Learning and Instruction 28 (2013) 35–47

Contents lists available at SciVerse ScienceDirect

Learning and Instruction

journal homepage: www.elsevier.com/locate/learninstruc

Learning to be creative. The effects of observational learning on students' design products and processes

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ARTICLE INFO

Article history:
Received 27 July 2012
Received in revised form
9 May 2013
Accepted 14 May 2013

Keywords:
Observational learning
Cognitive modeling
Art and design education
Creativity
Creative process

ABSTRACT

Previous research indicated that observing is an effective learning activity in various domains. Can observational learning also be beneficial in enhancing creativity in art and design education? We hypothesized that observation has a positive effect on creativity measured in the designing process and the final products. 61 Students (ninth grade) participated in an experiment with a pre-post-test control group design, with randomized assignment to two conditions. In the observational learning condition participants observed and evaluated – on video – peers doing design tasks while concurrently thinking aloud. In the direct instruction condition participants were executing these design tasks themselves. The participants were pre- and post-tested on design tasks. Results indicated that observation had beneficial effects on creativity in the design products compared to the direct strategy instruction for high aptitude students, but not for low aptitude students. Students who observed generally brainstormed more and reported a more process oriented approach.

1. Introduction

Great Renaissance artists such as Leonardo da Vinci and Michelangelo were apprentices in the workshops of their masters to acquire the art and craft of painting and sculpture. Apprenticeship includes modeling and observation. Observational learning, as examined in the present study, also entails a form of modeling and observation; students learn by watching, interpreting and evaluating peers who carry out a creative task.

Observational learning proved to be an effective learning activity in various domains, such as mathematics (e.g., Schunk & Hanson, 1985), reading (Couzijn & Rijlaarsdam, 2004), argumentative writing (Braaksma, Rijlaarsdam, & Van den Bergh, 2002; Couzijn, 1999; Raedts, Rijlaarsdam, Van Waes, & Daems, 2007), learning to revise (Van Steendam, Rijlaarsdam, Sercu, & Van den Bergh, 2010), learning to collaborate (Rummel & Spada, 2005) and learning argumentation skills (Schworm & Renkl, 2007).

In the current study we examine the effectiveness of observational learning in the domain of creativity. Creative skills are highly valued in schools these days. In art and design education students are specifically trained in creative processes. There are few experimental studies that examine the effectiveness of interventions to enhance creative processes in secondary art education (e.g., Groenendijk, Janssen, Rijlaarsdam, & Van den Bergh, 2011). Therefore, we set up an experimental study in art education. In the following sections we will discuss the underlying mechanisms of learning from observation, describe the specific features of creative tasks, and outline some relevant creative processes which could be the object of observational learning.

1.1. Observational learning

Observational learning is a key element of Bandura's Social Learning Theory (1977). According to this theory, learning takes place through the interaction of cognitive and social processes: learners acquire new skills by observing others (models) at work. Bandura (1986) describes four preconditions for acquiring new skills by observation: 1) the learner needs to pay attention to the relevant behavior, 2) the learner needs to store the information actively in memory, 3) the learner needs to be able to reproduce the modeled behavior, and 4) the learner needs to be motivated to carry out newly acquired skills. These four preconditions can be stimulated in a learning situation. For example, learners more easily understand the model's actions when cognitive information, which is normally not accessible, is also provided. A model

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http://dx.doi.org/10.1016/j.learninstruc.2013.05.001

may verbalize his thought steps while being at work; this is called *cognitive modeling*. Memory storage, for instance, can be stimulated by having learners summarize or reword the behavior they observed.

Collins, Brown, and Newman (1989) developed a model for implementing apprenticeship learning in formal education for cognitive tasks by using cognitive modeling: cognitive apprenticeship. The advantage of cognitive apprenticeship is that learners acquire new information in the context of a task execution process (of an expert) just as in informal apprenticeship situations. According to Collins et al. (1989) this leads to the acquisition of new strategies and new understandings of what a specific task entails.

Observational learning includes both modeling of overt behavior and cognitive modeling. It may take place in real live or for example by means of video. In writing, Braaksma et al. (2002), Couzijn (1999), and Raedts et al. (2007) examined the effect of observation through a multimedia learning environment. In these cases, students in secondary education (Braaksma et al., 2002; Couzijn, 1999) and university students (Raedts et al., 2007) watched videos of peer models performing (parts of) a writing task while thinking aloud.

Several factors may influence the effectiveness of observational learning, such as students' aptitude level and the competence level of the models. Braaksma et al. (2002) found that when confronted with a new task, weaker writers learned more from focusing on the weaker model of a pair, while better writers learned more from focusing on the more competent model. Zimmerman and Kitsantas (2002) showed that college students who observed a coping model, a model who gradually improved her writing technique, did better than students who had observed a mastery model, a model who already completely mastered the skill. So learners' aptitude and models' competence level should be taken into account when testing the effects of observational learning.

Learning by observation involves more than just watching models. A crucial element is evaluation. Braaksma, Van den Bergh, Rijlaarsdam, and Couzijn (2001) analyzed students' observation activities and found that evaluation and elaboration are essential for the effectiveness of learning by observing. Sonnenschein and Whitehurst (1984) studied the effect of observation and evaluation compared to observation only for preschool children who practised communication skills. Children performed better on speaking and listening tasks in the observation-evaluation condition than in the observation only condition. Sonnenschein and Whitehurst suggest that the additional evaluation task caused the transfer effects on listening and speaking. It seems advisable then to stimulate students to evaluate models and to elaborate on the models' behavior after observation.

1.2. Creative tasks and modeling

Creative tasks are by definition 'ill-defined'. Not all task parameters are entirely defined. This results in a large problem space, especially since high performance on creative tasks requires novelty and originality. Artists even have to discover their own task (artistic problem), before they can start solving it (for example, finding out what to draw (Getzels & Csikszentmihalyi, 1976)). Is observation others effective for learning to deal with these ill-defined creative tasks?

At first sight creativity and modeling seem to be in contrast. Creativity requires originality and novelty whereas modeling may lead to imitation. Bandura (1986), however, describes the potential for creative modeling; models may stimulate unconventional thinking. Observational learning affects the task process. Braaksma, Rijlaarsdam, Van den Bergh, and Van Hout-Wolters (2004) demonstrated this for writing argumentative texts. Students who had learned to write by observing engaged in metacognitive activities during writing, such as planning, more often than students who had learned by practicing writing. Therefore, we expect that the observation of someone who is thinking aloud while engaged in creative work affects the observer's future thinking activities rather than product features.

Similar to learning from models is learning from worked examples. These examples also show process steps. Several studies in the area of worked examples have focused on the effect of examples for learning in ill-defined domains (e.g., Rourke & Sweller, 2009; Van Gog, Paas, & Van Merriënboer, 2004, 2006, 2008). Rourke and Sweller (2009), for instance, found that students who studied worked examples of a task about recognizing designers' styles, performed better than students who practiced this task themselves. They concluded that process examples are as effective in ill-defined domains as they are in well-structured domains. The difference between worked examples and modeling is that worked examples show the ideal problem solution steps, on an executional level, while think aloud models show also the metacognitive and affective processes, and may show coping behavior instead of mastery behavior only (Van Gog & Rummel, 2010).

Several worked example studies have defined the type of information that should be modeled in the case of ill-defined tasks (e.g., Hilbert, Renkl, Kessler, & Reiss, 2008; Van Gog et al., 2004, 2006, 2008). Hilbert et al. (2008) have shown that heuristic information, solution steps which *may* lead to successful solutions, foster learning in mathematical proving skills. Van Gog et al. (2004, 2006, 2008) argue that experts' 'how' and 'why' process information enables students to deepen their understanding of solution procedures in ill-defined domains. For tasks with large problem spaces, learners need strategies to explore and narrow the search space and select the most promising solution procedures. Therefore, students need to know why certain solution steps are taken. Van Gog et al. (2008) show that process information is indeed effective in the first phase of learning in electrical circuit troubleshooting.

Few studies examined the effect of modeling examples and artistic creative tasks (Anderson & Yates, 1999; Groenendijk et al., 2011; Teyken, 1988). Anderson and Yates (1999) examined the effect of modeling on young children's clay works. They found that the creativity of clay works produced after modeling was higher than of clay works produced under regular conditions. Teyken (1988) examined the effects of an experimental curriculum for student art teachers. Among other activities, the students watched videos of designers-at-work. Teyken found that the students' design processes changed as a result of the experimental curriculum. Observation was part of this experimental curriculum. Unfortunately the effect of this learning activity was not isolated. Therefore it remains unclear what the contribution of observation was.

Groenendijk et al. (2011) examined the effect of observational learning on two creative tasks: poetry writing and collage making. A positive effect on the creativity of products was found for collage making, but not for poetry writing. In both domains process effects were demonstrated, with a quite rough measure. In the current study we build upon this study to gain more insight into the effect of observation on processes in the visual arts domain by using more precise process measures that distinguish between typical processes and an intervention more strongly focused on creative processes.