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Reading books with augmented reality to preschool children: The relationship with engagement and text comprehension

S.Yu. Smirnova[1] ✉, **E.E. Klopotova**[1]
[1] Moscow State University of Psychology and Education, Moscow, Russian Federation
✉ smirnovasy@mgppu.ru

Abstract

Context and relevance. The spread of digital technologies is affecting children's reading practices, including through the emergence of books with augmented reality (AR) elements, which alter the nature of a child's interaction with text. **Objective.** This study aims to identify the relationship between the use of augmented reality technology in books while reading to preschool children and their engagement in the reading process as well as their comprehension of the text. **Hypothesis.** Books featuring augmented reality technology attract children's attention and involve them in the reading process but distract them from the content of the text being read. **Methods and materials.** The study involved 120 children (60 boys and 60 girls) aged 5–7 years (M = 75,17 months, SD = 6,16 months) from the preschool division of ANOO "Khoroshevskaya School" (Moscow). The children were randomly assigned to three equally sized and gender-balanced groups: they were read books without illustrations, with traditional illustrations, and with AR illustrations. Nonparticipant observation and structured interviews were used as research methods. **Results.** The highest level of activity (questions, comments) was observed in the group using books with AR elements. The greatest activity (questions, comments) during the reading process was observed in the group where children were read a book with AR elements. However, a significant portion of children's remarks focused on visual and sound effects rather than the text content. Notably, none of the children in this group asked questions about unfamiliar words, despite observable difficulties in understanding them.

Keywords: augmented reality, preschool age, AR books, text comprehension, reading process

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Чтение детям дошкольного возраста книг с дополненной реальностью: связь с вовлеченностью и пониманием текста

С.Ю. Смирнова[1] ✉, **Е.Е. Клопотова**[1]
[1] Московский государственный психолого-педагогический университет, Москва, Российская Федерация
✉ smirnovasy@mgppu.ru

Резюме

Контекст и актуальность. Распространение цифровых технологий влияет на практики детского чтения, в том числе через появление книг с интерактивными элементами дополненной реальности (AR). **Цель.** Выявить характер связи между использованием технологии дополненной реальности в книгах при чтении детям дошкольного возраста и их вовлеченностью в процесс чтения и пониманием прочитанного текста. Г**ипотеза.** Книги с технологией дополненной реальности привлекают внимание детей и вовлекают в процесс чтения, но отвлекают от содержания читаемого текста. **Методы и материалы.** В исследовании участвовали 120 детей (60 мальчиков и 60 девочек) 5–7 лет (M = 75,17 мес., SD = 6,16 мес.) из дошкольного отделения АНОО «Хорошевская школа» (г. Москва). Дети были случайным образом распределены на три равные по численности и полу группы: им читали книги без иллюстраций, с традиционными иллюстрациями и с AR-иллюстрациями. Использовались методы невключенного наблюдения и формализованной беседы. **Результаты.** Наибольшая активность (вопросы, комментарии) в процессе чтения наблюдалась в группе, где детям читали книгу с элементами AR. При этом значительная часть детских высказываний была связана с визуальными и звуковыми эффектами, а не с содержанием текста. Ни один ребенок из этой группы не задал вопросов по поводу незнакомых слов. **Выводы.** Книги с AR-элементами привлекают внимание детей и побуждают их к активности в процессе чтения, но визуальные и звуковые эффекты могут отвлекать ребенка от содержания, смещая внимание с текста и сюжета на визуальные эффекты.

Ключевые слова: дополненная реальность, дошкольный возраст, книги с дополненной реальностью, понимание текста, процесс чтения

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Introduction

The acquisition of reading skills is a critical stage in every child's development. On the one hand, it reflects the maturation of specific mental functions; on the other, it serves as a key instrument of socialization by providing access to the cultural heritage of humanity. Consequently, the development and support of reading skills have consistently remained a central concern of educational systems.

Research conducted over recent decades has documented a decline in reading interest among younger generations (VCIOM, 2024). This trend is not limited to Russia but has also been observed in other countries (HarperCollins Children's Books, Farshore, 2024; Clark et al., 2024).

In Russia, efforts to address this issue are currently being undertaken at various levels. Taking into account the developmental characteristics of contemporary children and drawing on the best examples of children's literature, including modern works, reading practices are being developed both in educational institutions and within families. Numerous initiatives — library-based, museum-based, and others — aimed at fostering children's interest in reading are actively supported. Programs promoting high-quality literary works and encouraging family reading are being implemented. The National Program for the Support and Development of Reading (2006) has been established, and work is underway on the Program for Supporting Children's, Youth, and Family Reading Based on Traditional Values and Considering Modern Technologies (2024).

Such sustained attention to this issue is обусловлено the fact that core reading competencies begin to develop at an early age — when a child first encounters a book, listens to an adult reading aloud, and explores illustrations. In the preschool period, adult-led reading becomes a distinct, purposeful activity, as reflected in the Federal Educational Program for Preschool Education (Order of the Ministry of Education of the Russian Federation, November 25, 2022, No. 1028).

The concept of a "reader" is applicable to preschool children even if they have not yet mastered independent reading. At this age, reading skills encompass the ability to perceive and comprehend literary texts through listening and interaction with the book, forming the foundation for later independent reading (A.V. Zaporozhets; D.B. Elkonin). A crucial component of this skill is reading competence, which includes motivation to read, text comprehension, and the establishment of an emotional connection with literature (Solntseva, Ezopova, Kaganets, 2023).

The development of a reading individual is primarily determined by the formation of motivation toward the reading process. As a structural component of reading competence, motivation emerges earlier than other components. In young children, enjoyment of reading is largely associated with illustrations and shared interaction with an adult. The reading process requires sustained attention as well as volitional and cognitive effort, which poses significant challenges for young children and becomes feasible mainly toward the end of the preschool period. By this time, intrinsic motivation may already support children's engagement in reading, while sustained focus on the content contributes to the development of reading interest (Akulova, Gurovich, 2012).

A key condition for the development of the motivational component of reading competence in preschool children is the emergence of a positive emotional response associated with book perception and shared reading with an adult. Experiencing pleasure from interaction with a literary text lays the foundation for a stable interest in reading and for the further development of reading activity (Ezopova, Solntseva, 2022).

In preschool age, reading motivation often relies on external stimuli that facilitate engagement in the process, such as illustrations, visual and tactile elements, and various special effects (e.g., sounds and smells). For this reason, considerable attention is devoted to the design of children's books. Today, book design includes not only illustrations and interactive features but also opportunities associated with digital technologies, which have become an integral part of modern children's lives.

The digitalization of childhood has already affected traditional childhood practices — play, productive activities, reading, and others — endowing them with new characteristics that, in turn, influence child development. A number of studies have demonstrated that the developmental profiles of contemporary preschool children, who actively engage with digital technologies from an early age and prefer visual and interactive modes of information acquisition, differ substantially from those of their peers at the beginning of the 21st century (Klopotova, 2017; Soldatova, Vishneva, 2019; Denisenkova, Fedorov, 2021; Bukhalenkova, Almazova, Gavrilova, 2023).

Despite extensive discussion, the digitalization of childhood has not yet led to unequivocal conclusions. As in any domain, the introduction of digital technologies reveals both advantages and limitations. When such technologies are widely used in children's books (e.g., e-books, interactive books, augmented reality books), producers emphasize their educational and developmental potential. However, research indicates that these technologies are often insufficiently adapted to the age-related and psychological characteristics of young children (Bai et al., 2022; Chen, Huang, 2025). Interactive elements may overload children's perceptual systems and distract them from the main text. This concern is also emphasized by Christ et al. (2019), who stress the necessity of adapting digital books to children's developmental needs. At the same time, interactivity attracts children and helps sustain their attention (Sun, Roberts, Bus, 2022). Overall, the positive and negative effects observed in children's interaction with digitally enhanced books are primarily determined by the degree of thoughtful design, alignment with age-specific characteristics, and the nature of early childhood reading practices (Klippen, Kucirkova, Bus, 2021). In an effort to maximize appeal, producers often transform books into objects of entertainment, thereby modifying traditional shared reading practices based on adult reading aloud and joint examination of illustrations.

Concerns have been raised that an increasing emphasis on external motivation for reading — through additional features (e.g., puzzles, hidden elements, movable parts, gamification) and special effects (e.g., sounds and smells) — may turn reading primarily into a form of entertainment. In such cases, it becomes difficult to engage children's age-appropriate cognitive capacities and volitional efforts necessary for meaningful involvement in the reading process, which presupposes focused listening (Strouse, 2017). Excessive multimedia content in children's books may also reduce the quality of adult–child interaction during shared reading and divert attention away from textual meaning.

At the same time, the use of digital technologies in education and reading is becoming increasingly widespread. Books with additional features, particularly those incorporating digital content, are popular among preschool children (Kozhevnikova, Diner, 2021), as interactivity and the opportunity to gain diverse sensory experiences are especially appealing to them. In recent years, children's books featuring augmented reality (AR) illustrations have gained rapid popularity. These books combine traditional printed illustrations with access to digital audio and video content. To view AR illustrations, a digital device (smartphone or tablet) is used. When a child or adult points the device's camera at a page of a printed book for which additional content has

been created, a dedicated application displays this content on the screen. Compared with traditional printed books, interaction with AR books differs substantially: readers hold a digital device over the printed book and observe how static illustrations acquire motion, accompanied by additional video and audio effects absent from the printed version. This effect attracts children and helps sustain their attention. Several studies have shown that children interacting with AR books demonstrate higher levels of engagement, maintain attention for longer periods, and more frequently initiate rereading (Şimşek, 2024; Du, Sanmugam, Barkhaya, 2024).

An analysis of existing research indicates that, to date, there is insufficient empirical evidence to draw definitive conclusions regarding the impact of AR technologies in children's books on preschoolers' text comprehension, attitudes toward reading, and reading motivation (Klopotova, Smirnova, 2024). Moreover, available findings are often inconsistent (Son, Butcher, 2024; Savva, Higgins, Beckmann, 2022; Chang et al., 2023).

The aim of the present study was to examine the nature of the relationship between augmented reality technology in children's books, children's engagement in the reading process, and text comprehension. We hypothesized that the use of AR illustrations in children's books would attract children's attention to the book and the reading process while simultaneously distracting them from the textual content.

The theoretical framework of the study is grounded in the cultural-historical approach (L.S. Vygotsky; D.B. Elkonin), within which the development of reading activity is conceptualized as a form of shared cultural practice between the child and the adult, as well as in contemporary research on reading competence (Solntseva, Ezopova, Kaganets, 2023).

Thus, the present study aims to refine and extend current understanding of the relationship between augmented reality technology and key components of preschool children's reading activity, including engagement in the reading process and text comprehension.

The assessment of children's engagement in reading based on their questions and comments has long been used in psychological and educational research (Moschovaki, Meadows, 2005; Lepola et al., 2023; Son et al., 2023). Children's activity during reading — in the form of questions and comments — can be considered an indicator not only of engagement but also of text comprehension. By asking questions and making comments, children demonstrate active cognitive processing of the material. It has been shown that children who more frequently ask questions and provide comments during adult-led reading better reproduce content and demonstrate higher levels of comprehension (Moschovaki, Meadows, 2005). More recent studies have likewise indicated that interactive engagement during shared reading, including questions and comments, is positively associated with text comprehension outcomes (Son et al., 2023).

Materials and methods

Within the framework of the study aimed at identifying the impact of augmented reality (AR) technology in children's books on children's engagement in the reading process and text comprehension, three book formats were examined: books without illustrations, books with traditional printed illustrations, and books with augmented reality (AR) illustrations.

The experimental material was the book by N. Landa Basya: A Cat's Diary. Sequel*,* which met the objectives of the study, including the presence of AR illustrations and the possibility of reading the text without displaying them. Children were read one story, Carolina the Brave, which contained four traditional printed illustrations that could also be presented in an augmented reality format. None of the participants had been previously familiar with the text. The reading session lasted approximately 15–20 minutes. The story

featured four main characters (a cat, a horse, a cow, and a grandmother) and included several words unfamiliar to the children, such as milk pail*,* cowshed*,* and fresh milk.

Participants

The experiment was conducted in the preschool department of the Autonomous Non-Commercial Educational Organization "Khoroshevskaya School" in Moscow and involved 120 children (60 boys and 60 girls) aged 5 to 7 years (M = 75,17 months, SD = 6,16 months). All participants were randomly assigned to three groups equal in size and gender composition (40 children per group):

- EG1 (N = 40): reading a book without illustrations;
- EG2 (N = 40): reading a book with traditional printed illustrations;
- EG3 (N = 40): reading a book with printed illustrations supplemented by AR illustrations.

Based on pedagogical assessment conducted within the framework of the preschool educational program Inspiration*,* no significant differences were found between the groups in terms of speech development or the formation of reading-related skills.

Procedure

Reading sessions were conducted by a preschool teacher who regularly worked with the participating children. In EG1, children were read the text printed on A4 sheets. In EG2, reading was accompanied by traditional printed illustrations. In EG3, in addition to printed illustrations, the teacher demonstrated AR images using a tablet at the corresponding moments in the text.

All sessions took place in the afternoon during free activity time. Each of the three experimental groups was divided into small subgroups of 4–5 children, with whom the teacher worked sequentially.

During the reading process, the researcher conducted non-participant observation, recording children's questions and comments. After the reading session, each child participated in an individual structured interview aimed at assessing their attitude toward the reading process. During the subsequent month, the book remained freely accessible in the group to observe the maintenance of children's interest over time.

Measures

To assess text comprehension and attitudes toward reading, a diagnostic toolkit was developed, including a non-participant observation checklist for the reading process and a structured interview protocol for children.

Children's engagement in the reading process and comprehension of the text were assessed based on their observable activity in the form of questions and comments related to the text. All questions and comments were recorded by the experimenter in the observation protocol during adult-led reading.

Children's questions and statements were evaluated according to the following parameters:

- the total number of questions and comments related to the read text expressed by each child;
- differentiation between questions/comments related to the content of the book and those related to the book format (AR);
- questions and comments concerning unfamiliar words (milk pail*,* cowshed*,* fresh milk**).**

A child was considered active if, during the observation, they expressed engagement with the book content through at least one question or comment.

Children's attitudes toward the book were assessed during the structured interview, which included questions aimed at identifying whether the child liked the book and whether they would like to have such a book at home. Attitudes were evaluated quantitatively based on "yes/no" responses and qualitatively based on the arguments provided by the child.

To achieve the study objectives, an expert evaluation of the diagnostic toolkit was conducted. Experts were specialists in the field of preschool education. The observation checklist and interview protocol were submitted for review to assess their correspondence with the study objectives related to examining children's engagement and text comprehension. Evaluation criteria included age appropriateness and relevance to the research goals. The assessment was conducted using a three-point scale (0/1/2). Items receiving fewer than 5 points across the three expert ratings were revised in accordance with expert recommendations. The final version of the toolkit, approved by all experts, was used in the empirical study. Expert evaluation ensured the content validity of the instruments employed (Hessmann, Sheronov, 2013).

Following the empirical phase of the study, qualitative and quantitative analyses of the collected data were conducted using methods of mathematical statistics, including Pearson's chi-square (χ^2) test.

Results

Analysis of non-participant observation results

At the overall level of engagement during the reading process, differences were observed across experimental subgroups in the proportion of children who demonstrated active involvement with the text content in the form of questions and comments. In experimental group EG1, 45% of participants (n = 18) exhibited activity; in EG2, this proportion increased to 72% (n = 29); and in EG3, to 90% (n = 36). According to the results of Pearson's chi-square (χ^2) test, the proportion of active participants in EG1 was significantly lower than in EG2 ($p < ,001$). The difference between EG2 and EG3 did not reach statistical significance ($p = ,086$).

The number of questions and comments per child in EG3 was substantially higher than in EG1 and EG2. In EG1 and EG2, children's questions and comments were exclusively related to the content of the book (e.g., "So is Carolina a cat or a horse?", "What is a cowshed?", "What was the cat's name?"). In contrast, in EG3, 58% of children (n = 23) asked questions and made comments that were not related to the textual content. These statements concerned the augmented reality format itself, including the demonstration process, the movements and sounds of the characters, or were unrelated spontaneous remarks (e.g., "How do they make it come alive?", "Can our books be animated like this?", "That's funny").

Nevertheless, even when accounting for these content-irrelevant statements, the subgroup in which children were read a book with augmented reality illustrations demonstrated nearly twice as many content-related questions and comments per active child compared to EG1 and EG2 (see Table 1).

Observations conducted over the month following the reading session showed that children displayed active interest in the book with augmented reality illustrations primarily during the first few days. Subsequently, over the course of the month, children did not return to the book on their own initiative. It was found that 20% of children in EG2 (n = 8) and one child (2,5%) from each of EG1 and EG3 recalled the book. Application of Pearson's chi-square test indicated that these differences between groups were statistically significant ($p \leq ,01$).

Requests to reread the book were expressed by one child (2,5%) in EG1 and by three children (7,5%) in EG2.

Analysis of structured interview results

During the interview, all children who participated in the experiment (N = 120) reported that they liked the book. However, analysis of their arguments allowed for differentiation in attitudes toward the read book. Three types of responses were identified: vague responses (the child stated that the book was liked but could not

Table 1

Results of non-included observation «Reading comprehension. Child monitoring card»

Group	Content-related questions and comments				Non-content-related questions and comments		
	Number of children who asked questions or made comments	Количество вопросов		Number of children noticing unknown words	Number of children who asked questions or made comments	Количество вопросов	
		Всего	Questions per child			Всего	Questions per child
EG1 (N = 40)	45% (n = 18)	n = 22	1,2	23% (n = 9)	0	0	0
EG2 (N = 40)	72% (n = 29)	n = 35	1,2	43% (n = 17)	0	0	0
EG3 (N = 40)	90% (n = 36)	n = 80	2,2	0	58% (n = 23)	n = 39	1,7

explain why, or provided nonspecific answers such as “because” or “it’s good”); content-based responses (the child referred to the story content, e.g., “everyone won,” “I like stories about animals”); and format-related responses, referring to the illustration format (e.g., “I liked the pictures,” “it’s a beautiful book”).

The highest proportion of vague responses was observed in EG1, where 60% of children (n = 24) provided such answers, which was significantly higher than in EG2 (22,5%, n = 9) and EG3 (22,5%, n = 9). Statistical analysis using Pearson’s chi-square test revealed significant differences between the groups at $p < ,05$.

In EG2, the majority of children (77,5%, n = 31) identified the content of the book as the primary reason for their positive attitude. In the other two groups, such responses were considerably less frequent: 40% in EG1 (n = 16) and 17,5% in EG3 (n = 7). Pearson’s chi-square analysis indicated significant differences between groups ($p < ,001$).

Only children in EG3 (65%, n = 26) referred to the book’s design features as the basis for their positive evaluation, mentioning aspects such as “living pictures” and “everything moves.”

Conversely, only in EG1 were there cases (15%, n = 6) in which children attributed their positive perception of the book to the teacher’s manner of reading (e.g., “the teacher read well,” “it was read nicely,” “I liked how it was read”).

The majority of children in EG1 (57,5%, n = 23) were unable to answer whether they would like to have such a book at home (referring to the book read in their experimental subgroup). Positive responses without justification were given by 22,5% (n = 9), while only 10% (n = 4) explicitly stated that they would not like to have the book.

In both EG2 and EG3, all children expressed a desire to have such a book at home. In EG2, most children (65%, n = 26) explained this desire by their interest in reading, whereas 35% (n = 14) referred to viewing the illustrations. In EG3, the pattern was reversed: the majority of children (77,5%, n = 31) wanted the book primarily to look at the pictures, while only 22,5% (n = 9) mentioned reading as the reason (see Table 2).

Table 2

The results of the conversation with children «Attitude to the reading process»

Question		Argumentation	EG1 (N = 40)	EG2 (N = 40)	EG3 (N = 40)
Did you like the book?	**Yes**	**Indeterminate answer**	60% (n = 24)	22,5% (n = 9)	22,5% (n = 9)
		Content	40% (n = 16)	77,5% (n = 31)	17,5% (n = 7)
		Book characteristics (Illustrations)	0	0	65% (n = 26)
		Reading characteristics	15% (n = 6)	0	0
	No		0	0	0
Desire to have such a book at home	**Yes**	**No Response**	57,5% (n = 23)	0	0
		Indeterminate answer	22,5% (n = 9)	0	0
		how, view	0	35% (n = 14)	77,5% (n = 31)
		To read	15% (n = 26)	65% (n = 26)	22,5% (n = 9)
	No		10% (n = 2)	0	0

No substantial differences were identified between the three experimental groups in children's attitudes toward the reading process itself. Results of non-participant observation aimed at assessing attitudes toward reading did not reveal significant differences across groups. Isolated and statistically non-significant instances of children attempting to engage in alternative activities during reading or refusing to participate were recorded in EG2 (3 children, 7,5%) and EG3 (2 children, 5%). Pearson's chi-square analysis did not reveal significant differences between the groups (p > ,20).

Discussion

The empirical findings obtained in the present study support the proposed hypothesis that augmented reality (AR) illustrations attract children's attention to the book and the reading process while simultaneously potentially diverting attention away from the text itself.

The results indicate that when a book with AR illustrations was read, almost all children demonstrated active involvement in the form of questions and comments. In contrast, such manifestations of activity were considerably less frequent in groups where the book was read with traditional printed illustrations or without illustrations. These findings are consistent with the conclusions of Strouse et al. (2017) and Savva et al. (2022), who note that multimedia elements can enhance children's engagement in the reading process by stimulating responsiveness and encouraging dialogic interaction.

An analysis of the content of children's utterances allows for a more nuanced understanding of the nature of this activity. In EG1 and EG2, all questions and comments were related to the textual content, whereas in EG3 approximately one third of all remarks referred to the characteristics of the illustrations and the specifics of their reproduction in the augmented reality format

(n = 39 out of N = 119). This shift in attentional focus partially corroborates concerns expressed by Son and Butcher (2024) that AR effects may distract children from semantic text processing by redirecting attention toward technical and visual features.

At the same time, even when this shift in attention is taken into account, the group in which children were read a book with AR illustrations demonstrated nearly twice as many content-related questions and comments per active child compared to the other groups. This finding suggests that reading a book with illustrations in this format not only captures children's attention but may also promote active engagement in the reading process, provided that it is accompanied by pedagogically appropriate adult mediation. A similar effect has been described by Chang et al. (2023), who emphasize the importance of integrating digital and textual components within a supportive adult–child communicative context.

Despite the high level of external engagement observed during reading in EG3, children in this group appeared less attentive to the textual content: none of the children asked questions about unfamiliar words, and the few difficulties in understanding that were observed were directly related to the comprehension of word meanings. This pattern may indicate a shift in attentional focus toward the book's visual effects rather than its semantic content.

Observations further showed that, although children were actively engaged during the reading of a book with AR illustrations, they did not return to the book on their own initiative after several days, despite having free access to it. For the majority of children in this group (65%, n = 26), the attractiveness of the book was primarily determined by its external features, whereas only 17,5% (n = 7) referred to its content, and the remaining children were unable to explain why they liked the book. By contrast, in EG2, 77,5% of children (n = 31) identified the content as the main source of the book's appeal, compared to 40% (n = 16) in EG1.

These results are consistent with the conclusions of several researchers (Strouse, 2017; Bai et al., 2022; Chen, Huang, 2025), who point to the potential risk of replacing reading as a meaning-oriented activity with elements of interactive entertainment. While additional visual and auditory features may indeed increase children's engagement, they can also distract attention from the text and reduce the depth of semantic processing.

Conclusions

The findings of the present study indicate an ambivalent effect of augmented reality technology when used in illustrations in children's books. On the one hand, books with AR elements attract children's attention and encourage active participation in the reading process in the form of questions and comments. This supports the assumption that augmented reality has the potential to enhance children's engagement in reading. On the other hand, the results demonstrate that visual and auditory effects may divert children's attention away from textual content, shifting the focus toward special effects and book design rather than meaning. Thus, the use of augmented reality illustrations in children's reading cannot be evaluated as unequivocally positive or negative. Such illustrations may serve both a supportive and a distracting function in the reading process. As noted in previous research, their effectiveness largely depends on the quality of implementation and their alignment with the semantic content of the text. Future research may extend this line of inquiry by examining the long-term effects of books with augmented reality elements on the development of meaning-oriented reading, language development, and the formation of children's reading preferences.

Limitations. This study has several limitations that should be taken into account when

interpreting the results. The sample included children aged 5 to 7 years, which restricts the generalizability of the findings to this specific age group. Future research should expand the age range of participants by including different subgroups of preschoolers. This would provide a more comprehensive understanding of how books with augmented-reality elements influence reading comprehension processes. The procedure used to develop the diagnostic tools allows us to speak only of their construct validity. Since Pearson's χ^2 test was used for statistical analysis, including in cases of small samples, the statistical significance obtained in this study can be interpreted only as an indicator for further research. Another limitation concerns the novelty factor: most children in the study had no prior experience interacting with augmented-reality illustrations. This may have affected their perception and engagement. Finally, the study was based on the analysis of a single AR-enhanced children's book. Such books may differ substantially in text content, visual design, and interactive features. Therefore, further research comparing different AR books is essential for a more precise identification of factors that contribute to preschoolers' engagement and text comprehension.

Список источников / References

1. Акулова, О.В., Гурович, Л.М. (2012). *Образовательная область «Чтение художественной литературы» [Текст]: учебно-методическое пособие для студентов высших учебных заведений, обучающихся по направлению 050100 «Педагогическое образование»*. Санкт-Петербург; Москва: Детство-Пресс; Творческий центр Сфера. Akulova, O.V., Gurovich, L.M. (2012). *Educational field "Reading of fiction" [Text]: A textbook for students of higher education institutions studying in the field 050100 «Pedagogical Education»*. Saint Petersburg; Moscow: Detstvo-Press; Creative Center Sfera. (In Russ.).
2. Бухаленкова, Д.А., Алмазова, О.В., Гаврилова, М.Н. (2023). Оценка особенностей воображения старших дошкольников воспитателями. *Национальный психологический журнал*, *18*(4), 148–164. https://doi.org/10.11621/npj.2023.0413
   Bukhalenkova, D.A., Almazova, O.V., Gavrilova, M.N. (2023). Assessment of Imagination Features in Older Preschoolers by Educators. *National Psychological Journal*, *18*(4), 148–164. (In Russ.). https://doi.org/10.11621/npj.2023.0413
3. Всероссийский центр изучения общественного мнения (ВЦИОМ). (2024). *Чтение в эпоху цифры: аналитический обзор*. Москва: ВЦИОМ. URL: https://wciom.ru/analytical-reviews/analiticheskii-obzor/chtenie-v-ehpokhu-cifry (дата обращения: 25.05.2025).
   All-Russian Public Opinion Research Center (VCIOM). (2024). *Reading in the Digital Age: Analytical Review*. Moscow: VCIOM. URL: https://wciom.ru/analytical-reviews/analiticheskii-obzor/chtenie-v-ehpokhu-cifry (viewed: 25.05.2025). (In Russ.).
4. Гессманн, Х., Шеронов, Е.А. (2013). Валидность психологического теста. *Современная зарубежная психология, 2*(4), 20–31. URL: https://psyjournals.ru/journals/jmfp/archive/2013_n4/65481 (дата обращения: 16.09.2025).
   Gessmann, H., Sheronov, E.A. (2013). Psychological Test Validity. *Journal of Modern Foreign Psychology*, 2(4), 20–31. URL: https://psyjournals.ru/journals/jmfp/archive/2013_n4/65481 (viewed: 16.09.2025). (In Russ.).
5. Денисенкова, Н.С., Федоров, В.В. (2021). Сравнительный анализ уровня развития умственных способностей современных старших дошкольников и их сверстников, посещавших детские сады в последней трети XX века. *Психологическая наука и образование*, *26*(3), 40–53. https://doi.org/10.17759/pse.2021260302
   Denisenkova, N.S., Fedorov, V.V. (2021). Comparative Analysis of the Level of Mental Abilities in Modern Older Preschoolers and Their Peers Who Attended Kindergartens in the Last Third of the 20th Century. *Psychological Science and Education*, *26*(3), 40–53. (In Russ.). https://doi.org/10.17759/pse.2021260302
6. Езопова, С.А., Солнцева, О.В. (2022). Проектирование инфраструктуры детского чтения в дошкольной образовательной организации: постановка проблемы. *Современное дошкольное образование*, *6*(114), 54–68. https://doi.org/10.24412/2782-4519-2022-6114-54-68
   Ezopova, S.A., Solntseva, O.V. (2022). Designing the Infrastructure for Children's

Reading in Preschool Educational Institutions: Problem Statement. *Contemporary Preschool Education*, *6*(114), 54–68. (In Russ.). https://doi.org/10.24412/2782-4519-2022-6114-54-68

7. Клопотова, Е.Е. (2017). Особенности ценностных ориентаций современных дошкольников. *Психологическая наука и образование*, *9*(1), 96–105. https://doi.org/10.17759/psyedu.2017090110
   Klopotova, E.E. (2017). Features of Value Orientations in Modern Preschoolers. *Psychological Science and Education*, *9*(1), 96–105. (In Russ.). https://doi.org/10.17759/psyedu.2017090110
8. Клопотова, Е.Е., Смирнова, С.Ю. (2024). Детское чтение в цифровую эпоху. *Современная зарубежная психология*, *13*(3), 113–122. https://doi.org/10.17759/jmfp.2024130311
   Klopotova, E.E., Smirnova, S.Yu. (2024). Children's Reading in the Digital Age. *Journal of Modern Foreign Psychology*, *13*(3), 113–122. (In Russ.). https://doi.org/10.17759/jmfp.2024130311
9. Кожевникова, Е.А., Динер, Е.В. (2021). Современные тенденции представления иллюстративного материала в детской книге [Электронный ресурс]. В: *Общество. Наука. Инновации (НПК–2021): Сборник статей XXI всероссийской научно-практической конференции: 12 апреля–30 апреля 2021 г.* (Том 1, с. 248–253). Киров: Вятский государственный университет. URL: https://elibrary.ru/item.asp?id=46138427 (дата обращения: 29.05.2025).
   Kozhevnikova, E.A., Diner, E.V. (2021). Modern Trends in the Presentation of Illustrative Material in Children's Books [Electronic resource]. In: *Society. Science. Innovations (NPK–2021): Proceedings of the 21st All-Russian Scientific and Practical Conference: April 12–30, 2021* (Vol. 1, pp. 248–253). Kirov: Vyatka State University. URL: https://elibrary.ru/item.asp?id=46138427 (viewed: 29.05.2025). (In Russ.).
10. Приказ от 25.11.2022 № 1028 «Об утверждении федеральной образовательной программы дошкольного образования» [Электронный ресурс] / Министерство просвещения Российской Федерации. Москва, 2022. 236 с. URL: http://publication.pravo.gov.ru/Document/View/0001202212280044 (дата обращения: 14.09.2025).
    Order from 25.11.2022 no. 1028: On approving the Federal education program for preschool education [Web resource] / Ministry of Education of Russia. Moscow, 2022. 236 p. URL: http://publication.pravo.gov.ru/Document/View/0001202212280044 (viewed: 14.09.2025). (In Russ.).
11. Солдатова, Г.У., Вишнева, А.Е. (2019). Особенности развития когнитивной сферы у детей с разной онлайн-активностью: есть ли золотая середина? *Консультативная психология и психотерапия*, *27*(3), 97–118. https://doi.org/10.17759/cpp.2019270307
    Soldatova, G.U., Vishneva, A.E. (2019). Features of Cognitive Development in Children with Different Levels of Online Activity: Is There a Golden Mean? *Consultative Psychology and Psychotherapy*, *27*(3), 97–118. (In Russ.). https://doi.org/10.17759/cpp.2019270307
12. Солнцева, О.В., Езопова, С.А., Каганец, С.В. (2023). Феноменология читательской компетентности детей старшего дошкольного возраста. *Современное дошкольное образование*, *5*(119), 4–17. https://doi.org/10.24412/2782-4519-2023-5119-4-17
    Solntseva, O.V., Ezopova, S.A., Kaganets, S.V. (2023). Phenomenology of Reading Competence in Older Preschool Children. *Contemporary Preschool Education*, *5*(119), 4–17. (In Russ.). https://doi.org/10.24412/2782-4519-2023-5119-4-17
13. Bai, J., Zhang, H., Chen, Q., Cheng, X., Zhou, Y. (2022). Technical supports and emotional design in digital picture books for children: A review. *Procedia Computer Science,* 201, 174—180. https://doi.org/10.1016/j.procs.2022.03.025
14. Chang, K.E., Tai, Y.W., Liu, T.C., Sung, Y.T. (2023). Embedding dialog reading into AR picture books. *Interactive Learning Environments, Advance online publication*, 1—17. https://doi.org/10.1080/10494820.2023.2192758
15. Chen, M., Huang, Y.C. (2025). Analysis on the role of picture books in children's cognitive development education. *Edelweiss Applied Science and Technology, Learning Gate*, 9(3), 1916—1925.
16. Christ, T., Wang, X.C., Chiu, M.M., Cho, H. (2019). Kindergartener's meaning making with multimodal app books: The relations amongst reader characteristics, app book characteristics, and comprehension outcomes. *Early Childhood Research Quarterly,* 47, 357—372. https://doi.org/10.1016/j.ecresq.2019.01.003
17. Clark, C., Picton, I., Cole, A., Oram, N. (2024). Children and young people's reading in 2024. National Literacy Trust. https://nlt.cdn.ngo/media/documents/Children_and_young_peoples_reading_in_2024_Report.pdf
18. Du, S., Sanmugam, M., Barkhaya, N. (2024). The Impact of Augmented Reality Story books on Children's Reading Comprehension and

Motivation. *International Journal of Interactive Mobile Technologies (iJIM),* 18, 100—114. https://doi.org/10.3991/ijim.v18i24.50793
19. HarperCollins Children's Books & Farshore. (2024). Understanding the Children's Book Consumer 2024. Available at: https://www.farshore.co.uk/wp-content/uploads/sites/46/2024/04/The-Farshore-and-HCCB-Annual-Review-of-Childrens-Reading-for-Pleasure-1.pdf
20. Klippen, M.I., Kucirkova, N., Bus, A. (2021). A comparison of children's reading on paper versus screen: A meta-analysis. *Review of Educational Research*, 91, Article 003465432199807. https://doi.org/10.3102/0034654321998074
21. Lepola, J., Kajamies, A., Laakkonen, E., Collins, M.F. (2023). Opportunities to Talk Matter in Shared Reading: The Mediating Roles of Children's Engagement and Verbal Participation in Narrative Listening Comprehension. *Early Education and Development*, 1—23. https://doi.org/10.1080/10409289.2023.2188865
22. Moschovaki, E., Meadows, S. (2005). Young children's spontaneous participation during classroom book reading: Differences according to various types of books. *Early Childhood Research & Practice,* 7(1), 1—17.
23. Savva, M., Higgins, S., Beckmann, N. (2022). Meta-analysis examining the effects of electronic storybooks on language and literacy outcomes for children in grades Pre-K to grade 2. *Journal of Computer Assisted Learning,* 38(2), 526—564. https://doi.org/10.1111/jcal.12623
24. Şimşek, E. (2024). The effect of augmented reality storybooks on the story comprehension and retelling of preschool children. *Frontiers in Psychology*, 15. https://doi.org/10.3389/fpsyg.2024.1459264
25. Son, S.C., Baroody, A., Opatz, M. (2023). Measuring preschool children's engagement behaviors during classroom shared reading: Construct and concurrent validity of the shared reading engagement rating scale. *Early Childhood Research Quarterly*, 64, 47—60. https://doi.org/10.1016/j.ecresq.2023.02.001
26. Son, S.H.C., Butcher, K.R. (2024). Effects of varied multimedia animations in digital storybooks: A randomized controlled trial with preschoolers. *Journal of Research in Reading, Advance online publication*, 1—20. https://doi.org/10.1111/1467-9817.12452
27. Strouse, G.A., Ganea, P.A. (2017). A print book preference: Caregivers report higher child enjoyment and more high-quality adult-child interactions when reading print than electronic books. *International Journal of Child-Computer Interaction*, 12, 8—15. https://doi.org/10.1016/j.ijcci.2017.02.001
28. Sun, H., Roberts, A.C., Bus, A. (2022). Bilingual children's visual attention while reading digital picture books and story retelling. *Journal of Experimental Child Psychology*, 215, Article 105327. https://doi.org/10.1016/j.jecp.2021.105327

Information about the authors

Svetlana Yu. Smirnova, Research Associate, Center for Interdisciplinary Research on Contemporary Childhood, Moscow State University of Psychology and Education, Moscow, Russian Federation, ORCID: https://orcid.org/0000-0002-8579-4908, e-mail: smirnovasy@mgppu.ru

Ekaterina E. Klopotova, PhD in Psychology, Associate Professor, Department of Educational Psychology, Senior Researcher, Center for Interdisciplinary Research on Contemporary Childhood, Moscow State University of Psychology and Education, Moscow, Russian Federation, ORCID: https://orcid.org/0000-0002-1975-318X, e-mail: klopotovaee@mgppu.ru

Информация об авторах

Светлана Юрьевна Смирнова, научный сотрудник Центра междисциплинарных исследований современного детства, Московский государственный психолого-педагогический университет (ФГБОУ ВО МГППУ), Москва, Российская Федерация, ORCID: https://orcid.org/0000-0002-8579-4908, e-mail: smirnovasy@mgppu.ru

Екатерина Евгеньевна Клопотова, кандидат психологических наук, доцент факультета психологии образования; старший научный сотрудник Центра междисциплинарных исследований современного детства, Московский государственный психолого-педагогический университет (ФГБОУ ВО МГППУ), Москва, Российская Федерация, ORCID: https://orcid.org/0000-0002-1975-318X, e-mail: klopotovaee@mgppu.ru

Contribution of the authors

Svetlana Yu. Smirnova — ideas; planning the research; conducting the research; data collection; discussing the results; writing the text; manuscript formating.

Ekaterina E. Klopotova — ideas; planning of the research; application of statistical methods for data analysis; discussing the results; writing the text.

All authors participated in the discussion of the results and approved the final text of the manuscript.

Вклад авторов

Смирнова С.Ю. — идеи исследования, планирование исследования, проведение и сбор данных исследования, обсуждение результатов, написание текста; оформление рукописи.

Клопотова Е.Е. — идеи исследования, планирование исследования, применение статистических методов для анализа данных; обсуждение результатов, написание текста.

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