JOURNAL OF EDUCATIONAL AND INSTRUCTIONAL STUDIES
IN THE WORLD
June 2016, Volume: 6 Special Issue 1 Article: 16 ISSN: 2146-7463

EEG ATTENTION AND MEDITATION RESPONSES OF STUDENTS ON DIFFERENT PRESENTATION SLIDE COLORS

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Abstract
In this study, five presentations have been created and each of them has been included one presentation slide in which the same context with the different font colors and background colors. Black-White, Black-Red, White-Black, Yellow-Black, Yellow-Red as the first for the background color and the second for the font color respectively. Thirty-five students have been divided into five groups of seven each randomly. While the addressed presentation slide has been showed to the students of each group, attention and meditation levels of the measured EEG of the students have been recorded, investigated and evaluated. The best average attention level has been found in yellow background color and black font color in the presentation slide.

Keywords: EEG, attention, meditation, presentation, color.

INTRODUCTION

Multimedia presentations have important role on education and learning process in the course classrooms. Type, size and color of font and background color must be reviewed for effective projected slides and many multimedia presentation developers use inappropriate colors in first time and then the presentations may not be comprehended nor read easily (Vetter, Ward, & Shapiro, 1995). Twelve tips on effective PowerPoint presentations have been advised (Holzl, 1997). Colors have important role on presentation of information and can increase learning efficiency in visual presentations (Kumi, Conway, Limayem, & Goyal, 2013). Colors have psychological, attitudes and emotions effects on people and the effects can be measured in the nervous system (Kumi et al., 2013; Vetter et al., 1995). An electroencephalography (EEG) is a recording technique which records electrical activities of neurons in the brain and has relationships with emotions (Xiaowei et al., 2011). (Mihajlovic, Grundlehner, Vullers, & Penders, 2015) have evaluated EEG, EEG signal processing, EEG artifacts and wearable EEG devices.

In the literature , human attention towards different colors has been identified using EEG (Bekdash, Asirvadam, Kamel, & Hutapea, 2015) and driving fatigue detection has been investigated on the attention and meditation of EEG (He, Liu, Wan, & Hu, 2014). An assessment has been studied for PowerPoint presentation structure in undergraduate courses (Apperson, Laws, & Scepansky, 2008), effectiveness of PowerPoint presentations in lectures has been studied (Bartsch & Cobern, 2003), effectiveness on presentation graphics for students' experience in the classroom has been investigated (Apperson, Laws, & Scepansky, 2006), it has been determined attitudes of preservice teachers on PowerPoint presentation (Yalman & Kutluca, 2013) and it has been investigated that color affects learning outcomes (Kumi et al., 2013).

In this study, students' EEG attention and meditation responses on different presentation slide colors have been investigated and evaluated.

METHOD

Participants

Thirty-five students (M=21, SD=3.03), 27-male and 8-female have participated voluntarily from the Department of Electricity and Energy and the Department of Accounting and Taxation at Usak University. None of these participants has presented about any visual disorders.

Materials

Five presentation have been created and each of them has been included one presentation slide in which the same context with the different font colors and background colors. Black-White, Black-Red, White-Black, Yellow-Black, Yellow-Red as the first for the background color and the second for the font color respectively. The context in the slides has been chose a part from the Academic Rules and Regulations at Usak University. In this study, Helvetica font type, 24-point for headings and 18-point for the body text have been used as discussed in (Vetter et al., 1995) in the projected slides. The thumb of the slides shows in the Figure1.

Figure 1: The thumb of the slides

"MindWave Mobile" from Neurosky Inc. has been used to record EEG signals of the students. This device uses Bluetooth wireless module to send also attention and meditation levels of the measured EEG at the left prefrontal Fp1 point in 1 Hz frequency to smart devices (He et al., 2014).

Procedures

The participants have been divided into five groups of seven each randomly. The addressed presentation slide has been showed to each group. The groups and the addressed presentation slides are shown in the Table 1.

Table 1: The groups vs the addressed presentation slides

Group No.	The Addressed Slide
1	Black background – White Font
2	Black background – Red Font
3	White background – Black Font
4	Yellow background – Black Font
5	Yellow background – Red Font

The flowchart of the procedure in that Recording the EEG attention and meditation levels of the students while showing the addressed presentation slide is shown if the Figure 2.

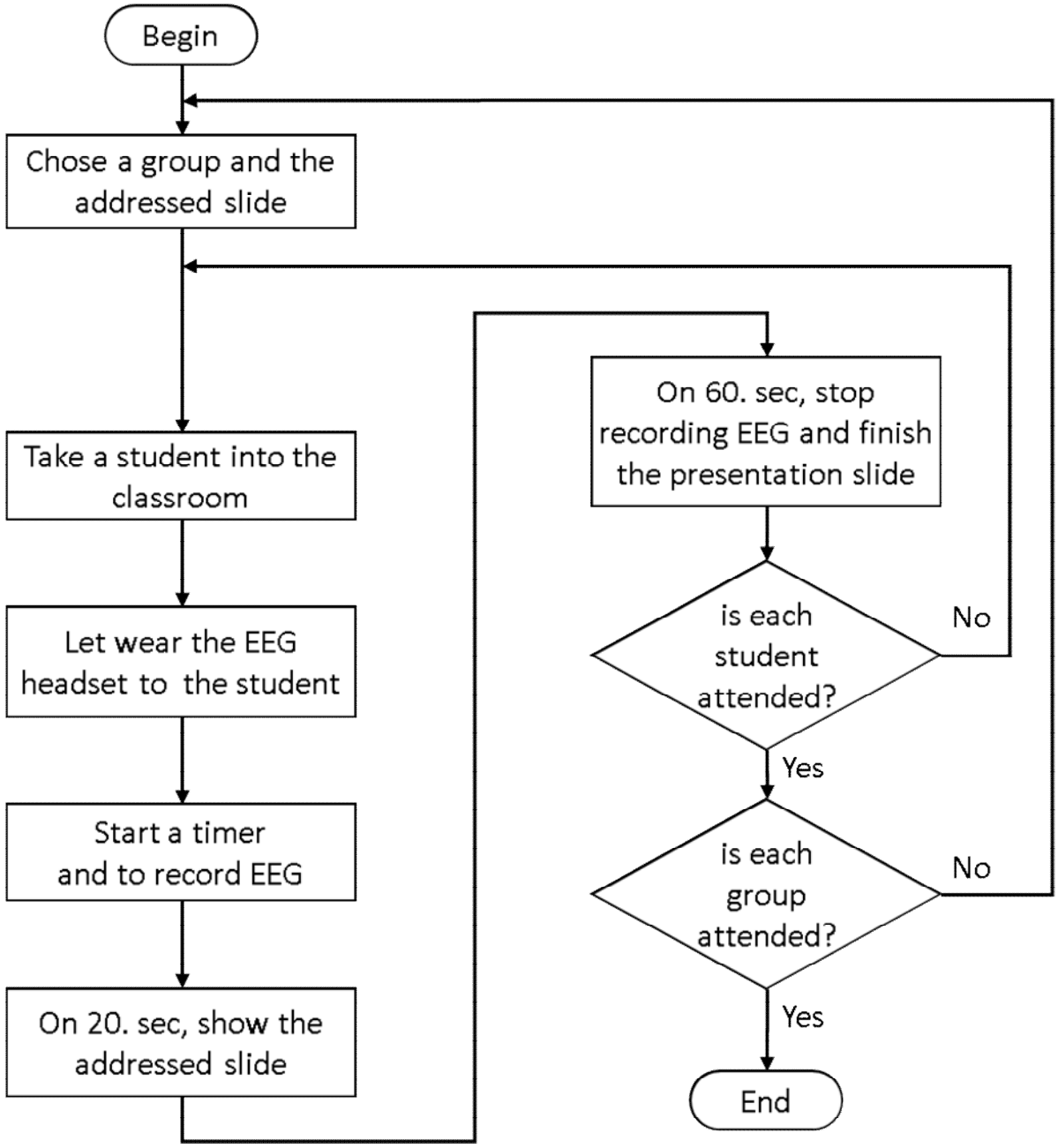
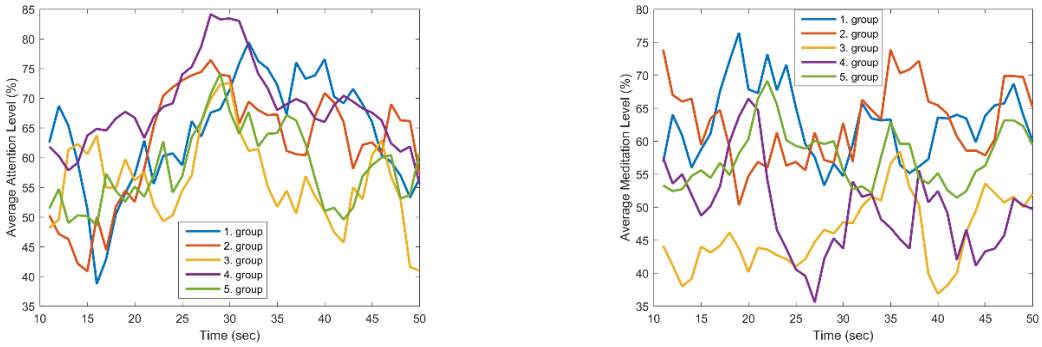


Figure 2: The flowchart of the procedure

As shown in the Figure 2, the first 20 seconds have been assigned to the relaxation of the students to get much stable EEG signals. The addressed presentation slides have been showed the students during the last 40 seconds. Since relaxation and attention decreasing after reading context in the slides, the first 10 seconds and the last 10 seconds of the recordings have been deleted. Average attention and meditation levels of the students of each group have been calculated.

FINDINGS

Average attention and meditation levels of each group have been drawn in the Figure 3.

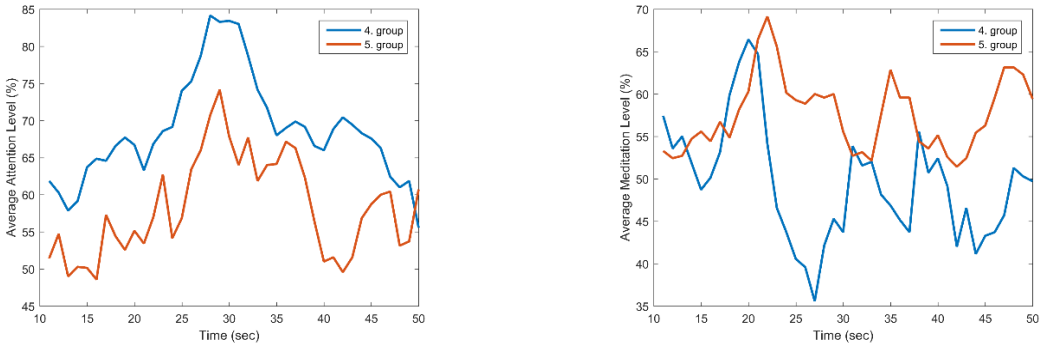


(a) (b)

Figure 3: Average attention (a) and meditation (b) levels of each group

As seen in the Figure 3a the addressed presentation slides have been started to show for the students of each group at the 20. second. The average attention levels have been increased with same slope in time delays approximately. After the 30. seconds, the average attention levels have been decreased. As seen in the Figure 3b, the comparing with the sum of average attention of each group, the 4. group has been taken much points than the others. In the 25-30 seconds, it has been seen that the average meditation levels have been decreased.

The comparison of the average attention and meditation levels of 4. group and 5. group have been drawn in the Figure 4.

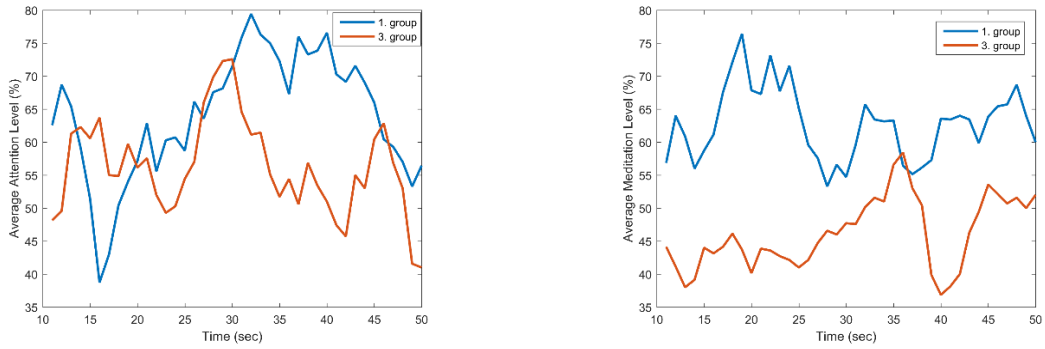


(a) (b)

Figure 4: Average attention (a) and meditation (b) levels of each group

As seen in the Figure 4a, the average attention of the 4. group has been measured more than the 5. group. As seen in the Figure 4b, the comparing with the sum of average meditation of the 4. and 5. groups, the 5. group has been taken much point than the 4. group.

The comparison of the average attention and meditation levels of 1. group and 3. group have been drawn in the Figure 5.



(a) (b)

Figure 5: Average attention (a) and meditation (b) levels of 1. group and 3. group

As seen in the Figure 5a, the average attention levels of the 1. and 3. groups have been increased after the presentation slides and then the average attention levels of the 3. group has been decreased immediately in 5 seconds. As seen in the Figure 5b, comparing with the sum of average meditation levels of the 1. and 3. groups, the 1. group has been taken much point than the 3. group.

CONCLUSION

Using the materials and the method mentioned of this study, the following has been concluded.

1. The average attention level of the students has been increased for 10 seconds on the showing addressed presentation slides and then decreased. The reason of the decreasing in the attentions can be due to be completed to read the addressed presentation slides by students.
2. The best average attention level has been found in yellow background color and black font color.
3. On yellow background, black and red font colors have same slope but black font helps to obtain more attention and red font helps to obtain more meditation.
4. Black background– white font presentation slide is more effective than white background – black font presentation slides in terms of attention and meditation of the students.

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