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Learning from video modeling examples: Content kept equal, adults are more effective models than peers

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ABSTRACT

Learning from (video) modeling examples in which a model demonstrates how to perform a task is an effective instructional strategy. The model-observer similarity (MOS) hypothesis postulates that (perceived) similarity between learners and the model in terms of age or expertise moderates the effectiveness of modeling examples. Findings have been mixed, however, possibly because manipulations of MOS were often associated with differences in example content and manipulations of (perceived) expertise confounded with age. Therefore, we investigated whether similarity with the model in terms of age and putative expertise would affect cognitive and motivational aspects of learning when the example content is kept equal across conditions. Adolescents ($N = 157$) watched a short video in which a peer or adult model was introduced as having low or high expertise, followed by two video modeling examples in which the model demonstrated how to troubleshoot electrical circuit problems. Results showed no effects of putative expertise. In contrast to the MOS hypothesis, adult models were more effective and efficient to learn from than peer models.

1. Introduction

Instructional videos are rapidly gaining popularity in education. They form the backbone of massive open online courses (MOOCs) and blended courses, and support students during self-study at home or at school. Next to web lectures (e.g., Chen & Wu, 2015; Korving, Hernández, & De Groot, 2016; Traphagan, Kucsera, & Kishi, 2010) and short knowledge clips (e.g., Day, 2008), demonstration (i.e., "how-to") videos (e.g., Ayres, Marcus, Chan, & Qian, 2009; Van der Meij & Van der Meij, 2013) make up an important part of the instructional videos on offer. Such demonstration videos are also known as *video modeling examples*. Research inspired by Bandura's (1977, 1986) social learning theory has shown the effectiveness of observational learning from human models, and this dovetails nicely with findings from cognitive psychology and instructional design research (e.g., Anderson, 1993; Sweller, Ayres, & Kalyuga, 2011) that has shown the effectiveness of example-based learning (for reviews: Renkl, 2014; Sweller et al., 2011; Van Gog & Rummel, 2010).[1]

Video modeling examples in which a model demonstrates and explains how to solve a problem are effective for acquiring new skills (e.g., Braaksma, Rijlaarsdam, & Van den Bergh, 2002; Schunk, Hanson, & Cox, 1987; Schwan & Riempp, 2004; Van Gog, Verveer, & Verveer, 2014) and may enhance the confidence learners have in their own capabilities to perform the modeled task (i.e., self-efficacy and perceived competence; Bandura, 1997; Hoogerheide, Loyens, & Van Gog, 2014, Hoogerheide, Loyens, & Van Gog, 2016; Schunk & Hanson, 1985). Yet, when developing video modeling examples, several design choices have to be made that may influence their effectiveness, the most salient of which is the choice of model. The present study investigates whether similarity between the learner and the model in terms of age and (putative) expertise would affect self-efficacy and learning outcomes, as predicted by the model-observer similarity hypothesis.

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[1] Note that examples can lose their effectiveness or may even hamper learning when students have some prior knowledge of the problem (Kalyuga, Chandler, Tuovinen, & Sweller, 2001; Kalyuga & Renkl, 2010).

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1.1. The model-observer similarity hypothesis

The model-observer similarity (MOS) hypothesis (Bandura, 1994; Schunk, 1987; see also the similarity-attraction hypothesis, Montoya & Horton, 2013; Moreno & Flowerday, 2006; Reeves & Nass, 1996) postulates that, because modeling enables social comparison (Berger, 1977; Johnson & Lammers, 2012), the effectiveness of observational learning from (video) modeling examples depends in part on how similar to the model learners perceive themselves to be. Or in Bandura's (1994) words:

> The impact of modeling on perceived self-efficacy is strongly influenced by perceived similarity to the models. The greater the assumed similarity, the more persuasive are the models' successes and failures. If people see the models as very different from themselves their perceived self-efficacy is not much influenced by the models' behavior and the results it produces. (p.72)

Self-efficacy and the closely related construct of perceived competence are important, as they have been linked to factors such as academic motivation (Self-efficacy: Bandura, 1994; Schunk, 1991, 2001; Schwarzer, 1992; Perceived competence: Bong & Skaalvik, 2003; Harter, 1990) and learning outcomes (Self-efficacy: Bandura, 1994; Schwarzer, 1992; Perceived competence: Bong & Skaalvik, 2003; Harter, 1990; Ma & Kishor, 1997). Learners who perceive themselves as more similar to the model may also feel more attracted to the model and pay more attention to the model (Berscheid & Walster, 1969), and a high degree of similarity can help them form outcome expectations (Schunk, 1987). Similarity factors may be particularly important for novice learners whose self-efficacy and prior knowledge are still low, as they are especially prone to engaging in social comparison (Buunk, Zurriaga, Gonzalez-Roma, & Subirats, 2003). The present study focuses on MOS in terms of age and putative expertise.

1.2. Model-observer similarity in age and expertise

With regard to the age of a model, the MOS-hypothesis predicts that primary or secondary education students would benefit more from a model that is perceived as similar in age, such as a peer model, than dissimilar in age, such as an adult model. Findings have been mixed however, with some studies showing stronger effects of observing a peer model compared to an adult model (e.g., Davidson & Smith, 1982; Rodriguez Buritica, Eppinger, Schuck, Heekeren, & Shu-Chen & Wu, 2015; Schunk & Hanson, 1985; Zmyj, Aschersleben, Prinz, & Daum, 2012), some showing no differences (Robert, 1983; Strauss, 1978), and others showing stronger effects of an adult model (e.g., Hicks, 1965; Jakubczak & Walters, 1959). A possible explanation for these mixed findings may be that peer models are especially beneficial for learners who have encountered difficulties in learning or for learners of low ability (Schunk, 1987). Schunk and Hanson (1985), for instance, examined whether children who previously showed difficulties learning fractions benefited more from a peer model, a teacher model, or no model, and found that peer modeling was more conducive to both self-efficacy and learning than teacher modeling, while both models were more effective than no modeling. Another possible explanation is that age only becomes a salient cue when coupled with (perceived) expertise. That is, students may particularly imitate peer models when they believe them to be high in expertise, and age may become an informative cue especially for tasks in which peers are generally (perceived as) less of an expert than adults (Bandura, 1986; Schunk, 1987).

Research on the MOS-hypothesis in terms of expertise has used different approaches. One line of research contrasted learning from a mastery model (i.e., a model who displays faultless performance from the start) to learning from a coping model (i.e., a model who shows performance errors that he or she corrects later on), and this has led to mixed results. For instance, in math, no differences in the effectiveness of both model types were found for low ability students who had had prior successful experiences with the task (e.g., Schunk & Hanson, 1985) or for average ability students (Schunk & Hanson, 1989). However, for low ability students without prior success with the task, coping models were more effective for learning (Schunk et al., 1987).

Another line of research has compared the effects of learning from a high expertise (e.g., expert) model to a lower expertise (e.g., advanced student) model, the latter being closer in knowledge and skill to novice learners. Contrary to the model-observer similarity hypothesis, older findings indicate that for primary school children, a more expert model was more beneficial for a wide range of measures such as learning communication skills or paired-associates relative to a low expertise model (e.g., Simon, Ditrichs, & Speckhart, 1975; Sonnenschein & Whitehurst, 1980). In line with the MOS-hypothesis, however, Braaksma et al. (2002) showed more recently that secondary education students who had weak writing skills benefitted more from being instructed to focus on weak models who explained and demonstrated how to write an argumentative text (on video) than from focusing on strong models, whereas the reversed effect was found for more competent students. Studies in higher professional education, however, showed no benefit of (advanced) peer models: written examples created by experts fostered transfer (i.e., applying the acquired knowledge to novel tasks) more than examples created by advanced peer students, possibly because experts' explanations contain a higher degree of abstraction (Boekhout, Van Gog, Van de Wiel, Gerards-Last, & Geraets, 2010; Lachner & Nückles, 2015).

Clearly, findings regarding both age and expertise have been mixed. There are two important things to note, however. First, in many of those studies, there were actual differences in how the models behaved across conditions or in other words, in the content of the examples. This applies, for instance, to studies that contrasted learning from coping models and mastery models because only coping models' behaviour contains expressions of uncertainty and/or errors (e.g., Kitsantas, Zimmerman, & Cleary, 2000; Schunk & Hanson, 1985; Zimmerman & Kitsantas, 2002), and to studies that compared high and lower expertise models because their explanations differ in quality (e.g., Lachner & Nückles, 2015; Simon et al., 1975; Sonnenschein & Whitehurst, 1980). This makes it hard to evaluate whether any differences in motivational or learning outcomes were due to (perceived) similarity or to differences in content. Some evidence indicating that perceived similarity may still influence cognitive, affective, or motivational aspects of learning when all else is equal, comes from studies with *animated* models (i.e., animated pedagogical agents) in which the content was kept equal. For instance, Rosenberg-Kima, Baylor, Plant, and Doerr (2008) found that self-efficacy was enhanced more for students who learned about engineering from a 'young and cool' agent than a 'young and uncool' and an 'older and (un) cool' agent. Liew, Tan, and Jayothisa (2013) found that for female university students, a peer-like agent was more enjoyable to learn programming skills from than an expert-like agent, although the expert-like agents were more credible and led to less anxiety during learning, possibly because people are more easily persuaded by those whom they perceive as experts (Chaiken & Maheswaran, 1994; Debono & Harnish, 1988). Lastly, Kim, Baylor, and Reed (2003) found that a mentor-like agent was as beneficial for learning compared to an expert-like agent, but was considered more motivating to interact with and learn from.