

Does the Personalization of Multimedia Instruction Influence the Effectiveness of Decorative Graphics during Foreign Language Instruction?

(外语教学中多媒体设计的个性化原则是否影响图像教学的效果)

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Abstract: This report summarizes two experiments that explored whether the personalization principle mitigates the influence of seductive details in decorative graphics during multimedia instruction about the culture of a language. The results showed that decorative graphics increased learning during personalized instruction (Experiment 1), but impaired learning during impersonal instruction (Experiment 2). These findings add to research literature by showing that the instructional value of decorative graphics in multimedia instruction depends on the verbal-semantic context in which they are embedded. This research demonstrates that they are beneficial in personalized multimedia instruction, but detrimental in impersonal instruction.

摘要: 本文旨在研究外语教学中, 采用多媒体辅助文化知识学习中, 个性化原则能否对装饰性图像效果进行调和。实验一的研究结果显示在个性化教学中, 装饰性图像能提高教学效果, 实验二的研究结果显示在非个性化教学中, 装饰性图像有损教学效果。本文提出在多媒体辅助教学中, 装饰性图像的教学效果依赖于语言的语义场景, 装饰性图像有益于个性化的多媒体教学, 但是对非个性化的多媒体教学无益。本文的研究对文献进行了补充, 为教学实践提供了参考依据。

Keywords: Multimedia, personalization principle, decorative graphics

关键词: 多媒体、个性化原则、装饰性图像

1. Introduction

Understanding the culture associated with another language is an important aspect of foreign language instruction. True proficiency in a foreign language cannot be developed without understanding the culture of the target language (National Standards

in Foreign Language Education Projects, 1996). This idea is consistent with the primary premise of situated learning theory: what is learned cannot be separated from how it is learned and used. That is, “Learning and cognition . . . are fundamentally situated” (Brown, Collins, & Duguid, 1989, p. 32).

Although situating foreign-language instruction within its cultural context has been found to be the most effective means of reaching second language proficiency (Met, 1998), teaching the culture of a language can be challenging when full immersion programs are not feasible. One solution to this dilemma is to use rich multimedia materials (e.g., engaging video) in the classroom to help students experience the charm and appeal of the culture of a foreign language. Because learning about the culture of a language encompasses both affective (e.g., interest, appreciation, aesthetics) and cognitive learning domains, multimedia instruction containing decorative, rather than instructional, visuals may be the most effective approach. Furthermore, combining decorative visuals with a personalized, rather than a non-personalized, narrative may be the optimal way to combine visual and verbal information in multimedia instruction (Danielson, 2012; Danielson, Schwartz, Falahi, & DeVries, 2011). However, this assumption needs empirical examination because decorative visuals are typically viewed as detrimental to learning (Carney & Levin, 2002; Moreno & Mayer, 2000).

The purpose of the current research is to examine whether personalizing multimedia instruction moderates learning from decorative graphics. Our theoretical goal was to determine whether a previously identified boundary condition of the multimedia principle (i.e., that graphics must convey instructional information) is negated when multimedia instruction combines decorative graphics with a personalized narrative. Our practical goal was to discover optimal ways of designing multimedia materials to improve Chinese language learning.

2. Literature review

The multimedia learning principle states that student learning is improved when text is combined with graphics (Mayer, 2009). Empirical support for this principle can be found in several experimental studies (Butcher, 2006; Mayer, 1989; Mayer & Anderson, 1991, 1992; Moreno & Valdez, 2005). The multimedia learning principle can be explained from the perspective of Mayer’s cognitive theory of multimedia learning (CTML).

2.1 Cognitive theory of multimedia learning

Mayer’s (2009) CTML describes the mental processes involved in learning from multimedia materials. The CTML is based on three assumptions about the human information processing system: (a) dual channels, (b) limited capacity, and (c) active processing. The dual channel assumption refers to separate channels for processing visual and auditory information in working memory. The limited capacity assumption refers to the information processing limitations (in terms of capacity and duration) of each channel. Finally, the active processing assumption is that learners must actively process

information in working memory by selecting, organizing, and integrating information within and between processing channels,

Most of the multimedia-learning principles described in the literature (e.g., continuity principle, modality principle) are informed by the first two assumptions of the CTML: dual channels and limited capacity. Viewed from this perspective they represent ways of reducing extraneous cognitive load in order to improve the efficiency of multimedia instruction (Mayer & Moreno, 2003). Extraneous cognitive load refers to mental effort that is invested in ways unrelated to the goals of the instruction (e.g., listening to background music, dividing attention between poorly arranged instructional elements). Interestingly, multimedia-learning principles related to the third assumption of the CTML (i.e., active processing) are less prevalent in the research literature. However, this is an important area of research because, according to the CTML, learning is contingent upon the active processing of instructional material—irrespective of issues related to extraneous load. That is, unless learners are motivated to actively select, organize, and integrate incoming information, efforts to reduce cognitive load are futile. However, the *personalization principle* has been identified as an instructional approach that promotes active processing in working memory.

2.2 The personalization principle

The personalization principle refers to students learning more effectively from multimedia instruction when words are presented in a conversational (personalized) manner rather than a formal (non-personalized) manner (Clark & Mayer, 2011; Mayer, Fennell, Farmer, & Campbell, 2004). Personalized instruction consists of verbal social cues that use first and second person language (e.g., I, my, you, etc.), comments focused directly at the learner, or comments that make the personality of the author more salient. Several studies have confirmed the advantages of personalizing multimedia instruction (Ginns, 2013; Mayer, et al., 2004; Moreno & Mayer, 2000; Rey & Steib, 2013).

Theoretically, personalized instruction is purported to increase learners' sense of social presence in a learning episode by creating the feeling that they are in a social relation with the individual or on-screen agent that is conveying the instructional message (Moreno & Mayer, 2004; Reeves & Nass, 1996). This increase in social presence, in turn, increases learner interest and motivation, encouraging them to use cognitive resources to actively process instructional messages (Moreno & Mayer, 2004). This increase in motivation also energizes and sustains learner effort to engage in active cognitive processing (i.e., selecting, organizing, or integrating information) (Wentzel & Wigfield, 2009), the third assumption of the CTML.

2.3 The seductive details hypothesis

Seductive details inhibit the learners' ability to engage in the active processing assumption of the CTML. Seductive details may inhibit active processing by (a) diverting attention from key information, (b) disrupting the coherent organization of information, or (c) activating irrelevant information. (Harp & Mayer, 1998; Sanchez & Wiley, 2006). For example, decorative graphics are often interesting and aesthetically pleasing, but not

directly relevant to the instructional objectives of a lesson (Sung & Mayer, 2012). They are often considered seductive details because they can be extraneous or incidental to the purposes of the instruction. Several studies have demonstrated the detrimental learning effects of decorative graphics in instructional messages (Carney & Levin, 2002; Levin, Anglin, & Carney, 1987; Sung & Mayer, 2012).

However, more recent studies have shown that decorative graphics are not always detrimental to learning; for instance, they can function as metaphors that highlight underlying themes in a lesson (Danielson, 2012). They can also increase positive mood, alertness, calmness, and confidence during learning (Lenzner, Schnotz, & Muller, 2013).

Furthermore, decorative graphics have been shown to moderate the beneficial effects of instructional graphics. For example, Lenzner et al. (2013) found that learners reading a text accompanied by both instructional and decorative graphics outperformed learners who read the text accompanied by instructional graphics alone. There is evidence to suggest that the moderating effect of decorative graphics may extend to other aspects of multimedia instruction. Danielson and colleagues (Danielson et al., 2011; Danielson, Schwartz, & Lippman, 2015) conducted a series of studies exploring the effects of decorative graphics on text comprehension. They concluded that decorative graphics can moderate (i.e. improve) text comprehension to the degree that learners are able to conceptually link the text and graphic. In their studies the decorative graphics functioned as metaphors that enabled the learners to infer a relationship between the text and graphics. Interestingly, these researchers found that the beneficial effects of decorative graphics were not evident on an immediate posttest, but only after a one-week delay. They concluded that linking an abstract metaphor to associated text requires a depth of cognitive processing that may not be apparent during immediate testing; only during delayed testing are the benefits of deeper processing manifest as cognitive schema that are more resistant to decay over time.

As a logical extension of this research we hypothesized that decorative graphics can moderate personalized narration if the learner sees the graphics (e.g., personal photographs) as personalized extensions of the narration. Specifically, we predicted that decorative graphics would increase the benefits of personalized multimedia instruction as evidenced by higher scores on a delayed, but not immediate, posttest. Contrariwise, we hypothesized that decorative graphics would function as seductive details in non-personalized multimedia instruction resulting in impaired performance on immediate and delayed posttests. This prediction was based on the assumption that multimedia instruction containing non-personalized narration lacks the social cues necessary to generate a feeling of social presence and a corresponding increase in interest, motivation, and learning. Obviously, decorative graphics cannot strengthen the effects of personalization in a non-personalized narration.

In this investigation we explored the hypotheses discussed above in two experiments. In Experiment 1 we compared a multimedia presentation that combined decorative graphics with a corresponding personalized narrative (the personalization principle) to a presentation of the same personalized narrative without graphics. In Experiment 2 we combined a non-personalized narrative with corresponding decorative

graphics to a presentation of the same non-personalized narrative without graphics. We hypothesized decorative graphics congruent with a personalized narrative would facilitate learning on a delayed, but not immediate, posttest (Experiment 1), while decorative graphics accompanying a non-personalized narrative would impair performance on both immediate and delayed posttests (Experiment 2).

3. Experiment 1

Based on prior research, we hypothesized that a personalized multimedia presentation would encourage learners to use decorative graphics as conceptual links between the personalized experience of the narrator and the content of the narration, thereby improving retention of the multimedia presentation.

3.1 Participants and design

Thirty-one undergraduate students (19 men and 12 women), ranging in age from 19-24 years old ($M = 21.7$), from a large university in the Southwestern United States volunteered to participate in the study. The participants were enrolled in Japanese language courses and received course credit for their participation. Each participant was randomly assigned to one of two experimental conditions: personalization plus decorative graphics (PDG) ($n = 17$) or personalization only (PO) ($n = 14$).

3.2 Multimedia presentation

The base multimedia presentation consisted of a five-minute video narrated in English by an Australian high-school female discussing her six-month experience as an exchange student in a Japanese high school. This video constituted the PDG treatment condition. Consistent with the *personalization principle*, the recorded live image of the female narrator was embedded in the video; the narrator discussed her experiences in a conversational tone using first-person language, occasionally focusing her comments directly at the participant. The video also included decorative graphics, which consisted of scenes from the Japanese high school. Most of the graphics were photographs taken by the narrator of the people and places she visited during her experience as an exchange student in Japan. The PO condition was created by removing the audio track from the video. Participants in the PO condition listened to the same audio as those in the PDG condition, but they did not view the visual information (i.e., narrator or decorative graphics); they listened to the narration of the video through headphones.

3.3 Tests, procedures and analysis

A retention test consisting of 10 multiple-choice items was created to assess learner retention of the verbal material presented by the female narrator. This test was used as a pretest, an immediate posttest, and a one-week delayed posttest.

Upon arriving at the university language learning laboratory, participants were randomly assigned to either the PDG or the PO condition. They then took the online

pretest, studied their assigned treatment material, and then took the immediate posttest. Seven days later the participants took the delayed posttest in their regular classrooms.

The data from the immediate and delayed posttest were analyzed separately by one-way analysis of covariance (ANCOVA); the pretest was used as the covariate in the analysis.

3.4 Results

One-way analysis of covariance (ANCOVA) was used to examine differences between groups on the immediate and delayed posttest. All statistical tests were conducted with alpha set at .05. Effect sizes are reported using partial Eta squared (η^2).

The results of the ANCOVA on the immediate posttest were not statistically significant, $F(1, 28) = 2.3$, $MSE = .52$, $p = .14$, $\eta^2 = .077$; however, consistent with our hypothesis, the delayed posttest was significant, $F(1, 28) = 6.74$, $MSE = 1.43$, $p = .015$, $\eta^2 = .194$. Students receiving a personalized narrative and decorative graphics outperformed those receiving just the personalized narration on the delayed posttest. (see Table 1)

Table 1: Immediate and Delayed Posttest Mean Scores by Experimental Condition in Experiments 1 and 2

Dependent Measures	Personalized	Decorative Graphics		Auditory Only		Total	
		M	SD	M	SD	M	SD
Immediate Posttest	Yes (Exp.1)	9.76	0.44	9.50	0.52	9.63	0.48
	No (Exp.2)	7.91	1.58	7.80	0.92	7.86	1.28
Delayed Posttest	Yes (Exp.1)	9.94	0.24	9.50	0.65	9.72	0.45
	No (Exp.2)	6.73	1.35	8.00	0.94	7.33	1.32

4. Experiment 2

In this experiment, we hypothesized that removing personalization from a multimedia presentation would mitigate the instructional value of decorative graphics, thereby, reducing the visual information to mere seductive details. Our hypothesis was based on prior research showing the detrimental effects of seductive details on learning (Carney & Leven, 2002; Harp & Mayer, 1998, Sung & Mayer, 2012).

4.1 Participants and design

Twenty-one undergraduate students (9 men and 12 women), ranging in age from 20-24 years old ($M = 21.6$), enrolled at the same university as the participants from Experiment 1, volunteered to participate in the study. The participants were enrolled in Chinese language courses and received course credit for their participation. Each

participant was randomly assigned to one of two experimental conditions: non-personalization plus decorative graphics (NPDG) ($n = 10$) or non-personalization only (NPO) ($n = 11$).

4.2 Multimedia presentation

The base multimedia presentation was a five-minute YouTube video clip about Chinese educational philosophy. The video was narrated in English by an adult male and consisted of information about the development of the philosophy of education in mainland China and Taiwan.

The narrator spoke in a formal tone using third-person language (e.g., it and he, etc.) with no personal comments or interactions with the listeners; he merely introduced the facts (e.g. “There are three main influences on the contemporary Chinese philosophy of education.”). The NPDG condition differed from the NPO condition by including both the video and the narration. However, the video did not contain personal images of the narrator, only decorative graphics that did not contain instructional content (e.g. photos of well-known Chinese educational philosophers, and Chinese universities). The audio track of the video (i.e., narration) was captured and saved in a separate file. The NPO group listened to the exact same audio as the NPDG group; the only difference was the absence of the video.

4.3 Tests, procedures and analysis

As in Experiment 1, a ten-item multiple-choice test was created to measure retention of the verbal information presented in the multimedia presentation. This test was used as a pretest, immediate posttest, and delayed posttest. The procedures and data analysis of the experiment were identical to Experiment 1.

4.4 Results

The results of the ANCOVA on the immediate posttest were not statistically significant, $F(1, 18) = .002, n.s., \eta^2 = .00$; however, the delayed posttest was significant, $F(1, 18) = 5.34, p = .03, \eta^2 = .229$. Students in the NPO condition outperformed those in NPDG condition on the delayed posttest. (see Table 1). Contrary to the findings from Experiment 1, students receiving only narration outperformed those receiving both narration plus decorative graphics. Consistent with our hypothesis, it appears that removing personalization from the narration mitigated the value of the decorative graphics as a vehicle for encouraging a linkage between the narrator’s message and the associated decorative graphics.

5. Conclusion

The results of this investigation provide support for the hypothesis that the instructional value of decorative graphics depends on the verbal-semantic context in which they are embedded (Danielson et al. 2011). In Experiment 1, participants who

viewed decorative graphics in the context of a personalized narration outperformed those who listened to the narration without viewing the graphics on a delayed posttest. This result suggests that participants viewing decorative graphics were able to mentally associate the verbal social cues in the narration with the graphics. Therefore, the instructional benefits of personalized narration (i.e., increased social presence, interest, and motivation) were likely enhanced through association with the decorative graphics (Danielson et al., 2011; Danielson, Schwartz, & Lippman, 2015; Lenzner et al. 2013). This interpretation of our results adds to research literature by providing a dual-channel interpretation of the personalization principle, with verbal social cues being processed in the verbal channel and related decorative graphics being processed in the visual channel (Mayer, 2009).

The findings from Experiment 2 provide support for the hypothesis presented above. Contrary to the findings of Experiment 1, the participants who viewed decorative graphics within the context of non-personalized narration performed worse than those who listened to the non-personalized narration without viewing the graphics. The decorative graphics in Experiment 2 appear to have functioned as seductive details resulting in impaired learning performance on the delayed posttest (Carney & Levin, 2002; Levin, Anglin, & Carney, 1987; Sung & Mayer, 2012). It appears that without social cues in the narration the participants were less likely to mentally associate the decorative graphics with the narration.

From a theoretical perspective it appears that a previously identified boundary condition of the multimedia learning principle (i.e., that graphics should be instructional) does not apply when the instructional materials are personalized. The personalization principle seems to mitigate the influence of seductive details in decorative graphics during multimedia instruction about the culture of a foreign language. Finally, the current research supports the use of decorative graphics in learning the culture of a foreign language as long as the accompanying verbal information is personalized.

This research has practical implications for Chinese language instruction. First, instructors should consider the use of personalized multimedia instruction as a means of helping students learn about the culture of the Chinese language. Second, in their search for appropriate video presentations, instructors should pay particular attention to avoid non-personalized presentations that may direct learner attention almost exclusively to the narration and away from the decorative graphics. Decorative graphics may convey important affective (e.g., motivation, aesthetic) information which is important for appreciating the culture of a foreign language. Finally, instructors should not be overly concerned with a lack of immediate learning results from personalized multimedia instruction. The benefits of this instructional approach appear to become more evident with the passage of time.

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