Examining the Effect of a Paradigm-Relatedness Problem Framing Tool

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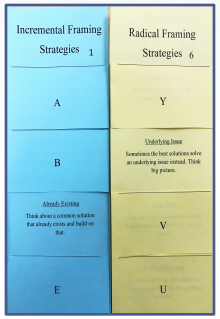
Introduction

Engineers are constantly faced with new and complex problems. They must develop creative solutions in order to address the issues before them. Ideation is a critical part of the design process, and our research goal is to create tools and methods to help engineers approach ideation. Our framing tool aims to aid engineers with their ideation flexibility. Increasing ideation flexibility leads to a wider variety of solutions to a given problem. Our data for the study was collected from pre-engineering students.

Background Terms

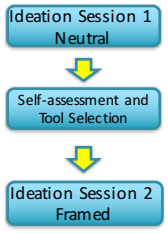
- Ideation Flexibility: the ability of an individual to generate ideas more adaptively or more innovatively relative to their natural cognitive style
- Paradigm Modifying: differs radically from pre-existing ideas (innovative)
- Paradigm Preserving: includes incremental changes to pre-existing ideas (adaptive)
- Framing: reformulating a problem statement to change how the individual views the given task

Framing Tool



There are two versions of the framing tool; radical and incremental. Each version has six framing strategies. The students received four frames each.

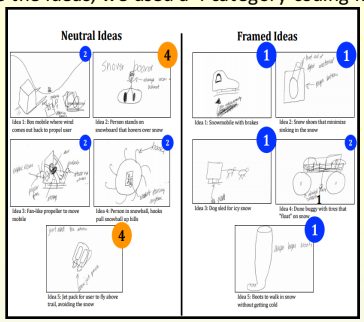
Procedure



Analysis

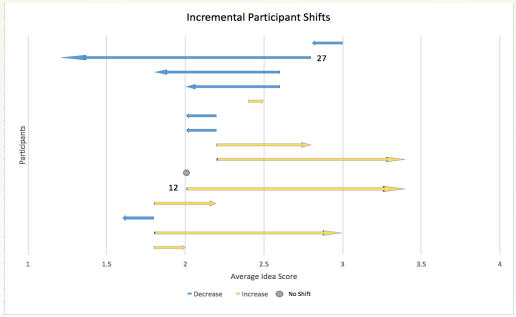
Category Coding

To analyze the ideas, we used a 4 category coding metric.

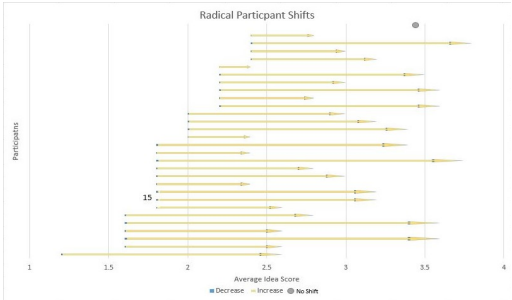


Results

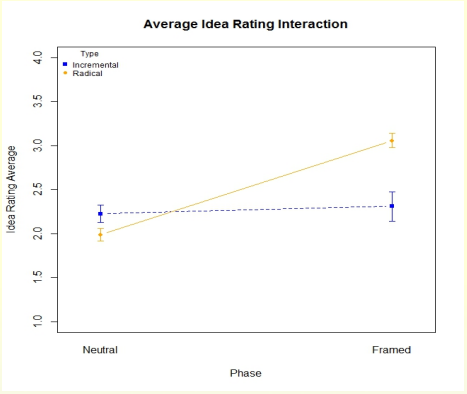
Do participants who took the incremental tool shift in the adaptive direction?



Do participants who took the radical tool shift in the innovative direction?



- 33 of the 45 total participants shifted in the direction of the tool they chose (73%)
- 29 of the 30 participants who took the radical tool shifted in the radical direction (96%)
- 4 of the 15 participants who took the incremental tool shifted in the incremental direction (26.67%)



The interaction plot above shows the mean idea score, ideation phase, and tool type. The participants who chose the radical tool had a mean idea score of 1.99 (SD = 0.40) for the Neutral ideation session, and a mean idea score of 3.06 (SD = 0.44) for the Framed ideation session. There was a significant shift towards generating more radical ideas in the radical tool group, $t(29) = 11.451$, $p < 0.001$.

Conclusions

- When a participant chose the framing tool we would have assigned them based on their neutral ideas, they are more likely to exhibit a shift in the direction of the tool.
- Certain frames on the adaptive framing tool were more difficult to follow than others.

Future Research

- Conduct think-aloud studies to gain a better understanding of the tool and how it works
- Collect more data using revised frames
- Conduct studies with undergraduate student, graduate students, and professional engineers

Acknowledgements

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