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Introducing the familiarity mechanism: A unified explanatory approach for the personalization effect and the examination of youth slang in multimedia learning

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ABSTRACT

Several approaches have been used to explain how the personalization effect operates in multimedia messages. This paper aims at unifying these statements in a core concept of familiarity and its influence on social cues. By amplifying the scope of possible forms of personalization, the study explores additionally how youth slang as a new factor of conversation influences learning. Secondary school children ($N = 166$) were randomly assigned to experimental groups and provided with materials about photosynthesis in two different experiments (audio vs. text message). Each experiment consisted of performance tests and a questionnaire concerning the newly found mechanism of familiarity. The results of each single factor between-subject design show that youth slang fosters learning. Strong effects among transfer task performance ($d_1 = 1.19$; $d_2 = 1.26$) confirm the personalization effect. Moreover, the outcomes deliver valid empirical evidence for the proposed familiarity mechanism. These findings are discussed as well as the confirmation of all presumptions for the familiarity mechanism as incorporated in the explanatory approach, resulting in clear theoretical implications and future directions for the field of multimedia learning research.

1. Introduction

Beyond the discussion about an upcoming group of "digital natives" (e.g. Helsper & Eynon, 2010; Palfrey & Gasser, 2008), it has been claimed that equipping each student with a computer will provide the best education (Bennett & Maton, 2010). Therefore, computer-based learning environments in school settings, aimed to enhance students' learning performance, have grown in popularity. In this ever-increasing resource management market, all involved stakeholders need to be able to utilize this technology. To do so, multimedia research theories are implemented to find out how technology-delivered instructions can be used to foster student learning.

Several cognitive psychological theories have emerged in recent decades to explain the possibilities and limitations that exist when designing instructions for these learning environments. Mayer and his colleagues created a central theory about understanding how learning with multimedia works—Cognitive Theory of Multimedia Learning (CTML, Mayer, 2005, 2009). This theory explains the psychological processes of cognition required to implement design principles for digitally presented instructional materials, which aim to enhance people's learning performance. Empirical data support most principles deriving from CTML (e.g. Adesope & Nesbit, 2012; Ginns, 2005, 2006; Ginns, Martin, & Marsh, 2013; Höffler, 2010; Rey, 2012; Symons & Johnson, 1997), while some design principles can be linked to various other cognition theories (Sweller, Ayres, & Kalyuga, 2011; Sweller, Van Merriënboer, & Paas, 1998). However, the gap between empirical support and an appropriate theoretical explanation still exists for other effects, such as the personalization and voice principles.

In the beginning of the investigation of the personalization principle, Moreno and Mayer (2004) claimed that, when learning with an on-screen agent, the use of a conversational style can foster better learning performance in comparison to a formal speaking style. An informal or conversational style in this content means replacing all passive forms and articles with pronouns ("I", "my", "mine", "we", "our", "ours", "you", etc.; Clark, Mayer, & Thalheimer, 2003; Mayer, 2005). Moreover, the voice effect hypothesizes that learners achieve better transfer scores if the voice of the instruction is has a familiar accent rather than a machine-synthesized voice or a foreign accent (Mayer, Sobko, & Mautone, 2003).

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Rey and Steib (2013) conducted a study that varied personalization by dialect and standard language. Secondary school students in Austria were presented with learning materials with a personalized (vs. a formal) language style in an Austrian (vs. standard German) dialect. The speaker of the narration explained how network topologies work by communicating with the students. The results showed better retention scores in both the personalized and the dialect conditions. The transfer results differed only with personalization in that personalized narrations showed significantly higher scores.

Consistent with previous empirical data, the present study tries to find out whether it is worth integrating a new form of personalization, youth slang, into multimedia instructional design. This may bring broader access to the field of sociolects in multimedia learning. For younger pupils, slang may be more easily connected with their own oral linguistic usage. The consideration is divided naturally by modality (text version vs. auditory version), whereas both modalities are examined in different experiments. In addition to these experiments, this article offers a first theoretical combination of previous explanatory approaches while testing this new mechanism in combination within the experiments.

The following sections provide an overview of previous literature and experiments on the personalization effect underlining its robustness, especially in transfer scores. Furthermore, the influences of voice and speech are considered, and a new theoretical framework of these effects is given and tested. Empirical foundations for all hypotheses are provided by two experiments. Implications, limitations, and future directions conclude the study.

2. Literature review

2.1. Connecting the personalization effect with retention and transfer problems

The personalization principle has been under examination for several years, and most of the studies support its enhancement of learning, especially with respect to transfer scores. The study of Ginns et al. (2013) was the first attempt to provide an overview of this research area. The meta-analysis examined 32 studies concerning the effects of a conversational style, while 27 of them focuse on the personalization principle. The researchers found reliable average effects on retention tasks ($d = 0.30$) and even higher effect sizes on transfer ($d = 0.53$). Some of the studies used in the meta-analysis will be discussed in this paper to derive substantiated hypotheses for retention and transfer scores.

Moreno and Mayer (2000) started exploring the effects the use of a conversational style with five experiments. In the first two experiments, students were provided with an animated multimedia presentation about the process of lightning formation with either on-screen text or accompanied speech and tested in two different groups with either neutral (third-person) or personalized (first- and second-person) forms. The results showed only significant differences among transfer scores ($d1 = 1.00$, $d2 = 1.60$). All the other experiments tried to transfer these findings using a computer game about environmental science. Students interacted with a computer-based tutor, whose purpose was to explain how different plants flourish in a wide range of environments. Instructional messages were transformed into one-to-one conversational communication. All tests of retention and transfer then showed significant differences in favor of personalized messages. Moreno and Mayer (2004) strengthened their personalization hypothesis using the aforementioned computer game. They replicated their findings, especially in connection with higher transfer performances. Mayer, Fennell, Farmer, and Campbell (2004) showed how strong this effect is for other instructional materials. Students received a narrated animation of how the human respiratory system works with differently personalized statements. The analysis of scores revealed the repetition of the strength of transfer scores in personalized messages.

Apart from that, most of the following studies failed to include questionnaires about transferring knowledge to problems or other related areas (e.g. Ginns & Fraser, 2010; McLaren, Lim, Gagnon, Yaron, & Koedinger, 2006; Yeung, Schmid, George, & King, 2009 (Experiment 1, 2, 3 and 4)), and some of the studies even found no support for the personalization principle at all (Clarebout & Elen, 2007; Doolittle, 2010; Kurt, 2011; Son & Goldstone, 2009). These results might have occurred due to lack of focus on altering conversational style within learning specific content information (Clarebout & Elen, 2007), pretenses of unimaginable role understandings (Son & Goldstone, 2009) or high levels of computer experience (Kurt, 2011). However, there is still no clear definition of what conversational style really is.

One of the most important moderating influences on personalization seems to be prior knowledge, connecting it automatically with the expertise reversal effect (Kalyuga, 2007). Study results have shown that only people with little prior knowledge about the topic to be learned benefit from personalized learning environments (Yeung et al., 2009). However, this conclusion is connected to the study of Sweller et al. (1998), who found that inexperienced learners may benefit from instructional material as a substitute for missing schemata. Stiller and Jedlicka (2010) stated, moreover, that verbal tasks could be negatively affected by personalization.

Overall, most of the studies supported the personalization effect, especially in relation to transfer performances. These findings have been proven for several experimental conditions but still lack external validity. This effect has to be investigated, therefore, in various new learning contexts and different age and language groups to be able to generalize the results to a broader learning environment (Ginns et al., 2013; Kartal, 2010). Hence, this study examined how students at secondary schools in Germany benefit from personalization.

2.2. The voice principle, accents, and dialects

Personalization occurs not only through changing third-person constructions into pronouns such as "you" and "I" but also in various other forms. Schworm and Stiller (2012) found the same convincing results for a transfer-increasing effect with direct comments, underlining the assumption that personalization occurs in different phenotypes. These variations are called social triggers and according to Reeves and Nass (1996), only a few social triggers are needed for people to interact with computers as real people. This thesis is called *media equation* and can be explained by the fact that people respond socially and naturally to media, although they are not conscious of this connection.

Mayer et al. (2003), Exp. 2 analyzed different types of narrations regarding their voice. Learners in their study showed better retention and transfer scores when the speech of the narration was more human-like than machine-synthesized. Additionally, they found that learners rated a personalized narration more positively, easier to understand and, in terms of cognitive load, less difficult. This so-called voice effect influences the reaction to multimedia learning messages the same as other personalization styles.

Linek, Gerjets, and Scheiter (2010) added the variable of gender to this research field. According to their experiments, a narrated animation can be learned more easily if a female speaker is used instead of a male one, regardless of the sex of the learners.

Moreover, Mayer et al. (2003), Exp. 1 demonstrated how learners are influenced by the speaker's accent. If the voice of a narration has a typical native accent (American English in this study) instead of a foreign accent (Russian here), students were positively