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Effects of science fiction films on junior high school students' creative processes and products

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ABSTRACT

This study explored whether it is possible to enhance the creative processes and products of junior high school students enrolled in technological design courses by cultivating an atmosphere rooted in science fiction films (SFFs) or training in creative problem-solving. A quasi-experimental method comprised of non-equivalent pre- and post-tests was used in teaching experiments involving 163 seventh-grade students in seven classes. Descriptive statistics and ANCOVA revealed the following: (1) students immersed in a SFF environment performed better when presenting creative ideas during the creative process; (2) students in a SFF environment performed better in making creative products, but not at a significant level; (3) students with different cognitive styles did not differ in terms of creative processes and products.

1. Introduction

Teaching creativity is important because it promotes economic growth and the acquisition of essential life skills that improve the quality of everyday life (Craft, 2005; Sternberg, Lubart, Kaufman, & Pretz, 2005). There is a vital need for research into creativity as it is important in cultivating students' ingenuity. Many scholars have explored technological design courses and their effects on creativity in high school education; some have reported that typical activities in technological design courses are unchallenging and uninspiring, and subsequently ineffective at promoting creativity (McLellan & Nicholl, 2013). Thus, facilitating an appropriate atmosphere in technological design courses is important and worthy of further exploration.

Technological design courses generally involve design and practice. Some previous researchers working in the field of product design have used science fiction films (SFFs) in an attempt to stimulate students' imagination and creativity, and subsequently their overall performance (Lin, Tsai, Chien, & Chang, 2013; Yu, Fan, Tsai, & Chu, 2013). Imagination is a valuable cognitive activity recognized by researchers specializing in mental simulation who advocate enhancing learners' performance in technological design by analyzing students' imaginative activities (van Meer & Theunissen, 2009). Additionally, learners can simulate complicated situations using their imagination. Aside from enhancing problem-solving capacity, imagination is also effective at diversifying combinations and possibilities that, in turn, yield more creative solutions (Liang, Hsu, & Chang, 2013). Hence, integrating SFFs with technological design activities may encourage the creation of learning environments that inspire and cultivate student creativity.

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With regard to implementing a creative atmosphere in which SFFs complement technological design activities, it is not yet clear which creative aspects are most beneficial. Yeh and Wu (2006) called the convergence between creativity and technological design 'technological creativity,' where the creative process and product are intertwined (Yeh, 2004a). Hence, incorporating SFFs into technological design activities should help foster creative processes and creative products. Some research has suggested that students generated creative ideas more readily after being inspired by SFFs. In their research into technological design activities, specifically the creative products of junior high school students, Yu, Lin, and Hung (2010) discovered that students performed better in materials and form, and that there was room for improvement in structural and functional design. This study investigated whether SFFs inspire students to perform better in structural and functional design, focusing on a creative product. Additionally, because students have different cognitive styles, they use different organizational, learning, and data processing methods (Kirby, Moore, & Schofield, 1988; Riding & Rayner, 1998; Riding & Sadler-Smith, 1997). Ormrod (2008) found that students with text-oriented cognitive styles performed better when processing text-based data compared with students with graphic-oriented cognitive styles. In contrast, students with graphic-oriented cognitive styles excelled at processing pictorial data. These results suggest that a learning environment based on SFFs may have varying effects on students with varying cognitive styles. For example, students with graphic-oriented cognitive styles may exhibit superior creative processes and products.

In summary, this study explored whether it is possible to enhance the creative processes and products of students enrolled in technological design courses by cultivating an atmosphere rooted in SFFs. Specifically, it explored: (1) the overall effects of SFFs on junior high school students; (2) how SFFs affect the creative products of students; (3) how different cognitive styles affect the creative process after watching SFFs; and (4) how different cognitive styles affect the creative products of students under the same conditions.

2. Literature review

2.1. Science fiction films (SFFs)

Using SFFs in education is not a new technique; many educators have used SFFs to introduce new scientific concepts to students (Barnett & Kafka, 2007; Efthimiou & Lewellyn, 2004; Freedman & Little, 1980). Researchers have investigated the positive (Liberko, 2004) and negative (Barnett et al., 2006) aspects of this approach. Some researchers have also explored using SFFs to help students learn new scientific concepts, and to inspire them to learn new scientific concepts, with positive results in both cases (Brake & Thornton, 2003; Laprise & Winrich, 2010).

Apart from using SFFs to teach traditional science subjects, some scholars have analyzed the contents of SFFs and their potential to inspire the imaginations of learners. Larson (2008) analyzed ten popular SFFs and identified certain technological limitations within them, as well as future trends based on the development and conceptualization of computers in each film. Stated simply, the contents of SFFs are bound to real-world limitations that foretell their future development. Larson found that although the contents of these SFFs were limited, they were still capable of inspiring and promoting learners' imaginations. Additionally, the sequences of these ten SFFs showed that technological limitations were eventually overcome, subsequently providing students with more imaginative space. Yu et al. (2013) used scientific detective videos, which are similar to SFFs, and provided imaginative space for technology teachers to support the design of technology learning activities. The results revealed that a broad range of scientific detective videos can inspire technology teachers to integrate other kinds of subject matter into the design of their teaching activities.

This study builds on previous research to explore whether, and how, the imaginations of junior high school students can be nurtured using SFFs, with a specific focus on elements of technological design. The experiments used in this study examined the values of the SFFs, not their quality (Larson, 2008). Additionally, this study investigated whether learners can use the imaginative contents effectively and transform them into a creative product.

2.2. Creative process and creative products

Within the field of technological design, the concept of 'creativity' refers to creative products, i.e., 'technological creativity.' This has been the case in most studies exploring technological creativity and the creative process and products, because it is possible to evaluate learners' accomplishments and their creativity based on their creative products (Chang, Lee, Yu, and Lin, 2009; Cheng & Yeh, 2006; Yeh & Wu, 2006; Yeh, 2004b, 2005).

Wallas (1926) proposed four major stages of the creative process: preparation, incubation, inspiration, and verification. Almost 80 years later, Nemiro (2002) proposed four stages of the creative process using the following terms: idea generation, development, finalization/closure, and evaluation. Although the terms differ, the concepts are similar. The creative ideas produced in the early stages are the key factors affecting the creative product in the later stages. Treffinger (1980) believed that creativity was closely related to the creative process, through which it was possible to enhance creative performance. Similarly, Feldhusen and Treffinger (1980) stressed the need to improve students' creative processes using problem-solving activities designed to promote learners' creative performances; many other scholars have made similar arguments, including Davis and Rimm (1985), Karnes et al. (1961) and Subotnik (1988). Davis (1991) and Davis and Rimm (1985) also argued that student creativity can be enhanced through peer learning, especially if they are encouraged to participate in student-team activities (Karnes et al., 1961). Recently, Lassig (2013) also proposed four stages of the creative process: adaptation, transfer,