A Study on Students' Attitudes Towards Text Crowding on Multilingual Educational Slides

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Abstract
The need for multilingual educational materials in higher education is growing rapidly. It is still largely unclear, however, whether students consider extra-textual information, i.e., the same information in two or more languages, as a distraction or an increase in cognitive load or not. Recent research on multilingual subtitles in videos has shown that viewers tend to allocate their visual attention towards subtitles in their native (L1) language, while subtitles in their second language (L2) did not add any cognitive load. So far, however, it is still unknown whether these findings also relate to multilingual educational slides. In the present research we investigated students' attitudes towards this issue, particularly focusing on how they evaluated slides with multiple languages. We asked 25 Japanese and 25 Indonesian students to provide their opinions about unilingual, bilingual, and trilingual educational slides, with the same content provided in Japanese, Bahasa Indonesia, and English. The amount of content and the layout of the slides were systematically varied, and rating scales were used to obtain students' evaluations. The main findings showed that students had significantly more trouble choosing important information, and were more distracted by the crowded layout and different text fonts on multilingual slides as compared to unilingual slides. However, when the layout of the multilingual slides was such that the information was separated according to language, no such trend occurred. The same results were obtained for both student groups, clearly implying that educators can use multilingual slides, provided they visually group information separately for each language.

Keywords: Educational Slides, Multilingual, Text Crowding, Information Distraction, Cognitive Load

Introduction

There is an increasing demand to use more than one language on slide presentations (e.g., PowerPoint slides) for higher education. Despite its popularity, the advantage of the use of slides is not convincingly proven (Baker *et al.*, 2018). For example, information overload ("cognitive overload") can occur if the amount of information or text on a slide and the presentation time are not managed well (Adamov, Olic & Segedinac, 2012). Related to this is text crowding, which is naturally more likely to occur when educational material is presented in two or more languages. Hence, several variables need to be taken into account when designing a slide, in particular with multiple languages, such as the amount and the use of text (e.g., fonts, size) and the slide layout (e.g., the use of bullet points, spacing) (Marchack, 2002; Durso *et al.*, 2011).

Outside the field of education, several studies have been performed on the perception of materials in multiple languages. In research about cognitive load for video subtitles, unilingual and bilingual subtitle conditions were compared, comprising of the viewe's native (L1) language (Chinese) and non-native (L2) language (English) (Liao, Kruger & Doherty, 2020). First, compared with having no subtitles, bilingual subtitles were considered beneficial for content comprehension. More importantly, the bilingual subtitle condition did not add any cognitive load compared to the monolingual subtitle condition. One reason for this might be that the subtitles were supporting the spoken text and the visual (motion) information in the videos. It is thus unclear whether adding a language to an educational slide will give the same result, i.e., will not lead to increased cognitive load.

Bilingual or multilingual texts have also been used for other specific communication purposes, such as for road signs, advertisements, safety instructions, and even newspapers (Sebba, 2012). Comparative research has shown that the layout structure of bilingual materials is important. For example, bilingual newspaper articles can have a mixed layout for two languages, in which information is presented in alternating lines for each language. The organization of such a mixed text can make written information look more complex or crowded, which ideally should be avoided. It is likely that the same applies to educational slides.

So far, little is known about the perception of multilingual educational slides from the perspective of the most important recipients of the information on the slides: students. In the present research, we therefore used rating scales to investigate students' attitudes towards text crowding and information distraction (e.g., cognitive overload) on multilingual educational slides, consisting of the same information in Japanese, and/or Bahasa Indonesia, and/or English. The students consisted of a group of native speakers of Japanese and a group of native speakers of Bahasa Indonesia. Both groups had English as their second language.

Method

Participants: Fifty participants were employed, divided into 25 Indonesian students (L1: Bahasa Indonesia) and 25 Japanese students (L1: Japanese). All of them were enrolled at universities in Japan. They were 7 undergraduate and 43 post-graduate students (22 Master and 21 Doctoral students), 32 men and 18 women. Both groups had English as L2. All students provided informed, written consent as to their participation in the study. The procedures were pre-approved by the Ethics Committee of Kyushu University, Japan.

Materials: The materials consisted of education slides, with information about “How to do apartment searching in Japan”. The slides were varied according to a factorial design, dividing them into six sets. The first factor was language (3 levels): slides were unilingual, bilingual, or trilingual, providing the same information in Japanese, Bahasa Indonesia, and English. The second factor was layout (2 levels): mixed and separated layouts. In the mixed layout, information in multiple languages was given line-by-line, alternating for each language. In the separated layout, information in multiple languages was given in separate sections, divided according to language. The slides were presented to the students using a MacBook M1 Pro.

Procedure: The task of the participants was to read a set of the slides and answer a few statements after each set (for details see below) using a five-point Likert scale. They had to choose the answer from “Strongly disagree” to “Strongly agree”, as scored from 1 to 5 (1= “Strongly disagree”, 2= “Disagree”, 3=“Neutral”, 4=“Agree”, 5=“Strongly agree”). A total of 40 slides were given to the participants within an unspecified time and the order of the six sets of slides was pseudo-randomized, in a counterbalanced way.

In more detail, this study was conducted with the following steps. First, the purpose and the procedure of the survey were explained, and the participant was asked to provide written informed consent. Following this, they were given instructions in English. The participants were required to complete a questionnaire regarding personal information (name, age, nationality, study program, university, and language skills) by using online Google forms, which could be accessed by scanning a QR-code on the instruction paper through their smartphone. To start the survey, they were then required to look at the laptop screen with a viewing distance of 60 cm. Then they pressed a button on the laptop keyboard and the first of the six sets of slides was presented. For each slide that had been read, they were required to continue to the next slide by pressing the "next" button on the laptop keyboard. After they had finished reading a set of slides, they evaluated the slides using statements. The statements were as follows:

1) There is so much information available that I have trouble choosing what is important and what is not.
2) I get distracted by the crowded layout of the text.
3) I get distracted by the (different) text fonts used in the slides.
4) I get distracted by information in more than one language.

In the bilingual and trilingual sections, we asked the participant to answer another question:

5) “Which language do you prefer to read first on the presentation slides?”. They had to choose the answer between “English”, “Bahasa Indonesia”, or “Japanese.”

When the participant was done with the task for the first set of slides, then they had to answer the statements for the second set of slides that appeared on the screen by scanning another QR-code. This continued until the sixth set was completed. Upon completion of the experiment, each participant was given a gift-card of 2000 Japanese yen as honorarium.

Results

The results are illustrated in Figures 1 to 4. The figure captions show the statements to which the participants responded. To begin with, we tested the normality and consistency of the participants' evaluations for the six sets of slides. The results indicated a good internal consistency, in that the Cronbach α exceeded 0.8 (Cohen, 1988; Field, 2009), namely Cronbach' α = 0.870. We subjected the data to the normality test for answers to each statement for the six sets of slides. Shapiro-Wilk tests showed that for each statement the evaluations were not normally distributed ($p<.001$), which could be expected with a 5-point rating scale. Nevertheless, since data were obtained from a sufficient amount of participants (n=50), and in order to test the cause-and-effect relationship of students' evaluations when reading the slides based on the factors (language and layout), a repeated-measures two-way Analysis of Variance (ANOVA) was performed. The test was run over the participants' responses for the four statements (1-4, see above), using SPSS Statistics software (SPSS, version 23).

First, with regard to the first factor of language (3 levels; unilingual, bilingual, and trilingual), the students' evaluation scores for statements 1, 2, and 4 were significantly higher for multilingual slides (bi- and trilingual slides) than for unilingual slides [Figure 1: $F(2,96)=14.533$, $p<0.001$***, $\eta^2=0.232$; Figure 2: $F(2,96)=26.667$, $p<0.001$***, $\eta^2=0.357$; and Figure 4: $F(2,96)=32.803$, $p<0.001$***, $\eta^2=0.406$]. Meanwhile, for statement 3 the students' evaluation scores were significantly higher for trilingual than for unilingual slides [Figure 3: $F(2,96)=6.962$, $p<0.05$*, $\eta^2=0.127$]. Together, this main effect of language implies that the students had more difficulty processing the bilingual and trilingual slides than the unilingual slides.

Second, regarding the second factor of layout (2 levels; mixed and separated), significantly higher evaluations were given overall to mixed sections than to separate sections for all the statements, implying more difficulty processing mixed layouts [Figure 1: $F(1,48)=25.337$, $p<0.001$***, $\eta^2=0.345$; Figure 2: $F(1,48)=20.585$, $p<0.001$***, $\eta^2=0.300$; Figure 3: $F(1,48)=10.573$, $p<0.05$*, $\eta^2=0.181$; Figure 4: $F(1,48)=41.149$, $p<0.001$***, $\eta^2=0.462$].

With the significant main effects of language and layout, there was also a significant interaction effect. For *multilingual slides in a mixed layout*, as compared to unilingual slides, students had significantly more trouble choosing the important information [Figure 1; $F(2,96)=15.440$, $p<0.001$***, $\eta^2=0.243$], were more distracted by the crowded layout [Figure 2; $F(2,96)=16.382$, $p<0.001$***, $\eta^2=0.254$], were more distracted by having more than one text font [Figure 3; $F(2,96)=6.065$, $p<0.05$*, $\eta^2=0.112$], and were more distracted by information in more than one language [Figure 4; $F(2,96)=23.062$, $p<0.001$***, $\eta^2=0.325$]. However, when multilingual slides had a separated layout, this was not the case.

Finally, no significant difference was found between student groups for all four statements [Figure 1: $F(1,48)=2.739$, $p=.104$, $\eta^2=0.054$; Figure 2: $F(1,48)=0.303$, $p=0.584$, $\eta^2=0.006$; Figure 3: $F(1,48)=.037$, $p=0.849$, $\eta^2=0.001$; and Figure 4: $F(1,48)=1.820$, $p=0.184$, $\eta^2=0.037$]. Both student groups (Indonesian and Japanese students) thus shared similar opinions about the multilingual educational slides.

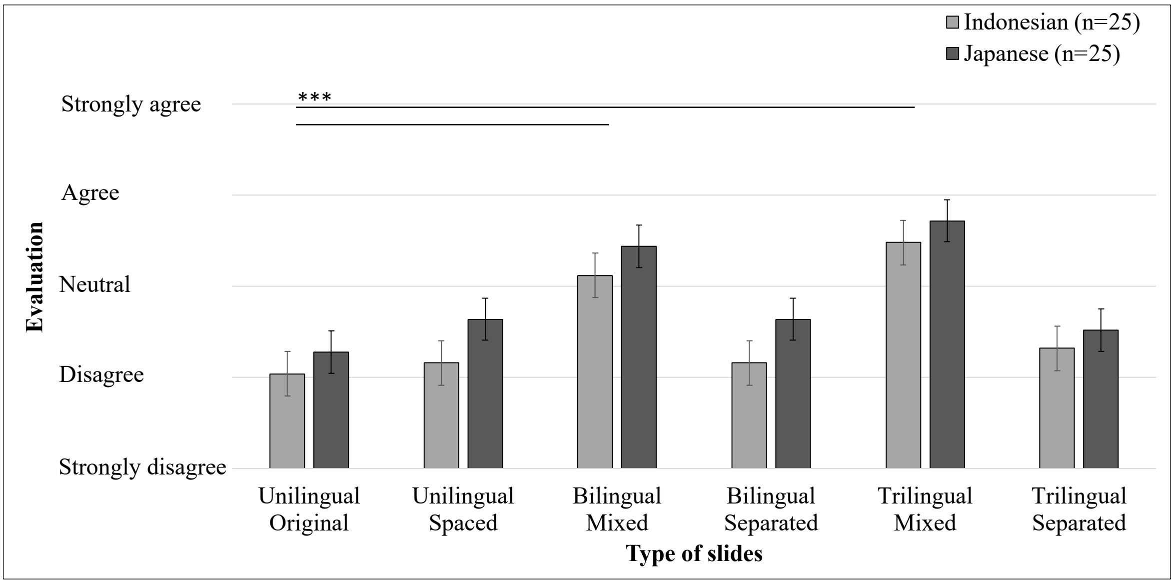

Figure 1: “On the educational presentation slides, there is so much information available that I have trouble choosing what is important and what is not” (n=50).

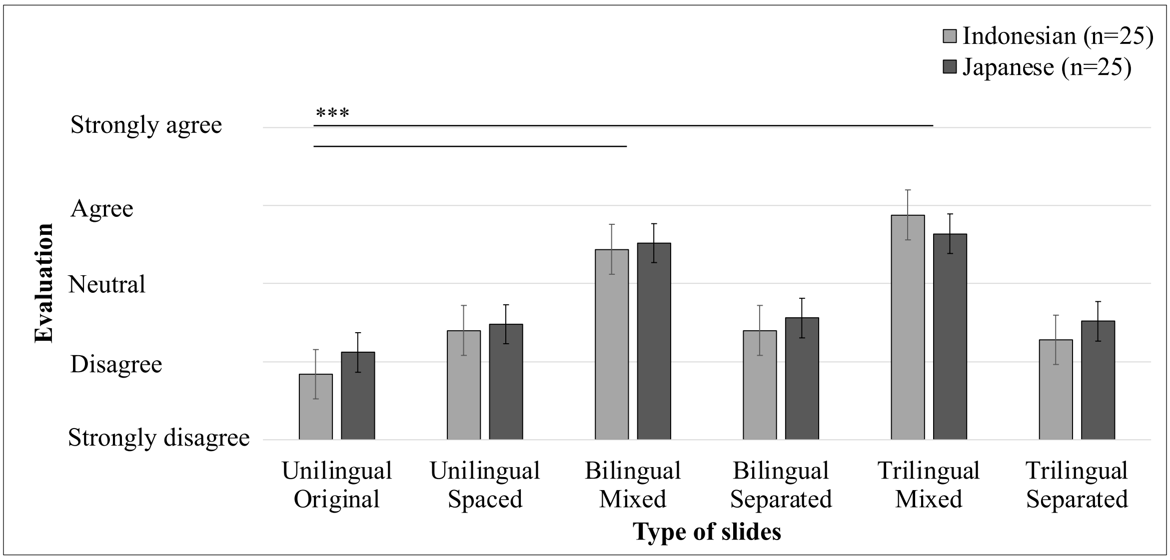

Figure 2: “On the educational presentation slides, I get distracted by the crowded layout of the text” (n=50).

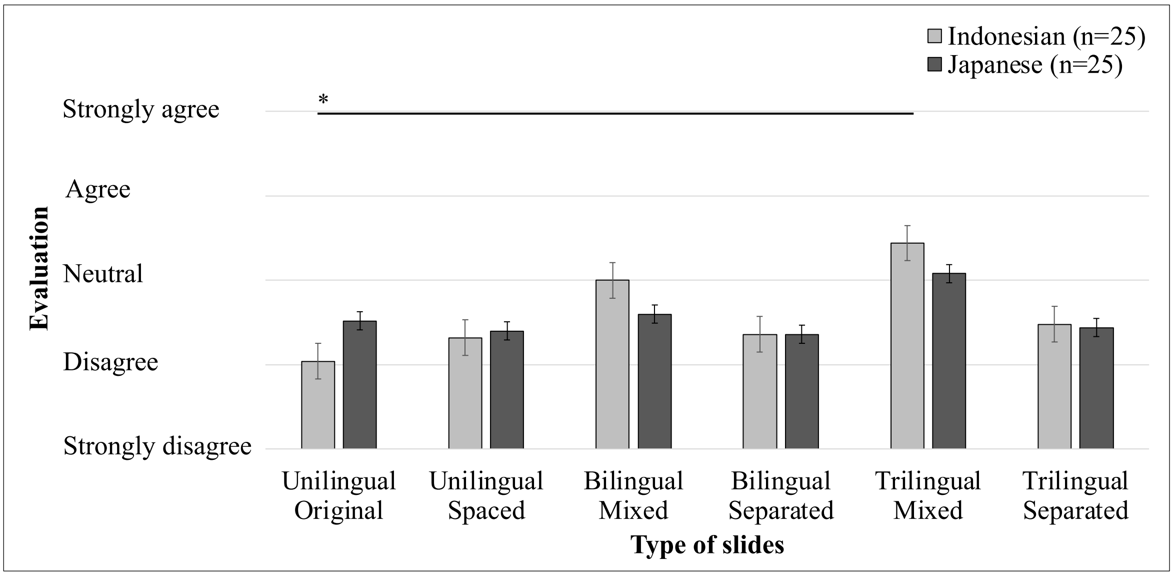

Figure 3: “On the educational presentation slides, I get distracted by the (different) text fonts used in the slides” (n=50).

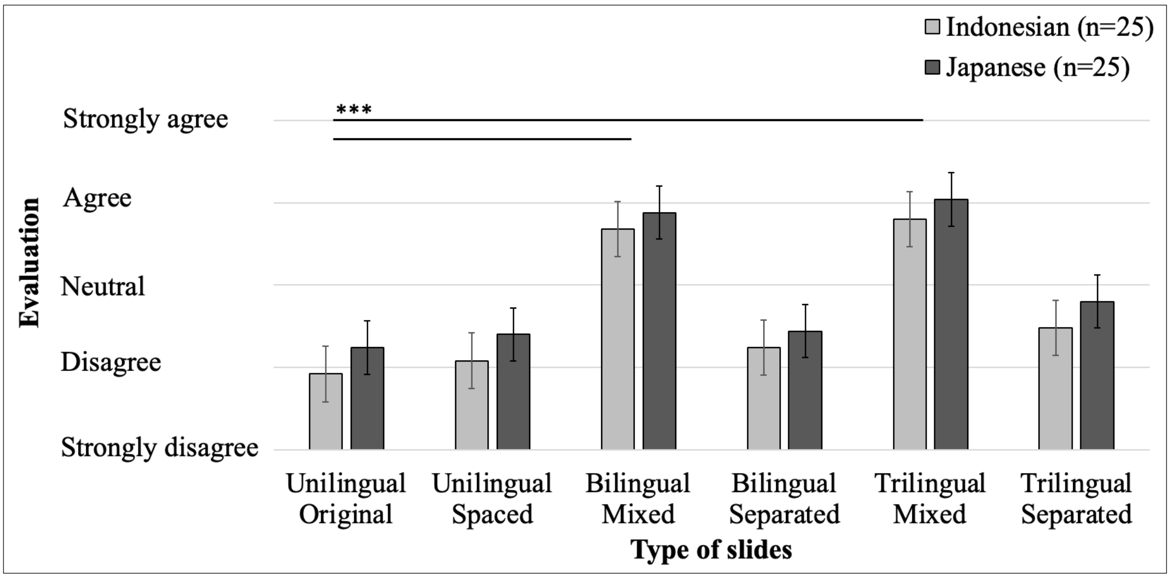

Figure 4: “On the educational presentation slides, I get distracted by the information in more than one language” (n=50).

Regarding the last question “Which language do you prefer to read first on the presentation slides?”, for the bilingual and trilingual slides, we found that the preferences varied between both student groups. Quite a lot of Indonesian students (10-15 out of 25) read the information in English first, followed by their native language of Bahasa Indonesia. However, the vast majority of Japanese students (21-23 out of 25) would read the information first in their native language and read English as their second preference.

Conclusion

From this study, we can conclude that regardless of which language students preferred to read first, they “agree” that slides with multilingual mixed layouts caused difficulties in choosing the important information and caused more distractions due to text crowding, different fonts, and having multiple languages. Students do not have these difficulties with multilingual educational slides with a separated layout. If no visual information is given other than text, educators thus can use multilingual slides, provided they visually group information separately for each language. The information on the slides used here was deliberately held very general (apartment searching), so as not to have educational background or level influence the results, but we suggest that future research needs to confirm whether the result of this study applies to all subjects taught via educational slides.

We had several limitations in our study. First, referring to the question of which language students tended to read first, we may assume that some read the language according to the familiarity and similarity of the characters (i.e., alphabetic). Japanese characters (including kanji characters, hiragana, and katakana) are physically very different from the alphabet, so they are easily distinguishable at first glance. Nevertheless, the participants preferred the separated layout in multilingual slides. Second, the survey was self-paced, and we do not know how much time they spent reading each slide, and where and how long they glanced at a particular line or word. Third, this study was not done in a well-controlled environment, in that lighting conditions were different for the two student groups. Therefore, as a next step, we would like to investigate student gaze behavior while reading the slides in an eye-tracking experiment, in a well-controlled environment.

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