Gamification of IE 311 – Principles of Solidification Processing

Overview
Various instructors of IE 311, a technical elective offered to industrial engineering students in Penn State, noted that students found it difficult to visualize complex metal casting design and solve problems related to those designs. In addition, students are also found to struggle to determine the effects of welding variables on weld size and critical cooling rate of different steels due to difficulty in visualizing the concept.

Objectives
The goal of the project is to create two video game products, accompanied by their instruction manuals, to enhance student learning and help them gain appreciation of the problem solving and economic aspects of both metal casting and welding. The games are expected to promote independent learning to help students reinforce what they have learned in their class.

Approach
- Bartle’s Test was conducted to identify prevalent gamer characteristic of IE 311 students, determining the crucial game elements in capturing student attention.
- Literature review was conducted to explore the best practices in visualizing metal casting and welding processes.
- Meeting with sponsor and current IE 311 instructor to clarify current problems and expectations.
- Coding of the first drafts of both casting and welding games.
- Meeting with sponsor to review accuracy of depicted process and values of welding variables.
- A survey was conducted where current IE 311 students played the games and provide feedbacks on their attitude towards the game and possible improvements to it.
- Coding of the final drafts of both codes and revision of instruction manuals.

Outcomes
From the second survey results:
- 71% would like to see the casting game implemented in future IE 311 courses.
- 69% would like to see the welding game implemented in future IE 311 courses.
- Plans for the game to be integrated in IE 311 for Summer and Fall 2016.