an engaging, active learning environment that exposes students to multi-layered, diverse, sets of problems and personalities. The opportunities for innovation must be gleaned from the scenario presented and, unlike many problems typically encountered in computing and engineering classes, there are no objective, correct solutions to the problems. Rather, creative competencies such as capturing information to identify unique opportunities and generating new approaches based on broad experiences and knowledge, must be used to generate innovative solutions [7]. The variety of problems, and

skills needed to conceive of creative solutions to those problems, provides a platform for appreciating diversity on the consultant side as well. Using video scenarios for group exercises creates an environment in which students can experience the value that diverse perspectives and inputs have in contributing to identifying, exploring and creating innovative solutions.

The goal of this special session is for participants to experience and appreciate the variety of ways video scenarios highlight the influence and value of diversity on creative problem solving while developing and honing innovative thinking skills. By taking part in a variety of small and large group activities, the participants will be ready to use video scenarios to easily bring collaborative exercises for creative diversity and innovative thinking into their computing or engineering classes. A wide variety of video scenarios and discussion prompts are available at www.youtube.com/virt-university in the Creativity College.

II. JUSTIFICATION

In the current social/professional climate, the need to create a culture in which diversity of thought and life experience is respected and valued is apparent. But hearing that a diversity of viewpoints is valuable does not equate to believing it (for example, James Demore's "Google Memo" [8]). A far more powerful approach is to participate in situations where the value of such diversity can be experienced [9]. Using video scenarios to motivate group-based exercises provides students with the opportunity to experience how ideas can be initiated, developed, expanded or refined through the contributions of individuals with different insights, viewpoints or experiences.

Video scenarios highlight the value of diverse perspectives in innovative thinking in a number of ways:

Problem Diversity. Each video scenario features a client with a unique situation such as a family-run, soccer-themed Italian restaurant with an eccentric chef or a hole-digging company that specializes in neatness. Their problems, which represent opportunities for technology-based creative solutions, may be discussed explicitly or alluded to implicitly. Alternatively, an opportunity for innovation may only be shown and not even mentioned by the clients. The variety of clients provides diverse settings in which to practice identifying needs and opportunities for innovation. In addition, while some scenarios may align with a student's interests or personality, others may challenge a student to consider problems in which he or she may have no interest. The diverse scenarios motivate students to see themselves as being able to stretch beyond their own interests and personal biases to find innovative opportunities even in settings where they are not interested in the problems or the individuals experiencing them. Students are challenged to see, for example, that not being interested in excavation does not mean that they cannot synthesize the information they have gathered, take into account the client's ethos, add their own creativity and arrive at an innovative idea to help the We Dig Holes company estimate the cost of digging a hole.

Client Ethos Diversity. In a written problem specification, a client may be described as "edgy", "zealous", "refined" or "quirky", but what exactly do these labels mean? What characteristic behaviors or viewpoints triggered their use? Do they effectively describe the client? The value of using video as opposed to written scenarios is that they show clients as real people with problems, rather than as pre-defined labels. Video scenarios require the audience to observe and interpret words, actions and interactions to form a concept of a client's ethos. The viewer then has the opportunity to draw his or her own conclusions about the ethos of a client and consider how it affects the acceptance or feasibility of possible solutions. For example, an Italian restaurant's chef who demonstrates, in a variety of statements and actions, that he is highly protective of his recipes, is not going to be open to the concept of live-streaming him as he cooks. By using video rather than a written description, students can hone requirement-gathering skills beyond fact-gathering to include discerning more abstract information such as the client's ethos and how to integrate it into the innovation process.

Customer Ethos Diversity. In some cases, the ethos of the client aligns with the ethos of the client's customers. In other cases, it may not. For example, a client may be conservative while its customers are free-wheeling or a client may be flexible while its customers are highly demanding. Videos that present such scenarios provide yet another level of diversity for students to consider.

Student Diversity. In undergraduate computer science and engineering curricula, achievement, as measured by exams, projects and assignments, is typically judged by heavily objective criteria. The individual life experiences, personality characteristics or non-academic interests of a student rarely come to bear. Since video scenarios are not focused on implementation or achieving one specific solution, they provide a freedom for creativity and exploration that is not limited by a student's technical knowledge or ability to implement his or her ideas. This freedom, in turn, leaves room for student individuality and imagination to have a greater impact. With an emphasis on listening and observation for collecting information, students are provided with a platform that emphasizes the process of discovering opportunities for innovation. This is a process in which life experiences and interests can enhance the ability to succeed. Attributes such as being able to empathize, grasp inference and subtext, actively listen, be observant and take a client's ethos into consideration translate into greater success. The advantage goes to students who are perceptive, flexible and empathetic, as well as creative; traits that are not routinely utilized in typical computing or engineering curricula.

Group Diversity. Since gathering information is based on observation and inference, and innovation comes from thinking creatively and beyond what exists, developing innovative ideas within a group provides a dynamic setting for the incremental

exploration, expansion and refinement of ideas. Different group members may notice different cues. A student may have a particular affinity, knowledge or life experience that can contribute directly to solving a given problem. Discussing approaches to a problem with others who have differing viewpoints can help refine one's own ideas or proposed solutions [9]. By collaborating with other group members, students are exposed to how multiple voices with diverse viewpoints can contribute to the process of creative problem solving and innovation. For example, The School of Base Knocks scenario, which features a softball and baseball coaching camp that believes in the power of the base hit over the home run, may not resonate with a particular student. While the scenario provides that student with the challenge of relating to the client, it also opens an opportunity for the student to appreciate the power of group diversity. Another member of the student's group may have more of an affinity with the client and better understand their ethos, or may see an opportunity the student had not seen or may simply have more creative ideas for the problems presented by that particular scenario.

The multiple levels of diversity that video scenarios provide allow all students to actively experience the power and potential that diverse problems, opportunities, experiences and viewpoints bring to creative problem solving. In addition, by being de-coupled from implementation, video scenarios provide an equal-footing platform for honing and acknowledging the breadth of skills innovative thinking requires.

III. INTERACTION

The special session will begin with two interactive large group exercises. The first large group exercise provides tips for active listening and critical observation. The second large group exercise provides tips for creative thinking. Participants learn and practice the tips using short video clips. After the large group exercises, small groups are formed for two comprehensive innovative thinking exercises, which will be in a longer format.

Active Listening and Critical Observation Exercise. The first of the large group exercises focusses on tips for active listening and critical observation which are used to identify innovation opportunities and build awareness of client/customer ethos. The tips will be reinforced with short video clips that highlight the complications that can arise when problems are shown or stated in conversational, vague or even contradictory ways. The clips will also highlight the importance of listening beyond what is said and observing beyond the obvious. For example, a clip may be shown in which a client is describing a process while demonstrating it, but the demonstration does not match the description. Participants will be challenged to notice such discrepancies. Alternatively, a clip may show clients describing an issue but the description may be intermixed with irrelevant actions or comments. Or are they actually relevant? Could they be irrelevant to the current topic but useful nonetheless? Do they

reveal aspects of the client's ethos? The audience is challenged to identify pertinent information in the clip and how it could potentially be used.

Creative Thinking Exercise. The next large group exercise is a warm-up for creative thinking and it focusses on looking beyond the obvious to help identify and expand upon opportunities for innovation. For example, when the proprietors of the Pretty, Pretty Pet Shop mention that pets sometimes become irritated by having many different pet clothes tried on them, extending the clothes-trying options to a digital fitting room may seem obvious. But what other new opportunities or functionalities can be grown from the somewhat obvious digital fitting room concept? To help address such challenges, this exercise involves deriving non-traditional characterizations of objects by using techniques such as re-naming them in terms of alternative functionalities they provide. For example, the functionality of a digital fitting room application for the Pretty Pretty Pet Shop would typically be characterized as providing the ability to digitally select pictures of pet clothes to be displayed on pictures of a pet. Its purpose is to avoid the inconvenience of actually trying the clothes on the pet. However, an alternative viewpoint is to characterize the digital fitting room application by the functionality of its output. What other innovative extensions can be inspired by characterizing it as a "pet fashion picture creator" instead? The creative thinking exercise will challenge participants to generate alternative names or characterizations of objects, processes, services or problems shown in video clips as a springboard for further innovation.

Comprehensive Innovative Thinking Exercises. The attendees will next participate in two comprehensive innovative thinking exercises. For these exercises they will work in small groups of 4-6 individuals. Each exercise will be motivated by viewing a complete 3-5-minute video scenario. Embedded into each scenario are numerous starting points for innovations, that is, problems that technology could help solve or situations it could improve. The opportunities may be implicitly or explicitly stated, or perhaps only shown and not discussed. The actions and interactions of the characters in video scenarios are designed to provide clues to the ethos of the individuals in the scenarios. All of these aspects must be critically observed and analyzed to form a basis for generating innovative solutions. Thus the participants will have the opportunity to follow the path of innovative thinking from active listening and critical observation to opportunity identification and creative solution design.

The first of these comprehensive innovative thinking exercises will have a greater emphasis on active listening, as the subjects discuss, in a conversational manner, the product or service they provide and the problems they are experiencing. The second will emphasize critical observation and will feature individuals experiencing a problem rather than discussing it. The second exercise will also present a problem which is more algorithmic in nature, such as way-finding.

For each comprehensive innovative thinking exercise, the small groups will use several guiding prompts, such as:

- Describe the client or customer ethos in 6 words
- Identify 3 opportunities/problems for innovation
- Select one of the 3 opportunities and suggest an innovative technology-based solution that would be a bad/unacceptable idea based on the client ethos
- Select one of the 3 opportunities and develop, as extensively as possible, an innovative technology-based solution that matches the client ethos

There will be a short period after each comprehensive innovative thinking exercise in which the small groups can share their ideas with the larger audience and alternative uses for the videos will be briefly discussed. The special session will wrap up with additional tips for using video scenarios and an opportunity for attendees to share their perspectives and ask questions. Attendees will also be invited to join an online forum for sharing materials, experiences and new ideas for bringing diversity-oriented innovative thinking exercises into computing and engineering education.

IV. SESSION DESCRIPTION

By participating in a variety of innovative thinking exercises, attendees will experience, from the student viewpoint, the use of video scenarios for collaborative problem-solving. Attendees will also be exposed to the flexibility of the video scenario approach and the ways in which it can be adopted or adapted to meet the varying educational goals, environments and time restrictions of individual instructors. Thus, additional options and contexts for using the video scenarios will be noted in the reflection periods.

The division of time for the various portions of the special session is as follows:

- (0:00-0:05) Introduction
- (0:05-0:20) Listening and Observation, and Creativity exercises, large group
- (0:20-0:40) Comprehensive Innovative Thinking Exercise I, small group
- (0:40-0:45) Reflection on Comprehensive Innovative Thinking Exercise I, large group
- (0:45-1:00) Comprehensive Innovative Thinking Exercise II, small group
- (1:00-1:05) Reflection on Comprehensive Innovative Thinking Exercise II, large group

- (1:05-1:20) Additional tips for effectively using video scenarios for a variety of purposes with questions and wrap-up

V. OUTCOMES

Attendees of the session will:

- Experience how using video scenarios in both large and small group settings can hone innovative thinking skills and highlight the inter-play between and value of diversity in creative problem solving
- Know how to access a collection of videos and materials for their own use
- Be able to immediately use video scenarios for innovation exercises in their classes
- Appreciate how the flexibility of video scenario-based innovative thinking exercises allows their use in a wide range of classes
- Be able to join an ongoing conversation about bringing innovation-oriented diversity experiences into computing and engineering education, including contributing ideas for future videos and sharing experiences using video scenarios.

REFERENCES

- [1] M. Spezialetti, "The Video Scenario Approach for Developing Computational and Entrepreneurial Thinking Skills". IEEE Frontiers in Education Conference, October, 2010.
- [2] M. Spezialetti, "Computing in Context: Video Scenarios for Recognizing and Utilizing Basic Computing Constructs", Special Interest Group in Computer Science Education Conference, poster, March, 2012.
- [3] M. Spezialetti, "Thinking About Asking: Encouraging a Questioning Approach to Requirements Gathering and Problem Solving", IEEE Frontiers in Education Conference, October, 2016.
- [4] V. Luthra, "Innovation", BusinessDictionary.com, WebFinance Inc., [Online]. Available: <http://www.businessdictionary.com/definition/innovation.html> [Accessed April 28, 2018].
- [5] S. Maranville, "Entrepreneurship in the Business Curriculum", Journal of Education for Business. Vol. 68 No. 1, 1992, pp. 27-3.
- [6] "Innovation", [Online]. Available: <http://wikipedia.org/wiki/Innovation>, [Accessed April 28, 2018].
- [7] R. Epstein. 2005. Generativity Theory and Creativity. Theories of creativity. In Theories of Creativity, M.A. Runco and R.S. Albert, Eds. Hampton Press, Cresskill, NJ.
- [8] J. Damore, "Google's Ideological Echo Chamber", DocumentCloud.org, [Online]. Available: <https://assets.documentcloud.org/documents/3914586/GooglesIdeological-Echo-Chamber.pdf>, [Accessed April 28, 2018].
- [9] S. Joshi and N. Soundarajan, "Enabling Deep Conceptual Learning in Computing Courses through Conflict-based Collaborative Learning", IEEE Frontiers in Education Conference, October, 2016.