How do engineering students embrace interaction design? We presented two groups of chemical engineering students with an interaction design brief with the task of producing a concept prototype of an interactive artefact. Through interaction analysis of video material we analyse how the students gesture and use concepts adhering to interaction. The students frequently use gestures to enhance idea-generation. Sketches are used sparsely and other design materials were almost not used at all.

Keywords: Interaction design, interactionary, concepts, gesture, use of concepts, design

BACKGROUND AND RESEARCH QUESTION

Engineering is a mathematically based design science in that it often involves the construction of different artifacts whether it is a new form of plastic or a bridge. The process of engineering often starts out by calculating how materials will respond and react to specific environments and then proceeds to test a real construction. Most materials which engineers work with are non-living materials which are to serve us as humans. However, since the advent of digital systems a material which could respond and act together with humans evolved as a specific form of engineering science. Interaction design is a subject which during the last decades has been more and more important as we use and interact with different devices which often have some digital component (i.e. computer, phone, microwave oven, automatcs etc.). The digital material is a very different material as it has no given, natural features, but rather the designer and programmer give the computer specific functionalities. Furthermore, the digital systems are dynamically changing as we use them, they respond to the user’s request or request information from the user (interactivity), they work in several temporal dimensions, and the design imposes some structural order on how the user might use the artifact. The tasks or the context where we use the computer system also affect, or define, the system. These new challenges to design can be said to have brought about a fundamental shift in how design problems should be approached, a shift from “technology-centered” to “human-centered” designs (Zoltowski et al, 2012; Krippendorff, 2006). There is therefore a need for engineers to learn how to enact such behaviors when designing (Atmen et al., 1999) even if their expertise is within more traditional engineering.

Specifically, engineering students need to learn how to design interactive systems. Most engineering sciences today do not actively teach design processes and especially not user-centered systems design. In this article we use the pedagogical interactionary format to analyze how chemistry engineering students without previous (interaction-)design experience reason and collaborate about doing conceptual design given a design brief (Artman et al, 2012). Our primary aim is to describe and analyze how the students represent and enact the design proposal through a lens of designs for learning perspective (Selander, 2008).
METHOD

Two groups of self-selected engineering students were given the task of designing an interactive artifact (scent-chatting). The task mirrored that of Artman et al. (2012). The student groups consisted of two students. They had 30 minutes to both distribute tasks and design their proposal. Besides presenting the task and the objective of the study, we did not intervene during the design sessions. During the presentation of the design task we emphasized that they should aim to come up with several design proposals and to have fun. They were asked to create design proposals including an artifact (i.e. a physical representation of the design proposal in a chosen material) and a use-scenario with a special focus on interactive aspects of the artifact and its use. The students were further informed that they were to give a presentation of their final proposal to us. The design sessions were video recorded from two different angles by the researchers and the video data was analyzed using an interaction analysis approach. The analysis directs particular interest towards how students organized their work in terms of design sequences and how these were handled, their use of concepts adhering to the above mentioned aspects of interaction and materials used in physically representing their design ideas. Moreover, quantitative analyses were conducted of how frequently the various aspects of interaction were addressed.

The two groups have been analyzed in terms of how they interact with each other during the design process as well as how they conceptualize the design. By focusing on the use of different materials in representing and re-representing design ideas, taken together with an analysis of how frequently aspects of interaction were addressed, we could observe how the student groups organized their work throughout the design process. Three raters independently rated the occurrences of the five aspects of interaction presented to the students. Ratings were based on an assessment protocol defining the characteristics of each aspect. After individual, independent ratings the raters discussed and aligned their ratings. Final inter-rater reliability coefficients were 65% (group1) and 79% (group2).

RESULTS

The results of the assessment of the five aspects of interaction analyzed by the raters revealed that both groups touched upon all five of the given aspects with the concept of “dynamics” peaking in the first group while the second group showed separate peaks of “dynamics”, “temporality” and “interactivity.” The first group discussed and tested several ideas during the first half of the session leading up to their peak of “dynamics” at which time they arrived at their final idea. The second group formulated their final concept nearly immediately and used the remaining time to explore various aspects of their main idea.

Both groups developed their ideas and concepts largely from a technical point of view rather than from a user perspective. The dialogues often emphasized technology in itself rather than contextualizing the technological aspects of the concepts. Somewhat surprisingly, however, very little technical terminology was used by either group with both groups using rather elementary scientific concepts related to chemistry. Both groups made extensive use of gestures in the early stages of their interaction. A qualitative analysis of selected gesture sequences revealed interesting aspects of the creative idea generation process and demonstrated how gestures reinforced the exchange and development of these ideas. Finally, both groups showed clear transformations moving from gesture representations to representations on paper and white board. As in Artman et al (2012) the students’ verbal and gestural communication decreased while working with physical materials. Interestingly, the final design result was very similar for both groups taking the form of a scent-surround system (similar to a sound-surround system).
REFERENCES


