

An Experimental Casual Game to Educate Players in Soap Production

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Today's world is characterized by technical enhancement and global competition, with continuously changing requirements at the labor market and increased demand for highly trained employees particularly in chemical engineering industries. Since students' motivation for STEM (Science, Technology, Engineering and Mathematics) subjects tends to be low in general [1], it is important to prompt students' interest. When situational interest is prompted, it could even turn into well-developed personalized interest in the long-term [2]. Games could be an educational tool to facilitate such interest.

This article describes the initial results of an experimental project, in which a digital game with authentic chemical engineering educational content is created. The game is a resource-managing, single player game, in which the player makes and sells soap. The aim of the game is to be intuitive, triggering situational interest for chemical processes through the use of motivational features following the principles of the Player Experience Needs Satisfaction model [3]. The game is thus based on autonomy satisfaction and implements granular feedback for competence satisfaction to amplify intrinsic motivation and engage the player.

The educational content is the process of soap making, including raw materials, needed amounts, reaction times and the effects of e.g. heat on substances. Decisions have been made with regard to scoping the game content, that is, to select which processes and parts the game focuses on, and in which level of detail, to benefit game play. That means, the accuracy of the game is selective. The effects of overheating the trace, for instance, should be simulated accurately; the curing process should be simulated but speeded up from several weeks to several hours.



Figure 1. The lab (left) and shop (right) game screens (design sketches).

In the game, the player acquires raw materials and equipment and produces soap (Figure 1). The player plans, organizes and initiates the process, and controls and manages it over time. The player also needs to be aware of economic aspects of the endeavor, such as questions of efficiency and capacity utilization; and to keep the equipment upgraded in-sync with the (increasing) scale of the manufacturing process. The game is released as a free online game through established online channels for the distribution of commercial or indie casual games. To assess actual players' interest, motivation, and engagement, game metrics such as log-data, game playtime, number of soap-making attempts, and the responses to an in-game pop-up survey are utilized.

This work aims to serve as an example of how games can be designed to be intrinsically motivating for educational purposes. It presents an interdisciplinary game development project in which educational content is integrated with game play. Future research could investigate knowledge acquisition regarding soap making; because the game employs game mechanics that support players' autonomy and competence, incidental learning is expected to occur while players are engaged in the game.

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