Towards a Brewery Educational Game: Would the Existence of a Game Goal Improve Learning?

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- serious games
- instructional effectiveness
- value-added approach
- brewery
- game goal
- multimedia learning

Introduction

A **value-added approach** to investigating the instructional effectiveness of digital games (Mayer, 2011) is to **manipulate the presence of a game element** and compare how the game promotes learning; both with and without the element. The presence/absence of the very **game goal** is a crucial example of such an element. Would the presence of a personally meaningful and reasonably challenging game goal **increase a player's engagement** and would that, in turn, increase the player's cognitive processing, leading to an **increase in learning gains** (compared to an educational simulation on the same topic without the explicit game goal)?

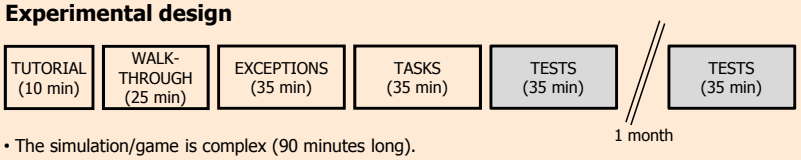
Theoretical rationale and evidence so far

Moreno & Mayer's **cognitive-affective theory of learning with media** (Moreno, 2005) proposes that when a high cognitive capacity is available for useful processing of educational materials, the better the information from the materials is integrated with the previous learner's knowledge. The theory's prediction is that the more **engaging** the materials are, the more **cognitive capacity** the learner is willing to recruit. However, at the same time, the learner uses more cognitive capacity to process the extra details, thus making the materials more engaging: a **trade-off**. It is not clear if a serious game would be a better learning tool than a mere simulation; even if both feature the same learning materials, as shown in the study by Rieber (2005).

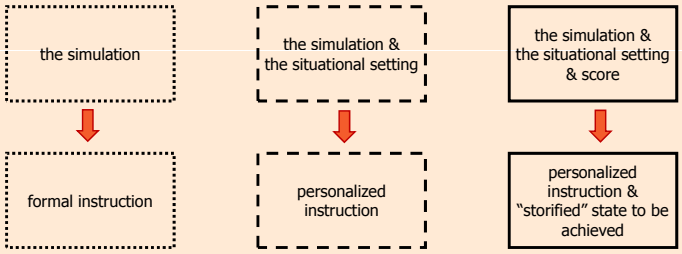
Mayer's **personalization principle** suggests (based on solid empirical evidence) that people learn better from multimedia materials when textual (audio) instructions are presented in a conversational style rather than a formal style (Mayer, 2009). "Personification" of textual materials can be considered as a step towards "gamification" of a simulation.

Malone's work (1981) suggests that the presence of a **game goal** and keeping **score** are important game features that determine preferences for playing the game.

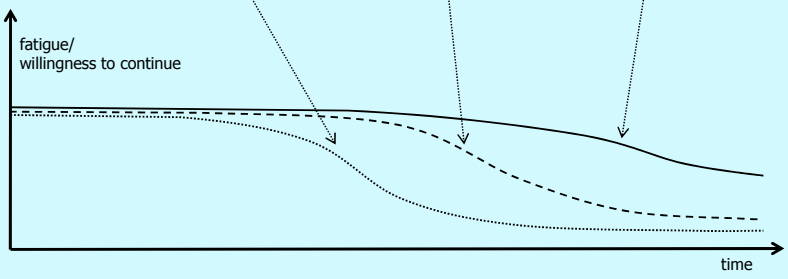
Experimental design

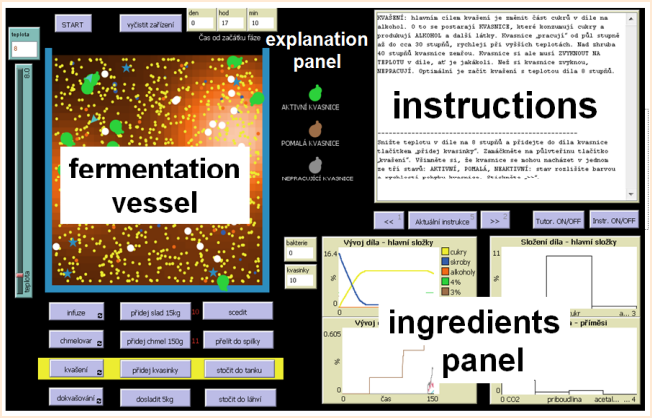


- The simulation/game is complex (90 minutes long).
- The instructional content is the same. There are no extraneous details for the "personified" version and very few extraneous details for the game version.



Expectations





The simulation screenshot.

Instrument: a brewery simulation/game

In Netlogo toolkit (Wilensky, 1999) we have developed an interactive **simulation of the brewing process**, in which the learner acquires the mental model for beer production. Note that brewing beer is a personally meaningful task for many Czechs, yet many of them do not actually know how to brew beer and thus low prior knowledge is to be expected (as confirmed, N=32).

For research purposes, the simulation has three versions: one of which is a game.

Game goal operationalized

The game goal: a situational setting plus a score that is meaningful in the context of the setting

The situational setting: Your family has a family-run brewery and the grandfather, the brewmaster, is considering you as his successor. However, you first have to learn the basics of brewing beer. For that reason, your grandfather has developed a simulation for you.

The score: After practicing the basics, the simulation starts to model the family brewery and you have to run it over a time period; earning as much money as possible by selling the beer you produce.

Hypotheses / expected outcomes

1A. Pers-simulation > simulation: personification principle replicated

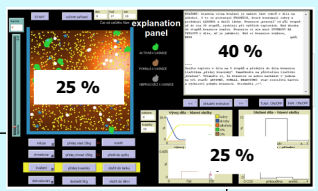
1B. Pers-simulation <= simulation: a boundary condition for personification principle found, presumably long time exposure

2A. Game > Pers-simulation: a goal/score element can indeed increase learning gains under a specific condition and/or help keep players engaged over a longer period of time

2B. Game <= Pers-simulation: replication that adding a game/score is detrimental to learning, even if extraneous details are minimal and the players are (cognitively) engaged in the same activities as in the pers-simulation

Results so far

- the simulation has been developed
- piloted, N>30, age: 18 - 28



Future plans

1) Piloting the personalized version of the simulation (autumn 2012)
2) Running the first part: pers-simulation vs. simulation (winter 2013)

Key questions: do you know the answer?

1) Can we allow participants to make notes using pen and pencil?
2) Is there any study with the same/similar research question?

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