PERSONALIZATION PRINCIPLE IN MULTIMEDIA LEARNING: CONVERSATIONAL VERSUS FORMAL STYLE IN WRITTEN WORD

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ABSTRACT
The purpose of the study is to examine the effect of appropriately designed multimedia software for both conversational and formal styles with respect to various variables. The model of nonequivalent control group was used in the study. While the group studying with the multimedia material in formal style included 22 students, the other group studying in the conversational style included 23 students. The data collection tools used in the study involved an achievement test, the cognitive load scale for both groups and a questionnaire about the students' views of the style used in the personalized group. As a result, a significant difference was found between the cognitive load scores of the students in the personalized group and those of the students in the non-personalized group. However, no significant difference was found between the background knowledge levels of the personalized and non-personalized groups and their posttest achievement scores. In the study, the learners who were in the personalized group stated that the style used in the software motivated them to study and they felt as if they were talking to a human. Additionally, they stated that they preferred similar multimedia software to be used in their other courses and they demanded the use of such multimedia software in face-to-face education.
Keywords: Multimedia learning, personalization, conversational style, formal style

INTRODUCTION

The infusion of multimedia into teaching and learning has considerably altered the instructional strategy in our educational institutions and changed the way teachers teach and students learn (Neo and Neo, 2003). However, a student working with multimedia software is alone but with the texts, narrations, feedback and cues in multimedia software and is provided with a conversation. Therefore, Mayer suggested the personalization principle. According to the personalization principle, people learn better through multimedia presentations in which the words are in the conversational style rather than in the formal style (Mayer, 2005, 2009). The findings of total 11 experiments carried out by Mayer and his colleagues revealed that the students taking the instructional content via the conversational style demonstrated better performance in transfer tests than the students taking the instructional content via the formal style (Mayer, 2009).

In general, the instructional content in multimedia software is given via the formal style. When the instructional content in multimedia software is transformed from the formal style to the conversational style, the personalization principle occurs. The conversational style can be formed in two ways: The first way is to use "I" and "you" instead of a third person in the instructional content. The second way is to include direct comments into the instructional content for the learner. Here, while the instructional content remains the same, only the presentation style of the content changes (Mayer, 2005). When the sample presented in Table 1 is examined, it is seen that the statement by a third person in the formal style was transformed into the conversational style by using "you" and adding the statement of "I wish I attended this class".

Table 1. A sample for the formal style and the conversational style

Formal style (non-personalized): "Since p value was .01, it could be stated that the mean score of the students in Teacher Yasemin's class (70.82) was significantly higher than the overall mean of students in Turkey (65.43) …"
Conversational style (personalized): "Since p value was .01, you could say the mean score of the students in Teacher Yasemin's class (70.82) was significantly higher than the overall mean of students in Turkey (65.43). I wish I attended this class…"

PURPOSE OF THE STUDY

The purpose of the study was to examine the multimedia software appropriately designed for the conversational and formal styles with respect to various variables. In line with this overall purpose, the research questions were as follows:

1. Is there a significant difference between the post-test achievement scores of the students studying with the multimedia software designed in conversational style and the post-test achievement scores of those studying with the multimedia software designed in formal style?
2. Is there a significant difference between the cognitive load scores of the students studying with two different multimedia softwares designed in accordance with either the conversational style or the formal

style?

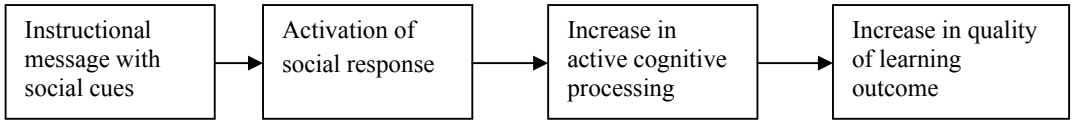
3. What are the views of the students studying with the multimedia software designed in conversational style about this software?

THEORETICAL FRAMEWORK

In this part, politeness theory, cognitive load theory and social agency theory constituting the theoretical basis of the study are explained.

Social agency theory: Mayer and his colleagues put forward the social agency theory. According to this theory, like the conversational style, social cues can help learners study harder in a multimedia learning environment. Figure 1 presents the social agency theory (Mayer, 2009).

How Social Cues Prime Deeper Learning



How Lack of Social Cues Does Not Prime Deeper Learning

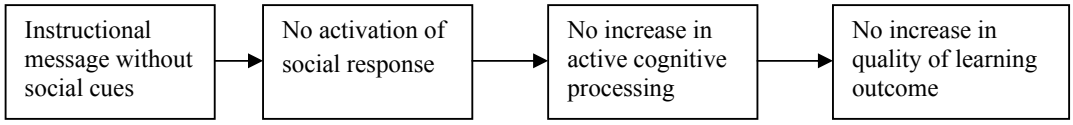


Figure 1. Social agency theory (Mayer, 2005, 2009)

As can be seen in the upper row in Figure 1, when the instructional messages include social cues (e.g. conversational style), the learner considers the tutor as a conversational partner. Thus, the learners' cognitive processes are active in order to make sense of the tutor's message. This situation increases the quality of learning outcomes. As can be seen in the lower row in Figure 1, when the instructional messages do not include any social cues (e.g. formal style), the learner does not consider the tutor as a conversational partner. Thus, learners are likely to make less effort to make sense of the tutor's message. In this case, the quality of the learning outcomes will not be improved (Mayer, 2009). In the present study, the multimedia software including social cues (conversational style) was compared with the multimedia software without any social cues (formal style).

Politeness theory: The politeness theory was introduced by Brown and Levinson (1987). The theory suggests that everybody has a positive face and a negative face. The negative face does not like being prevented. The positive face wants its demands to be approved. The suggestions and feedback as well as communicative acts in the instructional software are likely to threaten the positive and/or negative face(s) of the learners. For example, if the feedback in the software criticizes the learner, the learner may think his or her positive face is not approved. Similarly, if the feedback in the software gives advice to the learner, the learner may think his or her negative face is prevented and believe he or she is hindered. If polite tutors adopt a cooperative approach to the learner (e.g. "Let's read the following example"), this may decrease the threats to the positive face of the learner. In addition, if polite tutors do not restrict the freedom of the learner (e.g. "You could press the SPACE key"), this may decrease the threats to the negative face of the learner. In this study, the feedback in the multimedia software designed in conversational style was written in polite style.

Cognitive load theory: The cognitive load theory was put forward by Chandler and Sweller (1991). The cognitive load theory focuses on cognitive processes. Cognitive load increases with the existence of out-of-topic activities in the multimedia learning environment; thus, learning is damaged. The running memory has a limited capacity. An individual's exposure to a great amount of information causes to exceed the capacity of the running memory; resultantly cognitive overload occurs. The present study investigates whether the use of the conversational style as a text type is a factor increasing cognitive load.

LITERATURE REVIEW

In the literature, there are several studies investigating the influence of the multimedia instructional messages - given in the conversational style (personalized) and the formal style (non-personalized) - on students' achievement. Moreno and Mayer (2000), examined whether the multimedia messages given in conversational

and formal style in a multimedia science lesson increases learning through a study involving five experiments. The instructional content was presented via narration in the first, third and fifth experiments and via the text on the computer screen in the second and fourth experiments. In the study, it was concluded that the students receiving the instructional content via the conversational style demonstrated better performance in problem solving tests than those receiving the instructional content via the formal style. Mayer, Fennell, Farmer, and Campbell (2004) examined the performances of the students taking the personalized or non-personalized versions of a narrated animation explaining how the respiratory system of the humans functions. At the end of all the three experiments the researchers conducted, they found out that the students in the personalized group were significantly more successful in transfer tests than those in the non-personalized group. Similarly in another study carried out by Moreno and Mayer (2004), the students studied via an agent-based multimedia educational game. The agents used personalized or non-personalized speech. The students learning via the personalized version were more successful in the reminder and problem solving tests. Most of the studies in related literature focused on the achievement levels of the participants in conversational and formal styles. This study not only aims at finding possible achievement differences but also the amount of cognitive load expent and the participants' views about use of conversational style. The related literature demonstrates that in the studies conducted with the conversational style and formal style, the learners studied via software for a quite short period of time (60 seconds, 140 seconds and so on). In the present study, the learners studied the instructional content for 30 minutes. Therefore, this study could be said to be carried out in a more realistic learning environment.

Personalization can be promoted through politeness (Clark and Mayer, 2008). When the instructional content is presented to the students in the polite style, they demonstrate better performance than they do when it is presented in direct style; which indicates the politiness effect. When the studies on the politeness effect are examined, it is seen that the instructional contents presented via the polite style were compared with direct conversational style. In a study carried out by Mayer, Johnson, Shaw, and Sandhu (2006), the students scored the explanations based on positive and negative politeness. The students assigned lower scores to imperatives but higher scores to the statements based on politeness. The learners with little experience in computer use assigned higher scores to politeness-based statements than those with more experience in computer use. Wang, Johnson, Mayer, Rizzo, Shaw and Collins (2008) examined the influence of students' receiving polite feedback or direct feedback while learning via multimedia educational game on their test performances. The results of the study revealed that the students studying with the polite tutor were more successful in the transfer test. McLaren, DeLeeuwb, and Mayer (2011a) compared the polite conversational feedback and hints (e.g. "Shall we calculate the result now?") found in web-based intelligent tutors with the direct conversational feedback and hints (e.g. "The tutor wants you to calculate the result now"). In the study carried out in a laboratory setting, the researchers assumed that students learning via polite tutors would demonstrate better performance in transfer tests than those learning via direct tutors and that the politeness effect would be stronger with the students with low level of background knowledge than with those with high level of background knowledge. However, when the results considered, it was seen that politeness effect occurred only with the students with low level of background knowledge. This finding reveals an important boundary condition of politeness effect. Politeness effect is unlikely to occur with the students with high level of background knowledge but with the students with low level of background knowledge. McLaren, DeLeeuwb, and Mayer (2011b) conducted another study in a classroom setting - similar to their previous study carried out in the laboratory setting. The researchers compared the polite feedback and hints found in web-based intelligent tutors (e.g. "Let's calculate the result now") with the direct feedback and hints (e.g. "The goal here is to calculate the result"). In the study, two hypotheses were put forward: (1) students studying with polite tutors learn better than those studying with direct tutors and (2) politeness effect will be stronger for the students with low level of background knowledge than for those with high level of background knowledge. As a result of the study, no significant difference was found between the achievement levels of the polite and direct groups. Unlike the studies carried out in a laboratory setting by McLaren, DeLeeuwb and Mayer, politeness effect did not occur with the students with low level of background knowledge. Different from most of the studies carried out in laboratory setting, this study was conducted in real classroom environment equipped with computers, which might help to promote more realistic results. In the present study, polite conversational style was used for feedback but no comparison between polite feedback and direct feedback was aimed.

METHOD

This part of the paper presents the research model, participants, data collection tools, multimedia materials, application process and data analysis.

Research Model

In the study, the model of nonequivalent control group was used. In this model which is similar to the model of

pretest-posttest control group, the groups are not formed randomly. In other words, in this model, there is no special effort to equate the groups via objective assignment, but it is especially important to have subjects as similar as possible. The design allows to increase the number of the groups to have multiple groups, but it does not allow to have a control group (Balcı, 2001). Table 1 presents the symbolic appearance of the model used in the study.

Table 1. Research model

Group	Pretest	Experimental procedure	Posttest
G1 – experimental group (23 students)	ACT1	Studying with the multimedia in conversational style CLS	ACT2
G2 – control group (22 students)	ACT1	Studying with the multimedia in formal style CLS	ACT2

Meanings of the symbols used in the design:
G1: The group taking the multimedia in conversational style
G2: The group taking the multimedia in formal style
ACT1: Academic Achievement Test (Pretest)
ACT2: Academic Achievement Test (Posttest)
CLS: Cognitive Load Scale

Participants

The participants of the study were 3rd grade students taking the course of Scientific Research Methods-ARY204 in the Department of Computer Education and Instructional Technologies (CEIT) at the Education Faculty of Anadolu University. All the participants took this course for the first time. Since the participants were students from CEIT, they had high level of experience in computer use ($\overline{X}$=7 years). In the study, the group studying with the multimedia material in formal style included 22 (4 female and 18 male) students, and the group studying with the multimedia material in conversational style included 23 (6 female and 17 male) students.

Data Collection Tools

In the study, the tools used to gather data included an achievement test, the cognitive load scale and a questionnaire inquiring the students' views of the style used in the personalized group.

Achievement test: The achievement test including multiple choice test items was developed by the researcher. For the content validity and face validity of the test, three field experts were asked for their views (two of whom were experts in CEIT and the other in measurement & assessment). In line with the views and suggestions of the experts, the necessary changes were made, and the test including ten questions was finalized and made ready for the application.
Cognitive load scale: The cognitive load scale was used to measure the mental effort imposed on the participants while they learn the concepts with the multimedia instructional material. The 9-point likert-type scale was developed by Paas and Van Merriënboer (1993) and converted into Turkish by Kılıç and Karadeniz (2004). The internal consistency coefficient of the scale translated into Turkish was 0.78, and the Spearman Brown split half test correlation was 0.70. The scores to be obtained from the scale changed between the points of 1 and 9. The scores between 1 and 4 indicate low cognitive load; 5 corresponds to medium load and the scores between 6 and 9 demonstrate high cognitive load.

Questionnaire: The questionnaire including 10 five-point likert-type items and an open-ended question about the style used in the personalized group was developed by the researcher. For the content validity and face validity of the questionnaire, three field experts (two of whom were experts in CEIT and the other in measurement & assessment) were asked for their views. In line with the views and suggestions of the experts, the necessary changes were made to finalize the questionnaire.

Multimedia instructional materials

For the application of the study, the lesson unit of "t test and t test types" of the course of Scientific Research Methods - ARY204 – was developed as a multimedia material by the researcher and one academician. First, in line with the objectives of the lesson unit, the content was prepared, and two multimedia materials with the same content but in different styles (conversational and formal styles) were designed. The multimedia instructional materials were prepared with the Adobe Flash software, and for the preparation of the visuals, the Adobe Photoshop software was used. Following the development of the instructional software, the materials were

presented to three academicians expertized in subject matter, graphics and instructional design respectively. In line with the views and suggestions of the experts, the instructional materials were finalized. Figure 2 and 3 display the sample screens for the software.

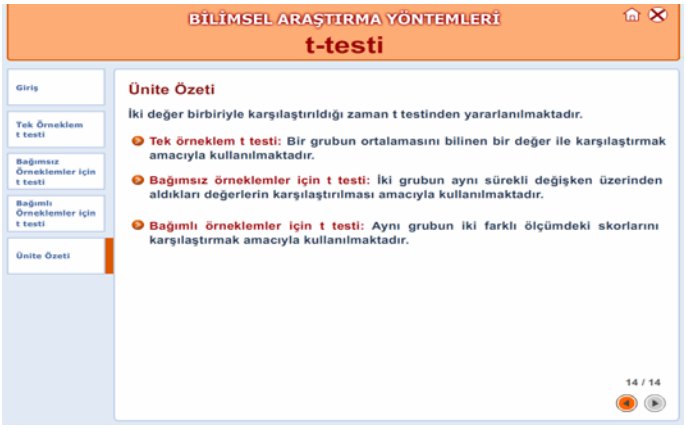


Figure 2. Sample screen for the non-personalized group

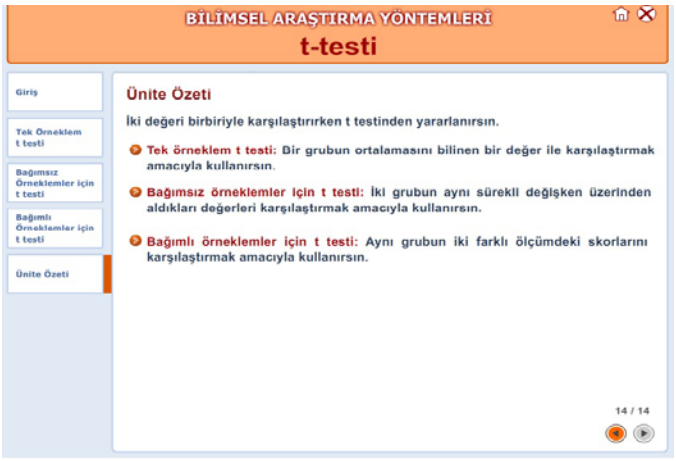


Figure 3. Sample screen for the personalized group

Application process

During the application of the study carried out in the Fall Term 2010-2011 academic years the process followed was described as follows:

- In the first hour of the course, the academic achievement test (pretest) was given to the students in both groups.
- The students in the first group studied individually with the multimedia instructional material prepared in conversational style, and the students in the second group studied individually with the multimedia instructional material prepared in formal style. During the application, the cognitive load scale was given to the students in paper-and-pencil form. The cognitive load scale included a question inquiring the extent of the cognitive load each student expended on each concept in the lesson unit. The students marked the appropriate option in the scale after they studied each concept.
- At the end of the application, the students in both groups were given the academic achievement test (posttest).
- The students in the personalized group were given the questionnaire adressing to the conversational style version of the software they studied with.

Data Analysis

In the study, the statistical significance level was taken as .05. In order to see whether the data obtained in the study had a normal distribution or not, Shapiro-Wilk normality test was applied. As a result of the analysis conducted, it was found out that the academic achievement pretest and posttest scores of the students in the personalized group and those of the students in the non-personalized group did not have a normal distribution ($p<.05$). Therefore, non-parametric tests were used for the analyses of these data sets. When it comes to

cognitive load scores, it was found that the mean cognitive load scores of the personalized and non-personalized groups had a normal distribution (p>.05). Therefore, parametric tests were used for the analyses of these data sets. As a result of the Mann-Whitney U test applied to determine whether the background knowledge levels of the personalized and non-personalized groups (pretest achievement scores) were equal, no significant difference was found between the background knowledge levels of the two groups (p>.05).

Mann-Whitney U test was applied to answer the first research question. For the second research question, independent samples t test was run and to find an answer for the third research question; mean scores were used for the analysis of the quantitative data. Besides, descriptive analysis was used to analyze the quantitative data and the formula [(n-1)/n] was used to interpret the data obtained from five-point likert-type questionaire items. The score ranges of 1,00-1,80 represented "strongly disagree", 1,81-2,60 "disagree", 2,61-3,40 "partly disagree", 3,41-4,20 "agree" and 4,21-5,00 "strongly agree".

FINDINGS

Background Knowledge Levels

There was no significant difference between the background knowledge levels of the personalized and non-personalized groups according to their pretest achievement scores (p>.05). The maximum score to be obtained from the achievement test was 10. As a result of the analysis, it was seen that the pretest achievement scores of both groups (personalized $\overline{X}$= 1.22, non-personalized $\overline{X}$=2.09) were quite low. The students' low level of background knowledge about the subject means that the personalization principle could be tested more reliably (Mayer, 2009).

Posttest Achievement Scores

As can be seen in the Table 1, the results of the Mann-Whitney U test revealed no significant difference between the posttest achievement scores of the students in the personalized and non-personalized groups (p>.05).

Table 1. Mann-Whitney U test regarding the posttest achievement scores

Group	n	Mean Rank	Sum of Ranks	U	p
Personalized	23	21.55	474	221	.447
Non-personalized	22	24.39	561		

Although there was no significant difference between the posttest achievement scores of both groups, it was revealed that the mean of the personalized group ($\overline{X}$=8.52) was higher than that of the non-personalized group ($\overline{X}$=8.40).

Cognitive Load Scores

Table 2 demonstrates that there was a significant difference between the cognitive load scores of the students in the two different groups (p<.05).

Table 2. Independent samples t test regarding the cognitive load scores

Group	N	$\overline{X}$	sd	t	p
Personalized	23	6.03	1.48	-2.86	.007
Non-personalized	22	4.67	1.71		

The cognitive load score of the personalized group ($\overline{X}$=6.03) was found significantly higher than the cognitive load of the non-personalized group ($\overline{X}$=4.67). While the software in the personalized group caused excessive cognitive load on the learners, the software in the non-personalized group resulted in low level of cognitive load.

Students' Views about the Software in the Personalized Group

Table 3. Descriptive Data Regarding Students' Views about the Software in the Personalized Group

	N	$\overline{X}$
1. I enjoyed the style used in the multimedia software.	23	3,96
2. The style used in the multimedia software motivated me to study.	23	3,52
3. The style used in the multimedia software helped me adapt in the learning environment.	23	3,48
4. I believe the style used in the multimedia software increased my learning.	23	3,48

5. I think the style used in the multimedia software was related with real life.	23	3,52
6. The style used in the multimedia software increased my confidence in the instructional source.	23	3,35
7. I think the style used in the multimedia software is not important.	22	1,82
8. I felt comfortable with the style used in the multimedia software.	23	3,61
9. I prefer the use of multimedia software designed with this style in my other courses.	22	3,73
10. I want this style to be used in face-to-face education as well.	23	3,78

As can be seen in Table 3, the students in the personalized group stated that they "agreed" with the 1st, 2nd, 3rd, 4th, 5th, 8th, 9th and 10th items while they "partly agreed" with the 6th item and "disagreed" with the 7th item. The students in the personalized group believed that the software motivated them, helped them adapt in the learning environment and increased their learning. In addition, the students thought that the conversational style was important and wanted it to be used in face-to-face education.

The responses given to the open-ended question of the questionnaire revealed that the students considered the style learner-friendly and different from the usual style (formal style) and that the style fostered their motivation. Some of the views of the students about the software are as follows:

"The samples used made it more memorable, and as the style was not formal, I felt more comfortable with it."
"I felt as if I was talking to a human. It was a simple, pure and comprehensible language. I think it is a style that makes studying more enjoyable."
"First, a style like this surprised me, but it is a good method for self-learning."
"The style is quite good and motivating…"

DISCUSSION AND CONCLUSION

The study aimed at examining multimedia software appropriately designed for the conversational style and formal style with respect to various variables. Unlike most of the studies reported in the related literature (e.g. Mayer, Fennell, Farmer, and Campbell, 2004; Moreno and Mayer, 2004; Moreno and Mayer, 2000), in the present study carried out, no significant difference was found between the posttest achievement scores of the students in the personalized group and non-personalized group. This finding of the present study does not support the personalization principle in multimedia which was put forward by Mayer (2005, 2009).

Mayer, Johnson, Shaw, and Sandhu (2006) stated that the instructional content developed based on politeness could be more influential on the students with low level of experience in computer use. Similarly, in the present study, it could be stated that as the learners had a high level of experience in computer use, the personalized group who received polite style feedback were not significantly more successful than the non-personalized group.

The present study carried out in the classroom setting revealed parallel results to the findings of a previous study carried out in an equal setting by McLaren, DeLeeuwb and Mayer (2011b), which reported that "politeness effect did not occur with students who had low level of background knowledge". This result is just the opposite of the result of another study conducted in the laboratory setting by McLaren, DeLeeuwb and Mayer (2011a) (for example, an artificial environment in which the study is carried out with paid participants). Therefore, more studies should be conducted on politeness effect in the real classroom setting. The results of this study, in which no politeness effect occurred, differed from the findings of another study carried out by Wang, Johnson, Mayer, Rizzo, Shaw and Collins (2008), which reported that "the students studying with polite tutor are more successful in transfer test".

While the software in the personalized group required excessive cognitive load from the learners, the software in the non-personalized group entailed low level of cognitive load from them. One of the reasons of this finding may be the fact that the personalized group was not accustomed to the content presented with the conversational style. In Turkish education system, instructional contents are presented with the formal style mostly. Therefore, students might be unfamiliar with the conversational style.

Results revealed that the learners tended to expend higher cognitive load in conversational style, yet they seemed to state positive views about the style used in the multimedia software. Most of the mean scores of their views were just above 3.50 but they were not high enough. One reason for this might be that the participants were not familiar with a learning environment in which conversational style was used. Formal style is mostly used in their classrooms rather than conversational style. Another reason might be that the participants studied with this style only one class hour. Their views might turn out to be more positive as they spend more time with this style. The learners stated that the style used in the software motivated them to study and they felt as if they were talking to a human. Furthermore, the learners expressed that similar multimedia software should be used in their other courses and that they wished the use of such multimedia software in face-to-face education. This result may have stemmed from the fact that the students seemed to feel as if they were studying in an entertaining atmosphere rather than just studying a lesson while using the multimedia.

In contrast to the previous studies conducted with short time (60 seconds, 140 seconds and so on) treatments (e.g. Mayer, Fennell, Farmer, and Campbell, 2004; Moreno and Mayer, 2004; Moreno and Mayer, 2000), in the present study carried out on the personalization principle, learners studied for one course-hour (30 minutes) with the software. However, no significant difference was found for the learners' achievement level. Therefore, it is believed that the present study revealed more realistic results. In this respect, the personalization principle should be tested in various courses with dissimiliar target populations and for a different period of time.

Among a few limitations of this study, it can be counted that the findings are limited to low number of participants. There might be more realistic findings if the same study is conducted with larger sample. Another limitation can be that only written data was gathered from the participants through pre and post-tests, cognitive load scale and the questionnaire. Data collection might become stronger if oral interviews with participants are conducted. This would provide more detailed information about the participants' views and also weak and strong points related to different styles. In this study cognitive load levels of the students studying in personalized style were found to be higher. This result might be questioned through oral interviews more healthily.

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