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Desirable difficulties while learning mathematics: Interleaved practice based on e-learning

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Keywords: Desirable difficulties, interleaved learning, blocked learning, e-learning, geometry.

Focus and rationale of the poster

The focus of the poster is the presentation of the project about interleaved practice based on e-learning with the focus on geometry. The poster is intended to provide an overview of the theoretical constructs, the indication of the content, the study design and possible implications.

Indication of the theoretical framework of the study reported

The theoretical framework of the study refers to the theory of desirable difficulties, which is a new approach from empirical research of learning according to the idea: “To make things hard, but in a good way” (Bjork & Bjork, 2011, p. 55). The learning is made difficult in the short term, but in the long term the learning development improves. Research shows (Rohrer, Dedrick & Stershic, 2014; Bjork, 1994) that desirable difficulties lead to a more sustainable learning success.

The poster focusses on the ”interleaved learning“, which represents a desirable difficulty. Interleaved practice is defined as an alternating and arrangement of several different learning contents, e.g., A, B, C (Lipowsky et al., 2015, see Figure 1).



Figure 1: Interleaved Practice with the learning contents A, B, C

The positive effect of interleaved practice is explained by the cognitive theories of learning psychology, because the sustainable learning results from a higher cognitive demand and a better memory performance (Bjork & Bjork, 2011; Sweller, Ayres & Kalyuga, 2011).

In contrast to the interleaving is the ”blocked learning“, which represents one kind of the traditional learning in mathematics lessons. Blocked learning, in turn, facilitates learning by teaching one learning content at a time before moving on to another, e.g., A, B, C (see Figure 2).



Figure 2: Blocked Practice with the learning contents A, B, C

The possible consequence of blocked practice is that the learners can not remember the first topics after the learning the last learning contents (Bjork & Bjork, 2011).

Indication of and justification for the content

The described project aims at investigating, whether the learning achievements of interleaved learning students differ from blocked learning students by the use of e-learning. Digital media are an important part of today's society and also used in school education for information, communication and networking processes. In the change of society, traditionally structured teaching must also be adapted (Bönsch, 2015). Using e-learning enables an innovative and current method for school education and promotes self-regulated learning (Blaschitz, Brandhofer, Nosko & Schwed, 2012).

Implications for existing research in the area

Possible practical implications for the existing research in e-learning seems to be the development of an e-tutorial for educational settings at school.

One goal of the empirical research in didactics of mathematics should be the promotion of sustainable learning in mathematics school lessons. If interleaved learning proves to be a successful new teaching concept in geometry, the few studies on interleaved practice based on e-learning (e.g., Ziegler & Stern, 2014) have to be expanded in various learning contents of mathematics to explore the effects of interleaved practice further.

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