# How to make online learning more effective: Experimental evidence from Russian

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## Abstract

We compared the mastering of material in an online lecture depending on the format of information presentation. In the experiment, participants listened to four fragments of an online lecture in linguistics in different formats: 1) auditory text without visual support; 2) auditory text and presentation with verbatim written text; 3) auditory text and presentation with a summary of the content; 4) auditory text and presentation with a summary of the content and illustrations. The combination of visual and auditory information was more effective than just the audio, and the summary was more effective than the word for word. The presence of illustrations supporting the text influenced the subjective assessment of the presentation format, but not the reliability of information acquisition.

Keywords: text processing, multimodal information, online learning, Russian

## Introduction

The results of studies that compare online learning and face-to-face communication between students and a teacher do not currently allow us to draw unambiguous conclusions about the advantage of one type of learning over another (cf., for example, (Ni 2013; McFarland, Hamilton 2005)). However, distance learning is actively developing. Thus, the studies of the effectiveness of different ways of presenting information in online learning are becoming more and more important.

The information is expected to be processed better if submitted by different channels (e.g., auditory and visual) (Mayer 2005; Svärdemo Åberg, Åkerfeldt 2017). At the same time, pictures or other iconic elements in a written text contribute to a more positive assessment of the material, but do not significantly increase the efficiency of information acquisition (Petrova, Riekhakaynen, 2019; Blinova, Shcherbakova, 2021). In our study, we tried to take into account both different modalities of information presentation (auditory and visual) and the ways of visual presentation (presence/absence of iconic elements and how detailed the presentation is). As far as we know, no such studies have yet been conducted on the material of the Russian language.

## Method

Four fragments from lectures on linguistics given by a teacher from St. Petersburg State University were used as the material. All fragments were similar in number of words (92–98), readability level (15.36–17.09, SMOG, aimed at an audience of 4–6 university students according to readability.io), and duration of the audio file (60–72 s).

Based on each fragment, four stimuli were prepared: a) auditory text without visual support (condition a); b) auditory text and presentation with verbatim written text (condition b); c) auditory text and presentation with a summary of the content (condition c); d) auditory text and presentation with a summary of the content and illustrations (condition d). In the first condition, there was no video. The video of the remaining stimuli included two slides each. In the second condition, the full transcript of the speaker's speech was placed on the slides, from which hesitations and repetitions were removed. In the third condition, the thesis presentation of the material was presented on the slides. The text in the fourth condition was identical to the third one, but pictures corresponding to the content of each thesis have been added to the slides.

Four protocols were created for the experiment. All protocols included four different videos under four different conditions mentioned above. The experiment was carried out using Google forms. After having processed each fragment, the participants answered to three questions about the information provided in the fragment and evaluated the fragment on three scales (presentation format, interestingness, how clear the presentation was). The first question on a general understanding of the topic of the fragment was a multiple choice one; the other two questions were about specific facts mentioned in the stimulus text and did not contain answer options. For answering the questions, the participant could receive from 0 to 5 points: 1 point for the correct answer to the multiple-choice question and 2 points for each question with an open answer. If the answer was partially correct (for example, it was required to indicate two aspects / parameters, and the participant wrote only one), then 1 point was assigned. 132 students from 18 to 24 years old took part in the experiment, 33 people listened to each fragment.

## Results

We observed the influence of the format of presentation on the effectiveness of information acquisition ($H(3,33)=35.72$, $p<.001$). There were significantly less correct answers after the auditory presentation without visual support than after all other formats of presentation ($p<.001$ for all pairs; Dunn's post hoc test). The highest scores for after the text questions were obtained for both formats with a summary of the content: the scores were significantly higher than for two other formats ($p\leq.025$).

The highest total subjective assessment scores were received by the format with the summary of the content and with pictures; the auditory text without

visual support was the worst evaluated; medians for all three scales for formats b and c were the same (see Table 1).

Table 1. The results for different conditions of presentation.

| Condition | a | b | c | d |
|---|---|---|---|---|
| Scores for the answers to the questions (M) | 3.11 | 3.77 | 4.07 | 4.11 |
| Presentation format (Me) | 2 | 3 | 3 | 4 |
| Interestingness (Me) | 3 | 3 | 3 | 3 |
| How clear the presentation was (Me) | 3 | 4 | 4 | 4 |
| Total subjective assessment scores | 8 | 10 | 10 | 11 |

We also observed the effect of the fragment ($H(3,33)=56.90$, $p<.001$). Participants responded significantly better to questions after the first text than to questions after all other texts ($p<.001$), and to text 3 they responded significantly worse ($p<.001$ when compared with text 4 and $p=.025$ when compared with text 2), the results for texts 2 and 4 did not differ significantly ($p=.097$).

At the same time, the influence of the text factor is least pronounced for format c (the auditory text supported by a summary of the content without illustrations): there are no statistically significant differences between any texts (see Fig. 1).

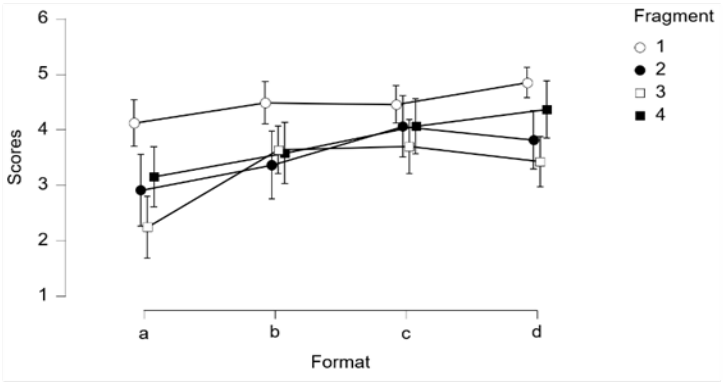


Figure 1. The scores for various text fragments in each of the presentation formats

## Discussion and conclusions

In general, the results obtained allow us to say that the format of information presentation affects the effectiveness of its processing: the combination of visual and auditory information turns out to be a more effective way of presenting material than just the auditory text without visual support. No

significant difference in the scores obtained for the conditions with and without illustrations (formats c and d) and a higher value of the median for the subjective assessment of the format with pictures is consistent with the results of previous studies of the perception of texts that include verbal and iconic information (Petrova, Riekhakaynen 2019; Blinova, Shcherbakova 2021).

At the same time, the influence of the text factor was revealed in the experiment. This result may be related to the complexity of the texts themselves. However, in our experiment, there correspondence between the level of readability and the correctness of the answers to the questions is not straightforward: the participants responded best to questions after text 1, which has the lowest level of readability, but the results for fragments 2 and 4, which differ quite a lot in terms of readability, did not significantly differ. In addition, the results could be affected by the fact that the questions to different texts turned out to be unequal in complexity. We plan to analyze these factors in more detail in our further studies. The further research in the field also includes the comparison of the format that we found to be the most efficient in our present study to the format with the video of a speaker as there is experimental evidence that when students can see the teacher during the lecture, they acquire the information better.

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