

Research Article

UDC 159.9.072

<https://doi.org/10.21702/rpj.2026.1.8>

Eye-tracking study of visual attention in schoolchildren while watching educational videos

Sergei V. Moiseev*, Elena A. Esipenko, Valeria V. Nesterenko

National Research Tomsk State University, Tomsk, Russian Federation

*Corresponding author: kaungreat@gmail.com

Abstract

Introduction. Creating engaging and effective educational videos for adolescents requires not only an understanding of how visual attention operates, but also knowledge of the principles underlying lesson structure with diverse content components. Eye-tracking technology provides objective data on the distribution of attention and its dynamics during the perception of visual content. The aim of this article was a comparative analysis of the component composition of attention indicators when watching three thematically distinct videos. **Methods.** Using eye-tracking methodology, attention indicators were analyzed in 45 middle- and high-school students while they watched 7-minute educational videos on Russian language, mathematics, and biology. Visual attention measures were studied in relation to the following stimuli: image, text, diagram, on-screen lecturer, and their combinations. **Results.** Analysis of each video's structure revealed that in the biology video, "diagrams and images" were the most prevalent element, with "diagrams" attracting the greatest attention. For mathematics and Russian language, the dominant component was "lecturer + text". The components "lecturer + diagram" and "lecturer + image" indicate limited effectiveness of these didactic techniques in the mathematics video. **Discussion.** The most effective approach proved to be the use of diverse illustrative components accompanied by parallel audio explanations from the lecturer, as demonstrated in the biology video. The combination of the lecturer on screen with slide text also proved effective (Russian language and mathematics videos), whereas the presence of the lecturer alongside other illustrative components was less so. The use of varied and vivid stimuli generates greater attention in adolescents. By understanding the specifics of each subject area

and the effective combination of lesson components, teachers can create educational videos that are both comprehensible and engaging for adolescent learners.

Keywords

visual attention, visual components, eye-tracking, adolescents, career guidance

Funding

This research was supported by the TSU Development Program ("Priority-2030"), grant No. 2.3.1.24 ML.

For citation

Moiseev, S. V., Esipenko, E. A., & Nesterenko, V. V. (2026). Eye-tracking study of visual attention in schoolchildren while watching educational videos. *Russian Psychological Journal*, 23(1), 140–155. <https://doi.org/10.21702/rpj.2026.1.8>

Introduction

Contemporary society is witnessing a significant transformation in the mechanisms by which the younger generation engages with the educational process, driven by the rapid development of digital technologies. Since the onset of the computer age, there have been fundamental changes in the tools through which knowledge is transmitted and conveyed. The information environment has emerged as a crucial factor in the formation of values and attitudes, influencing the development of the socio-psychological type of personality (Bardetsky, 2019). This transformation has also affected pedagogy; the trend became especially pronounced during the pandemic (Gu et al., 2024), when the mass transition to online learning took place. At present, online learning is commonplace. However, the effects of online education on the psychology and physiology of learners remain insufficiently studied, and convincing data on the quality of this approach are lacking (Dozhdikov, 2020). For this reason, non-classical methods drawn from psychophysiology have come to the aid of traditional pedagogy. Research within this framework allows the physiological responses to online content to be examined from an entirely new perspective; one such method is eye-tracking technology, which is employed to study video materials (Cao & Nishihara, 2012; Stull et al., 2018; Wang et al., 2020). Researchers have demonstrated that data related to eye movement tracking – including fixations, saccades, pupil dilation, and gaze duration (Cao & Nishihara, 2012) – are reliable indicators of human responses to emotional arousal and cognitive load (Ababkova & Rozova, 2022), as well as previously inaccessible aspects of such cognitive processes as memory and attention (Krotkova et al., 2018). The study of visual attention is particularly relevant in the context of the contemporary transformation of education, which increasingly incorporates

large amounts of video content. The advantage of eye-tracking research is that it is suited to the study of individual visual stimuli (Becker et al., 2022), to the individual processing of multimodal information (Cao & Nishihara, 2012), and to understanding cognitive processes, thereby providing additional information about task execution strategies or difficulties encountered (Becker et al., 2022).

The evolution of educational technology has given rise to video-based learning (VBL), a field concerned with identifying the formula for creating successful educational videos for instructional purposes (Garcia & Yousef, 2023). Drawing on this approach, it is possible to investigate combinations of video parameters with the aim of enhancing student engagement, which is itself a current research direction within the domain of online learning (Yolkina, 2022).

In the search for the optimal formula for educational video, the following parameters can be identified: video duration (Garcia & Yousef, 2023), lecturer speech rate and the learner's degree of preparedness for educational content (Guo et al., 2014), the presence of interactivity (Jacob & Centofanti, 2024), the on-screen presence of the lecturer (Bialowas & Steimel, 2019; Kizilcec et al., 2015), and others. A number of theoretical constructs have been established, yet they lack adequate empirical grounding; as the findings of Jacob & Centofanti (2024) demonstrate, theoretical expectations of positive effects were not borne out in practice. Students who had access to interactive resources showed no significant improvement in outcomes compared to those without such access (Jacob & Centofanti, 2024). This underscores the relevance of studying the component structure of online lessons. Accordingly, the question of how to effectively create educational content within the VBL framework remains open. Analysis of reliable physiological responses may help clarify certain aspects of how educational content is processed at different levels of multimedia (Zalata & Eremenko, 2020), a pursuit that is already being actively pursued abroad (Yıldırım & Sönmez, 2024).

In Russian science, the application of neuroimaging tools to the study of the educational process and online learning is still in a developmental phase. The literature describes studies conducted with university students; for example, Ababkova & Rozova (2022) examined the perceptual features of Russian and international students viewing presentations containing visual and textual elements; Kloktunova et al. (2019) analyzed eye movement responses in students reading educational information on screen; and Merkulova & Kalinina (2017) studied these responses in flight cadets during preflight preparation. Eye-tracking research is also being conducted for the psycho-pedagogical assessment of students with disabilities (Robin & Kruzhkova, 2024); the visual attention features of preschool children with hearing impairments are being analyzed (Smirnova, 2022; Smirnova, 2024); and eye-tracking is used to study the eye movement patterns of primary school children when composing stories from picture sequences (Efimova et al., 2023). Despite this partial coverage of the topic, the study of visual attention during online learning in adolescents remains largely unexplored. This age group is of particular interest, as adolescents frequently study material independently at home using educational video lectures. Furthermore, the lives of this age group are closely intertwined with the online environment and social networks (Konstantinova, 2023). Research devoted to the influence of digital technologies on cognitive processes and communication

does exist, but the findings are contradictory (Ageev et al., 2023). Studies examining attention and working memory in adolescents engaged in virtual activities are emerging (Kamenskaya & Tatyana, 2024), yet reliable data obtained through a psychophysiological approach are still lacking.

The importance of addressing this question provided the rationale for the present study, the aim of which was a comparative analysis of visual attention in adolescents watching three different educational videos using eye-tracking. It was hypothesized that attention is influenced by different combinations of video content components. For instance, Garcia & Yousef (2023) identify the following elements: (1) slide presentation with narration, (2) lecturer-only lecture, (3) real-time lecture recording, (4) picture-in-picture, (5) hand-drawn videos, and (6) screencasting.

In the practice of online education in Russia, the components most commonly used in preparing video materials are: text, diagram, image, and the presence of the lecturer on screen; accordingly, these were selected as the primary objects of analysis. It is also known that when creating videos that include text and images, it is necessary to consider learner strategies and the features of on-screen information processing, as the ratio of text to illustrative material may influence learners' attentional characteristics (Ababkova & Rozova, 2022). Based on these considerations, the research question can be formulated as follows: "How, and to what extent, will the combination of visual design components in educational videos affect the characteristics of schoolchildren's visual attention?"

Methods

The study involved 45 participants (19 male, 26 female; aged 13 to 17 years, mean age = 15.1), with normal or corrected-to-normal vision, who were students at the middle and upper levels of secondary school. The study was conducted in full compliance with ethical standards; informed consent was obtained from parents or legal guardians of all minors, and approval was granted by the Research Ethics Committee of NR TSU.

Procedure

Participants came to the laboratory of Tomsk State University (TSU), completed an intake questionnaire including questions on sex and age, and then participated in the main study, which comprised equipment setup, calibration, and viewing of the videos. At the end of the study, participants completed a brief exit questionnaire, answering open-ended questions about the nature of the videos and the attractiveness of the stimulus materials. Additionally, participants were invited to suggest modifications to the structural components of the presented videos.

Stimulus Materials

Each participant was shown three videos from the TSU archive, covering the following subjects: Russian language, mathematics, and biology. The mean duration of each video was 7 minutes. This duration was established as optimal for preparatory educational videos on school subjects (Grishin et al., 2020). Each video consisted of a set of slides containing text, diagrams, images, and an on-screen lecturer in various combinations or separately, with a simultaneous audio track providing the teacher's explanations. Each video had its own unique structural composition.

The biology video covered the topic of DNA and genes. In this video, emphasis was placed on visual components – images and diagrams – which were present throughout the video, while the lecturer's image was largely absent. The mathematics video was devoted to the Lischerel number. In it, the text component dominated, combined with the audiovisual presence of the lecturer. The Russian language video presented material on phonetics. It combined text with the audiovisual presence of the lecturer, as well as standalone text-only segments. The biology lecturer was male; in the other two videos, lecturers were female.

The following structural components were selected for analysis, appearing either independently or in combination: text, image, text + image, lecturer + text, diagram, lecturer + diagram, lecturer + image (all components listed engage primarily visual attention). To avoid cognitive load effects on the final video, and to eliminate a potential order effect, participants were randomly assigned one of three video presentation sequences.

Eye movement activity was recorded using the NTrend-ET500 video-oculograph (scanning frequency: 500 Hz; gaze direction accuracy: 0.4°; built-in IR camera capturing the participant's face at HD resolution – 1280×720 – at 25 frames per second; eye-to-IR-camera distance: 0.5–0.8 m). Data recording was performed using the “Neurobarometer” software.

Measures

In preparation for data analysis, the primary areas of interest (AOIs) were identified for each video separately. The following were analyzed: (1) mean dwell time in the area of interest (ms) across the group of respondents; (2) distributed attention indicators; (3) relevant and irrelevant AOIs (Sáiz-Manzanares et al., 2023).

The main data analysis was based on the key parameter of distributed attention across all participants, defined as the sum of individual attention distribution scores divided by the total number of participants, where the attention distribution score for a single participant is the ratio of total fixation duration within the zone to the duration of the zone of interest. This attention parameter (n) was calculated automatically using the “Neurobarometer” hardware-software complex. The method of attention assessment based on oculomotor indices was applied in accordance with a registered patent (Latanov et al., 2020). For clarity, results are presented using the distributed attention indicator across all participants (n), where $n < 0.1$ indicates a very low level of distributed attention; $0.1 < n < 0.2^*$ – low; $0.2 < n < 0.3^{**}$ – moderate; $0.3 < n^{***}$ – high. Asterisks are used to denote attention levels in the tabular results.

Results

Analysis of dwell time within areas of interest (excluding the lecturer) for each video showed: biology – 571,655 ms; mathematics – 560,481 ms; russian language – 410,467 ms. In the subsequent stage, each video was divided into slides and analyzed individually by key parameters.

The analyzed data are presented in three tables, one for each subject. In each table, the first row lists the different combinations of elements associated with specific slides. The rows below contain quantitative parameters reflecting the distribution of attention by the group of respondents across each zone, corresponding to the degree of their engagement with the relevant material. The higher the value of this parameter, the greater the attention directed to that zone. The distribution of attention is important to investigate because learners may experience difficulty when required to simultaneously integrate multiple sources of information, such as text and illustrations (Ozcelik et al., 2009).

Table 1 presents the component composition and the audience attention distribution indicator during viewing of the biology video.

Table 1
Attention Distribution Across Areas of Interest: Biology

Biology	Text	Image	Diagram	Diagram +Text
			0,125*	
Slide 1			0,139*	0,207**
	0,0273	0,048		
Slide 2		0,048		
		0,191*		
			0,159*	
			0,349***	
Slide 3	0,0102			
		0,040		
		0,0283		
			0,120*	
Slide 4		0,156*		
		0,119*		
	0,011			
	0,032			
Slide 5			0,059	
			0,280**	
	0,006			
			0,206**	
Slide 6	0,017	0,025		
		0,092		
			0,064	

INTERDISCIPLINARY RESEARCH ON COGNITIVE PROCESSES

This video is characterized by: (a) an emphasis on visualization (diagrams, images); (b) effective combination of text and diagrams; (c) the inclusion of a historical figure (e.g., a portrait of Mendel). Moreover, each slide in this video contained multiple visual components, which was reflected in the distribution of attention. Moderate and above-moderate attention values in the biology video were attracted by diagrams both independently and in combination with text ($0.1 < n < 0.2^*$, $0.2 < n < 0.3^{**}$, $0.3 < n^{***}$). Text blocks attracted less attention ($n < 0.1$). Of the multiple images on a slide, those related to historical figures elicited the least interest. For example, the attention indicator for the portrait of Mendel was $n = 0.048$, compared to $n = 0.191$ for the image of a plant (Slide 2, Table 1); the indicator for the portrait of Morgan was $n = 0.03$, compared to $n = 0.09$ for the crossing-over illustration (Slide 6, Table 1).

Table 2 presents the component composition of the mathematics video along with the distributed visual attention indicators.

Table 2
Attention Distribution Across Areas of Interest: Mathematics

Mathematics	Lecturer +Text	Lecturer + Diagram	Lecturer +Image	Diagram+Text
	0,112*			
Slide 1	0,179*		0,053	
	0,289			
Slide 2	0,099			
	0,134*			
Slide 3	0,313***			
	0,242**			
Slide 4				0,137*
			0,043	
Slide 5	0,391***			
	0,021			
Slide 6	0,265**			
		0,033		

Key features of this video include: (a) an emphasis on practical tasks and examples; (b) a lesser role of visual stimuli compared to the biology video; (c) greater prominence of the lecturer; (d) clarity in the formulation of tasks on slides. Of the six slides presented, 60% contained the “lecturer + text” component, with attention distribution ranging from low ($0.1 < n < 0.2^*$) to high ($0.3 < n^{***}$). The “lecturer + text” component on Slide 3 demonstrates a high level of distributed attention ($0.3 < n^{***}$), suggesting that the audience was actively

engaged in the learning process at that moment. The “lecturer + image” components (Slides 1 and 5, Table 2) and “lecturer + diagram” (Slide 6, Table 2) perform less well than the “lecturer + text” component (Table 2).

Table 3 presents the component composition of the Russian language video along with the attention distribution indicators.

Table 3
Attention Distribution Across Areas of Interest: Russian Language

Russian language	Lecturer+Text	Text
Slide 1	0,306***	
	0,088	
	0,033	
Slide 2	0,020	
	0,266**	
Slide 3	0,255**	
Slide 4	0,380***	
Slide 5	0,392***	
Slide 6		0,232**
		0,225**
Slide 7		0,251**
		0,143*
Slide 8		0,261**
		0,144*
Slide 9	0,096	

In this video, the emphasis was placed on: (a) the combination of theory and practice; (b) the smallest role of visualization among all subjects; (c) a focus on language-based tasks (combinations of words and syllables). Analysis revealed that stimuli on Slides 4 and 5, which show a high level ($0.3 < n^{***}$) of engagement, appear on slides with the lecturer, while slides with text only and no audiovisual accompaniment show moderate-to-low ($0.1 < n < 0.3^{**}$) attention.

For visual clarity, Figure 1 presents examples of heat maps with the engaging component sets, evaluating gaze fixation by study participants in the biology, Russian language, and mathematics videos.

INTERDISCIPLINARY RESEARCH ON COGNITIVE PROCESSES

Figure 1
Examples of heat maps with engaging component sets



Note. First slide from the biology video; second slide from the Russian language video; third slide from the mathematics video.

The results shown in the figures (heat maps and fixation zone diameters) illustrate successful combinations of components in each video that captured participants' attention. With respect to the slides whose component compositions were least engaging for participants, Figure 2 presents examples from the Russian language video.

Figure 2
Examples of heat maps with non-engaging component sets



The analysis of images for this subject is grounded in the parameter of low distributed attention levels, as well as criteria relating to the sparse stimulus content of the video, as noted by participants. The heat map demonstrates that rather than analyzing the text, respondents performed prolonged fixations on the lecturer's face.

Discussion

As noted above, each analyzed video had its own didactic model, differing in structure both in terms of subject-specific requirements and the intentions of the course author. Based on the results for dwell time within areas of interest (in ms), participants devoted the greatest attention to the biology video, in which schematic representations of material constituted the key component engaging audience attention. The observed reduction in attention toward the portrait of a historical figure (Mendel's portrait) relative to another illustration on the same slide (Figure 1) may be attributable to the portrait having been presented in black and white, thereby attracting less attention.

In the mathematics video, the highest visual attention score was obtained for the "lecturer + text" component, which is consistent with findings showing that the joint use of words and images in video-based learning produces sustained attention and heightened motivation through dynamic engagement (Gu et al., 2024). Furthermore, the image of the teacher engages more synchronized eye movements, additional attentional control, and deeper socio-emotional processing; learners devote substantial attention to the image of the teacher (up to 27% of total visual attention during video-based learning; Gu et al., 2024). In the case of "lecturer + diagram" and "lecturer + image" components, a reduction in the distributed attention indicator is observed; this may be attributable to the superimposition of two stimuli of the same modality – the lecturer – alongside another complex visual object.

In the Russian language video, a high attention score ($0.3 < n$) was also identified for the "lecturer + text" component, which may be explained by the fact that primary attention was drawn to the lecturer's face and that participants had no opportunity to direct attention elsewhere (Figure 2). In support of this interpretation, analysis of the post-study questionnaire showed that five participants, in response to the question "What would you suggest changing in the videos?", noted the sparse content of the Russian language video and reported rapid fatigue and low engagement in learning. Zones lacking specific tasks or examples received the least attention ($n < 0.1$).

The fixation distributions observed across different regions of visual components, obtained from the analysis of all slides for all participants (Figure 1), are most pronounced on color images (pictures and diagrams) and indicate deep processing of the information

INTERDISCIPLINARY RESEARCH ON COGNITIVE PROCESSES

presented. Furthermore, the results show that the most effective approach was the use of diverse illustrative components with simultaneous verbal explanations by the lecturer, as demonstrated in the biology video; and that the combination of the lecturer on screen with slide text (Russian language and mathematics videos) proved maximally effective. The presence of the lecturer alongside other illustrative components was comparatively less effective.

It is important to acknowledge certain limitations of the study. The sample was limited to one region (Tomsk) and specific schools, which precludes generalization of the findings to the broader student population and necessitates further investigation.

Taking all of the above into consideration, it is possible to develop a lesson structure allowing for effective delivery of video material for each subject individually, with due regard for its specific characteristics; this may facilitate learners' comprehension and assist those who experience difficulties in one or another subject. Accordingly, the study of the effects of visual stimuli on the learning process represents a relevant and promising field of scientific inquiry (Li et al., 2022). The findings obtained are of considerable importance for the development of contemporary pedagogy and psychology, and may be integrated into the initial stage of career guidance activities through the addition of a component of emotional engagement and individual personality characteristics, where the relationships between objective (psychophysiological) and subjective (questionnaire-based) indicators of physiological predispositions and tendencies toward different subject domains will be examined.

The topic of online learning formats is a matter of ongoing discussion among all participants in the educational process. It is a reality that requires an ongoing effort to identify the advantageous aspects of such a transition or mode of interaction. The advantages of distance learning technologies are extensive: (1) accessibility of education (for people of various ages, for those from small communities, with the possibility of saving time and money); (2) the ability to build one's own learning trajectory and to study independently at a convenient time, among others (Kislukhina, 2017). Questions about how to properly create educational video materials within the framework of contemporary twenty-first-century learning theory – video-based learning (VBL) – remain open. It is known that optimizing the visual design process and selecting appropriate stimuli helps retain respondents within areas of interest and may lead to more active engagement with the presented information (Wang et al., 2020). This experimental study, which seeks the most optimal parameters for educational video lectures for adolescents, contributes to the VBL approach that is actively developing in other countries and to a lesser extent in Russia.

On the basis of the findings obtained, the following recommendations for creating videos for adolescents can be proposed:

1. It is important to carefully consider the visual design of slides and fill them with diverse diagrams, charts, and images (taking into account image format – black-and-white or color), as these prove more effective in attracting and sustaining learners' attention than text blocks.
2. Interactive elements such as tasks and questions promote deeper immersion in the material and enhance the effectiveness of retention. It should be noted, however, that an excessive number of visual elements may give rise to cognitive overload, thereby reducing the effectiveness of learning.

The biology video, rich in visual stimuli, demonstrates a higher level of viewing engagement and intensifies the exploratory function of oculomotor activity during learning, as evidenced by an increased number of saccades and gaze fixations on different elements of the video. The optimization of visual design and the selection of appropriate stimuli contribute to retaining respondents within areas of interest and may lead to more active engagement with the presented information. Further research in this area will enable the development of new educational methodologies conducive to the effective development of key competencies.

References

- Ababkova, M. Yu., & Rozova, N. K. (2022). Eye tracking as a tool for evaluating electronic presentations by Russian and foreign students. *Journal of Pedagogical Innovations*, 4(68), 106–121. <https://doi.org/10.15293/1812-9463.2204.10> (in Russ.).
- Ageev, N. Ya., Tokarchuk, Yu. A., Tokarchuk, A. M., & Gavrilova, E. V. (2023). The relationship between digital technologies and the development of cognitive and communicative processes in adolescents and young adults: A review of empirical research. *Psychological Science and Education*, 15(1), 37–55. <https://doi.org/10.17759/psyedu.2023150103> (in Russ.).
- Bardetsky, S. S. (2019). The impact of media information on the consciousness and behavior of primary school children in the context of pedagogical issues. In *Science and innovations – contemporary concepts: Proceedings of the International Scientific Forum* (pp. 21–28). (in Russ.).
- Becker, S., Küchemann, S., Lichtenberger, K. P. A., & Kuhn, J. (2022). Gaze patterns enhance response prediction: More than correct or incorrect. *Physical Review Physics Education Research*, 18, 020107. <https://doi.org/10.1103/PhysRevPhysEducRes.18.020107>
- Bialowas, A., & Steimel, S. (2019). Less is more: Use of video to address the problem of teacher immediacy and presence in online courses. *International Journal of Teaching and Learning in Higher Education*, 31(2), 354–364.
- Cao, J., & Nishihara, A. (2012). Understand learning style by eye tracking in slide video learning. *Journal of Educational Multimedia and Hypermedia*, 21(4), 335–358.
- Dozhdikov, A. V. (2020). Online learning as e-learning: Quality and outcomes (critical analysis). *Higher Education in Russia*, 29(12), 21–32. <https://doi.org/10.31992/0869-3617-2020-29-12-21-32> (in Russ.).

INTERDISCIPLINARY RESEARCH ON COGNITIVE PROCESSES

- Efimova, V. L., Buynov, L. G., Novozhilov, A. V., & Khasnutdinova, A. L. (2023). Eye-tracking study: Composing an oral narrative from a series of pictures by primary school children with learning difficulties. *World of Science. Pedagogy and Psychology*, 11(2). (in Russ.).
- Garcia, M. B., & Yousef, A. M. F. (2023). Cognitive and affective effects of teachers' annotations and talking heads on asynchronous video lectures in a web development course. *Research and Practice in Technology Enhanced Learning*, 18, 020. <https://doi.org/10.58459/rptel.2023.18020>
- Grishin, A. S., Ilyina, S. A., Pichugina, M. V., & Turnova, Yu. I. (2020). Cognitive assessment of information perception during alternation of different types of video content. *Kazan Pedagogical Journal*, 5(142), 224–229. <https://doi.org/10.34772/KPJ.2020.142.5.033> (in Russ.).
- Gu, C., Peng, Y., Nastase, S. A., Mayer, R. E., & Li, P. (2024). Onscreen presence of instructors in video lectures affects learners neural synchrony and visual attention during multimedia learning. *Proceedings of the National Academy of Sciences*, 121(12), e2309054121. <https://doi.org/10.1073/pnas.2309054121>
- Guo, P. J., Kim, J., & Rubin, R. (2014). How video production affects student engagement: An empirical study of MOOC videos. In Proceedings of the First ACM Conference on Learning at Scale (pp. 41–50). Association for Computing Machinery. <https://doi.org/10.1145/2556325.2566239>
- Jacob, T., & Centofanti, S. (2024). Effectiveness of H5P in improving student learning outcomes in an online tertiary education setting. *Journal of Computing in Higher Education*, 36(2), 469–485. <https://doi.org/10.1007/s12528-023-09361-6>
- Kamenskaya, V. G., & Tatyana, E. V. (2024). Experimental study of working memory and attention in adolescents with different degrees of engagement in virtual activity during the COVID-19 pandemic. *Experimental Psychology*, 17(2), 52–67. <https://doi.org/10.17759/exppsy.2024170203> (in Russ.).
- Kislukhina, I. A. (2017). The use of distance educational technologies in higher education: Problems and prospects. *Management of Economic Systems: Electronic Scientific Journal*, 9(103), 7–14. (in Russ.).
- Kizilcec, R. F., Bailenson, J. N., & Gomez, C. J. (2015). The instructor's face in video instruction: Evidence from two large-scale field studies. *Journal of Educational Psychology*, 107(3), 724–739. <https://doi.org/10.1037/edu0000013>
- Kloktunova, N. A., Solovieva, V. A., Barsukova, M. I., & Kuzmin, A. M. (2019). Study of cognitive processes of students when searching for educational information on screen. *Perspectives of Science and Education*, 3(39), 326–340. <https://doi.org/10.32744/pse.2019.3.25> (in Russ.).
- Konstantinova, O. B. (2023). Possibilities of using video in the educational process from the perspective of teachers and adolescents. *Psychological Science and Education*, 15(2), 106–130. <https://doi.org/10.17759/psyedu.2023150207> (in Russ.).
- Krotkova, O. A., Danilov, G. V., Kaverina, M. Yu., Kulyova, A. Yu., Gavrilova, E. V., & Enikolopova, E. V. (2018). The volume of visual attention in normal aging: An eye-tracking study. *Moscow University Psychology Bulletin*, 1, 21–36. <https://doi.org/10.11621/vsp.2018.01.21> (in Russ.).
- Latanov, A. V., Anisimov, V. N., Boiko, L. A., & Galkina, N. V. (2020). Russian Federation Patent No. 2722447. Filed November 14, 2019; published June 1, 2020, Bulletin No. 16.
- Li, W., Wu, J., Yin, K., Jiang, G., Yu, C., & Li, L. (2022). A method of attention analysis on video.

- Journal of Physics: Conference Series*, 2253(1), 012032. <https://doi.org/10.1088/1742-6596/2253/1/012032>
- Merkulova, A. G., & Kalinina, S. A. (2017). Distribution of visual attention in the preparation of student pilots for flight activity. *Hygiene and Sanitation*, 96(8), 752–755. <https://doi.org/10.18821/0016-9900-2017-96-8-752-755> (in Russ.).
- Ozcelik, E., Karakus, T., Kursun, E., & Cagiltay, K. (2009). An eye-tracking study of how color coding affects multimedia learning. *Computers & Education*, 53(2), 445–453. <https://doi.org/10.1016/j.compedu.2009.03.002>
- Robin, S. D., & Kruzhkova, O. V. (2024). Possibilities of applying eye-tracking technology in the psycho-pedagogical assessment of students with disabilities and children with attention deficit hyperactivity disorder. *Special Education*, 4(75), 53–67. (in Russ.).
- Sáiz-Manzanares, M. C., Marticorena-Sánchez, R., Martín Antón, L. J., González-Díez, I., & Carbonero Martín, M. Á. (2023). Using eye tracking technology to analyse cognitive load in multichannel activities in university students. *International Journal of Human-Computer Interaction*, 39(19), 3816–3834. <https://doi.org/10.1080/10447318.2023.2188532>
- Smirnova, Ya. K. (2022). Eye-tracking studies of the use of different forms of instruction in teaching children. *Moscow University Psychology Bulletin*, 2, 192–222. <https://doi.org/10.11621/vsp.2022.02.09> (in Russ.).
- Smirnova, Ya. K. (2024). Eye-tracking study of the features of perceptual activity of preschool children with hearing impairment when working with visual educational material in the learning process. *Experimental Psychology*, 17(1), 17–43. <https://doi.org/10.17759/exppsy.2024170102> (in Russ.).
- Stull, A. T., Fiorella, L., & Mayer, R. E. (2018). An eye-tracking analysis of instructor presence in video lectures. *Computers in Human Behavior*, 88, 263–272. <https://doi.org/10.1016/j.chb.2018.07.019>
- Wang, J., Antonenko, P. D., & Dawson, K. (2020). Does visual attention to the instructor in online video affect learning and learner perceptions? An eye-tracking analysis. *Computers & Education*, 146, 103779. <https://doi.org/10.1016/j.compedu.2019.103779>
- Wang, X., Han, M., Lipsmeyer, L. L., & Spector, J. M. (2020). Impacts of cues on learning: Using eye-tracking technologies to examine the functions and designs of added cues in short instructional videos. *Computers in Human Behavior*, 107, 106279. <https://doi.org/10.1016/j.chb.2020.106279>
- Yıldırım, Ş. U., & Sönmez, D. (2024). A bibliometric look at eye tracking research in video-based learning. *Yüzyüncü Yıl Üniversitesi Eğitim Fakültesi Dergisi*. <https://doi.org/10.33711/yyuefd.1378898>
- Yolkina, I. Yu. (2022). Factors of student engagement in the educational process under distance learning conditions. *Educational Resources and Technologies*, 1(38), 7–13. <https://doi.org/10.21777/2500-2112-2022-1-7-13> (in Russ.).
- Zalata, O. A., & Eremenko, Yu. A. (2020). Assessment of the perception of educational content at different levels of multimedia. *Integration of Education*, 24(4), 678–691. <https://doi.org/10.15507/1991-9468.101.024.202004.678-691> (in Russ.).

Received: December 4, 2024

Revised: March 14, 2025

Accepted: January 12, 2026

Author Contributions

Sergei V. Moiseev – development of the research design; preparation and conduct of the empirical study; collection of materials on domestic and international practices; data collection, entry, processing, and analysis; methodological foundations of the article; visualization/presentation of data in the text; revision of the initial draft; interpretation of research data; formulation of conclusions.

Elena A. Esipenko – expert review of the study; formulation of the research objectives; development of the article concept; collection of materials on domestic and international practices; interpretation of research data; preparation of the final version of the text.

Valeria V. Nesterenko – preparation and conduct of the empirical study; data collection, entry, processing, and analysis; development of the article concept; preparation of the final version of the text.

Author Details

Sergei V. Moiseev – Junior Researcher, Center for Cognitive Research and Neuroscience, National Research Tomsk State University, Tomsk, Russia; ORCID ID: <https://orcid.org/0009-0003-4567-3241>; e-mail: kaungreat@gmail.com

Elena A. Esipenko – Cand. Sci. (Biology), Associate Professor, Department of Genetic and Clinical Psychology, Faculty of Psychology, National Research Tomsk State University, Tomsk, Russia; Scopus ID: 31267491800; ORCID ID: <https://orcid.org/0000-0001-7088-0195>; e-mail: esipenkoea@gmail.com

Valeria V. Nesterenko – Junior Researcher, Center for Cognitive Research and Neuroscience, National Research Tomsk State University, Tomsk, Russia; ORCID ID: <https://orcid.org/0009-0003-3353-8528>; e-mail: valerie2602000@gmail.com

Conflict of Interest Information

The authors have no conflicts of interest to declare.