The Differences between Problem-Based and Drill and Practice Games on Motivations to Learn

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ABSTRACT

Two trends can be witnessed in educational game design: Problem-Based Learning and Drill & Practice Training approach. The general assumption appears to favor Problem-Based approach above Drill & Practice, in regard to players' motivation. However, the differences between the approaches are seldom studied. The authors examined the motivational impact of one game consisting of a Problem-Based-, and a Drill & Practice learning mode. The first presents players with an ill-defined problem and offers various solutions to a challenge. In the Drill & Practice mode, there is only one correct answer. Secondary school students played the game and completed a pre- and post-test questionnaire about their experienced regulatory style for studying mathematics. Results suggest that the Problem-Based mode may decline the experience of feeling controlled by others to engage in mathematics learning. In comparison, players of the Drill & Practice mode reported increased intrinsic motivations towards mathematics.

Keywords: Drill & Practice Learning, Motivation, Problem-Based Learning, Self-Determination Theory, Serious Games

INTRODUCTION

Problem-Based education has been put forward as 'the way to go' in educational game design (Aldrich, 2009; Gee, 2005). It is argued that this educational approach appears the 'best fit' when it comes to creating educational games. In comparison, more traditional training regimes, called Drill & Practice learning, may proof less effective in a game when it concerns students' motivation to learn.

The differences between these two learning approaches in games are seldom studied. That is why this study examined one game with two modes: 1) a Problem-Based playing mode, and 2) a Drill & Practice gaming mode.

This study examined the reported change in motivation amongst students directly after playing one of the two game-modes. To do so the *Academic Self-Determination Questionnaire* (Ryan & Connell, 1989) was applied to qualify motivational change in experienced regulatory style. This questionnaire is well validated in educational settings. Additionally, Self-Determination Theory (SDT), a particular approach to human motivation, is studied (and validated) in the context of games (Przybylski, Rigby, & Ryan, 2010; Rieger, Wulf, Kneer, Frischlich, & Bente, 2014; Rigby & Ryan, 2011).

SDT qualifies motivation by experienced regulatory styles. This means that motivation can be expressed in the way someone feels regulated instead of stating that motivation is high or low. For example, someone who feels controlled and pushed by others to engage in an activity will feel *externally regulated*. In contrast, someone who engages in an activity because the activity in itself is satisfying will feel *intrinsically regulated*.

SDT offers three more regulatory types. By means of the *Academic Self-Regulation Questionnaire* the reported regulatory style was assessed before and after playing the game *Combinatorics* (Deen & Verhoeven, 2011). This game deals with a particular aspect of estimating change: 'smart counting'. Students (n = 105) played the game for twenty-five minutes and were already familiar with this particular aspect of mathematics. Therefore, the game fitted their curriculum and could build further upon their knowledge.

Results suggest that both modes have a different effect on students' experienced regulatory style. This article describes these differences and suggests a possible explanation.

BACKGROUND

Problem-Based education has been put forward as the most fruitful approach when it comes to serious game design (Aldrich, 2009; Gee, 2005). In Problem-Based learning, students start with a problem. This problem is rather loosely defined as something 'for which an individual lacks a ready response' (Hallinger, 1992, p. 27).

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