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Children on ChatGPT Readability in an Educational Context: Myth or Opportunity?

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ABSTRACT

In this work, we present the results of a preliminary exploration aiming to understand whether the use of ChatGPT in an educational context can be an asset to meet the specific needs of the students. In particular, we focus on the possibility of adapting the responses to online inquiries related to the primary school curriculum to meet the expectations of readers with different literacy levels. The analysis of feedback elicited from children (9- to 10-year-olds) in three 4th grade classrooms indicates that ChatGPT can adapt its responses to the 4th grade level. However, it still needs improvement to reach the right level of readability. Outcomes from this work can inspire future research directions involving technologies like ChatGPT to adapt learning paths to suit a broad range of students with varied cognitive skills. The potential of such tools to support teachers in their effort to adapt to individual learning needs is still to be fully exploited.

CCS CONCEPTS

• **Social and professional topics** → **Children**; • **Applied computing** → *Education*; • **Information systems** → *Web searching and information discovery*.

KEYWORDS

children, education, ChatGPT, personalization

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1 INTRODUCTION

The rise of ChatGPT has unlocked a new world of opportunities and related concerns [26]. The European Community in 2021 defined the Artificial Intelligence Act as "determining to what extent AI has a positive rather than negative effect on your life" [1]. Until recently, Artificial Intelligence (AI) conjured up images of an extremely complicated technicality far apart from the educational context. Everything changed with the availability of Large Language Models (LLMs) that accelerated the process of adopting AI and allowed people with a computer and Internet access to use AI.

When considering the use of ChatGPT¹, one of the most in-vogue LLMs nowadays, in an educational context, most professionals outline plagiarism as the main concern [5]. Different initiatives have arisen to prevent this problem and limit the use of LLMs in schools and Universities [4, 27]. Instead, we take another viewpoint and focus on the opportunities that arise from the existence of a technology that, to some degree, could help personalize students' learning paths at school [2, 10, 12]. We are particularly interested in ChatGPT's ability to produce answers in different readability levels, and how that trait could be of use to help students gain access to legible content at the right level of readability, addressing their education-related inquiries.

To further the understanding of the benefits that ChatGPT could bring to personalization, in this work, we probe the practical implications of personalizing the prompts used to elicit ChatGPT responses pertaining to the classroom context and, therefore, the responses produced to meet the specific need of each student—this would let children actively engage with school activities associated with online inquiries while preventing language literacy from hindering their access and use of online content. As students have the right to take an active part in their learning process, we bring them into the loop as experts. For this, we conducted a preliminary user study involving three classes of 4th grade students in Milan, Italy (i.e., students in primary school, ages 9 to 10) and asked them to evaluate ChatGPT responses to inquiries pertaining to the primary school curriculum.

A preliminary analysis of the collected responses and observations from teachers reveals that the students understood the general purpose of each text, even if they were not fully satisfied—they did not have a complete and deep comprehension of the content they

¹<https://chat.openai.com/>

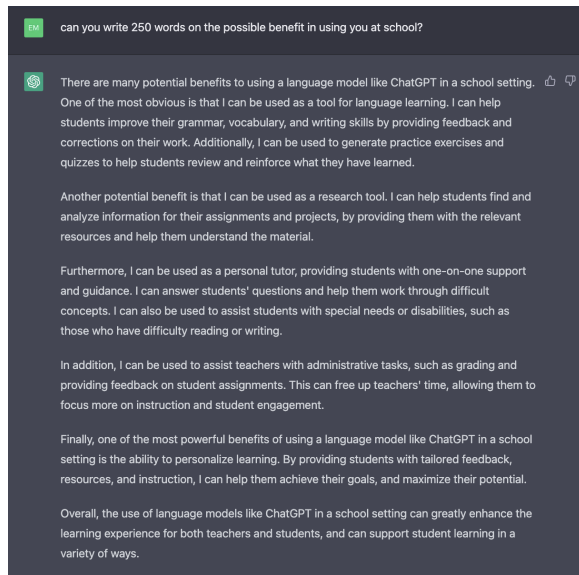


Figure 1: ChatGPT response pertaining to its ability to support education.

had been exposed to. From our initial findings, we can infer that ChatGPT has potential, in terms of being a technology that could serve as a means to overcome the language literacy variability that we encounter in the classrooms as it supports teachers and students by providing results adapted to each reader [29].

2 CHATGPT IN EDUCATION

With the surge of every new technology, some focus on the opportunities, and others on the concerns, so it is for ChatGPT. Since its appearance, education experts started questioning the impacts it could have and how to manage its use in the educational context [5]. LLM, as ChatGPT, can be a powerful ally for educators at all levels, as it eases students' engagement and accessibility by providing quick and scalable on-request answers to questions formulated in the most commonly spoken languages. Conversely, particularly for professionals relying on more traditional teaching methods, plagiarism is the more recurrent issue targeted [5, 13]. As a generative model, ChatGPT has not been designed to enable information seeking. Nevertheless, users seemed unaware of that and used to search for information through it. As shown in Figure 1, ChatGPT itself, when asked to explain the possible benefits of its use in the classroom, answered, "(...) Another potential benefit is that I can be used as a research tool. I can help students find and analyze information for their assignments and projects, by providing them with the relevant resources and help them understand the material. (...)".

With the initial exploration presented in this work, we aim to probe ChatGPT's ability to provide resources (i.e., responses in this case) adapted to specific needs that could help children understand the concepts common to the curriculum. If so, it would be possible to rely on ChatGPT as one of the tools that help education professionals to personalize their teaching.

Personalization opportunity with ChatGPT or yet another Edu-tech? Educational digital technologies entered schools ages ago, and with the Covid emergency, they conquered even the most traditional schools and teachers. As reported in [22], we know that using technologies per se does not imply better learning outcomes. Conversely, if we focus on technology characteristics, their design tends to cater for a generic group of learners, needing more personalization possibilities [20]. It has been a few months since it appeared online, and ChatGPT has spurred the debate around the opportunities and issues in using it at school [28]. Research outputs thus far have resulted in numerous papers that consider it a fascinating tool to add to teachers' dashboards to ease students' learning [18]. ChatGPT has a low access point for students as they can interact using their native language. Moreover, it does not require costly hardware and software, just a computer and a standard internet connection, so it is readily available even in schools that have budgeting issues. However, one of the most interesting features is its ability to adapt the answer following instructions given in the prompts. In the educational context, that means personalization of the output following the specific need of a single student.

Is ChatGPT the new goose with golden eggs? Seeking information online is a common task in schools for both teachers and students [16, 17, 21]. Before the rise of LLMs, teachers and students relied mostly on search engines; this requires keyword queries, which might be difficult to formulate when the aim is promoting the retrieval of resources suitable for the classroom [7]. Query formulation is also something children struggle with [8]. Moreover, traditional Search Engines Results Pages are challenging for most children, as they require the ability to identify the correct and reliable answer, hoping to find a website with text aligned with their literacy level [14]. Moreover, search mainstream engines are neither adaptable nor personalizable to students. One of the first barriers to accessing written content is language literacy, and as previously stated, the variability within student groups is really high.

Is the advent of ChatGPT changing this scenario? Does it deliver the promise to adapt the literacy level of the answers? In the classrooms, there are many variables to be accounted for, children with families speaking different languages [9] or recently arrived in the Country, students with disabilities and other special needs, to mention a few [24, 25]. Teachers' role is to keep seeking the best mix of methodologies and tools to address the needs of every single student. One of the many features of ChatGPT is the capability to adapt the outputs following the instruction given by the user. In an educational context, this could support teachers in personalizing the activities for each student, particularly in adapting the text to the teachers' requirements as an answer to children's specific needs [15].

3 EXPERIMENTAL SET UP

The preliminary study we discuss in this work aims to investigate whether the readability of texts produced by ChatGPT is effectively adapted to 4th grade learners. We see this as an initial step towards investigating if, ultimately, prompts formulated using natural language—as in ChatGPT—can facilitate children seeking for and understanding information in an educational context. For this, we involved teachers and children in a learner-centred approach

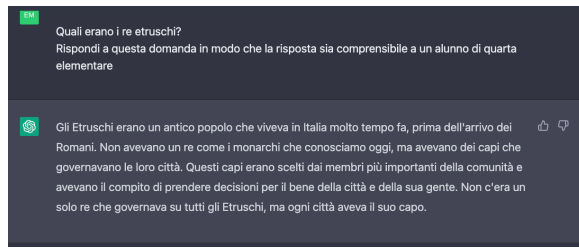


Figure 2: A screenshot of a prompt used to elicit a response from ChatGPT tailored to 4th graders. Translated to English from its original Italian, the prompt is: “Which kings were Etruscan? Answered this question in a way that would be understandable to a fourth grade.”

and asked their opinion on the readability levels of text produced by ChatGPT.

3.1 Participants

For data collection, we turned to one of the primary schools that collaborate with Learning Sciences Faculties in researching and training student-teachers, in Milan - Italy². On voluntary bases, teachers agreed to involve their students as a task in their school-week activity plan. This allowed us to engage 47 children, ages 9 to 10 from three different 4th grade classrooms.

3.2 Data Collection Protocol

For our study, we agreed with teachers to focus on a history curriculum topic that 4th graders have not been yet exposed to in order to avoid inferences and bias in evaluating the readability from knowing the contents well. Consequently, we turned to the 12 questions defined by expert educators to guide the completion of an online inquiry assignment in the 4th grade first introduced in [3]. Mindful of the need for prompt engineering to elicit suitable responses from LLMs [30], we rephrased the questions into prompts to explicitly target the audience of interest for our study (see a sample prompt in Figure 2). We then asked ChatGPT to answer each of these questions. This resulted in six task sheets, each with responses to two different inquiries related to Ancient Rome, which we used during the study.

In the classroom, we asked the children if they agreed to help us as we needed to evaluate a tech tool. More specifically, we had to decide if it could work in an educational context like theirs. We asked them to work as “scientists’ assistants” for once and help researchers to evaluate a technology that could be (or not) useful at school. Every child received a copy of ChatGPT-generated answers (two per page), i.e., the aforementioned task sheets. They were asked to (i) read the text of each provided answer, (ii) answer a Yes or No question *Can you understand this text?* and (iii) cross one of the five emoji smiles to express how much it was readable in their opinion. They had no time limit and could read each text multiple times to evaluate better. As a bonus non-mandatory task, they could colour

the words they could not understand³. This process took place for approximately an hour. This helped researchers and teachers to identify the difficulties and correct some biases.

4 RESULTS AND DISCUSSIONS

In this section, we discuss the findings and implications emerging from examining the data produced by children via the protocol described in Section 3.

As emerging from Figures 3a and 3b, in general, children consider the responses given by ChatGPT reasonably understandable. When examining responses for specific prompts, we see that Prompts 2 and 8 resulted in a lower number of yes-response, compared to the remaining prompts. We attribute this to the presence of often unknown words –which children circled in their answer sheets, such as “colle” instead of the more common “collina” and other specific terms such as the proper names of the Roman hills. On the other hand, prompts 3, 10 and 12, appeared to yield responses that children found the most easy to read and follow. Manually inspecting ChatGPT’s responses to these prompts, we found that they tell about legends and facts. Children familiarise themselves with storytelling early, so reading content that tells a story is more effortless.

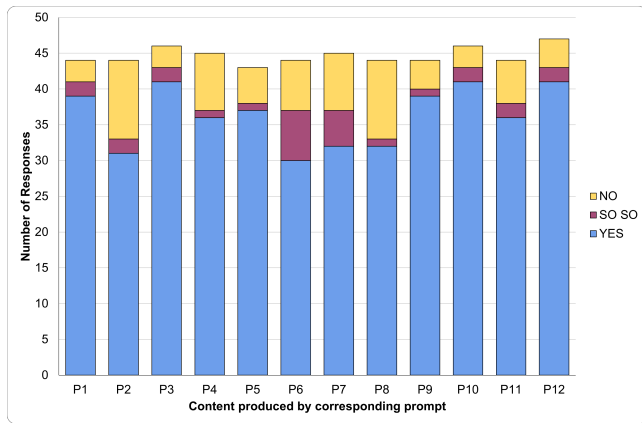
Some students, on their own or by asking permission, added the option “neither yes nor not” because they felt that, for some results, they could not decide between understandable and not understandable. Prompts 6 and 7 gained the maximum numbers of “not yes nor not” (Figures 4g and 4a). If we consider the degree of readability, then we can see that there is a significant agreement on the readability: “very understandable” (52) and “understandable” (209). On the other hand, children also selected “neutral” (52) and “confused” (126) emojis to indicate that ChatGPT-produced text was not always so easy to understand.

Results from our initial exploration reveal that according to the students, ChatGPT worked well enough in producing responses at the literacy level of a 4th grade student. At the same time, the prominence of “yes and no” responses, as well as the number of times the “sad” and “confused” emojis were chosen, shows that there is room for improvement, for example, in the lexicon ChatGPT employs on responses that are meant to be “easier-to-read”. In interpreting some of the dichotomies that can emerge from children’s judgements on ChatGPT responses, it is worth considering that “*decoding* and *meaning* construction are important components of text comprehension” [6]. Therefore, it is not unexpected when children claim to be able to read presented ChatGPT responses but do not always comprehend the conveyed information.

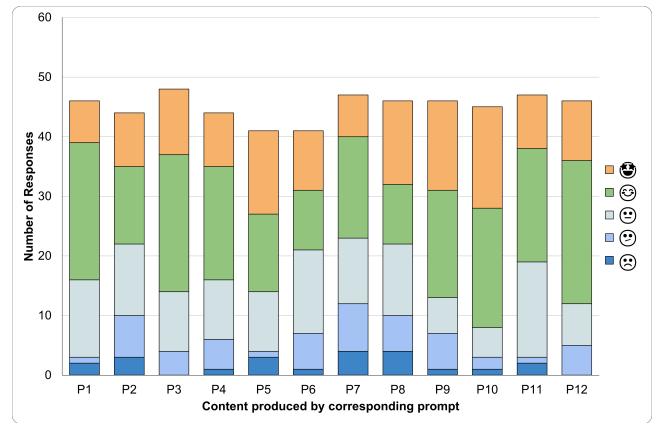
All the students managed to accomplish the task in less than one hour, and the children were so engrossed in the activity that they asked to discuss further the quality of ChatGPT’s performance and deepen their knowledge of the tool. They worked diligently, going beyond what was expected from the assignment: they provided valuable information, even without being prompted. For instance, as captured in Figure 4, children stated that “Sometimes it uses the same clauses in different answers” and “It forgets to use the

²Data collection followed the ethical requirements imposed by the primary school.

³Students in the different classrooms were highly engaged. Still, some students only evaluated some of the given text, mainly because they struggled to concentrate or read.



(a) Distribution of children’s perception of the degree to which they could understand ChatGPT-produced content pertaining to concepts related to Ancient Rome.



(b) Distribution of children’s responses to the degree to which they rate ChatGPT’s ability to produce content they can read and understand.

Figure 3: Analysis of responses collected as a result of an in-class exercise across three different 4th grade classrooms.

capital letter here, but it used it there in the same word in another answer" as in Figure 4c. They also coloured the words they could not understand (Figure 4b).

On average, the readability received a positive evaluation as shown in Figure 3. In general, they agreed that the texts were readable at an acceptable level. They went further explaining to us, teachers and researchers, that the presence of unknown words and the length of the text made some responses more difficult to understand. Some students coloured all the unknown words, including those starting with capital letters, as shown in Figure 4c. Therefore, we inferred that the readability of the text was good, as the difficulties were due to ignoring the proper names of places or people.

5 CONCLUDING REMARKS AND FUTURE WORK

With this work, we aim to explore the readiness of ChatGPT as a technology that could adapt to better support personalised learning, i.e., best support children of different ages and with varied cognitive skills. To control scope, we explicitly focused on children in primary school, ages 9 to 10. We were interested in eliciting their perception of the readability of the material produced by ChatGPT for inquiries about the classroom curriculum—in this case, a history topic focused on Ancient Rome.

Treating children as the experts in the loop, we conducted a preliminary study during which we elicited their judgement on ChatGPT responses. As this study was seamlessly integrated during classroom instruction, children not only provided the requested responses but also engaged with the task and provided unsolicited comments and insights, showcasing their enthusiasm for this type of technology and the opportunity to play the role of co-designers [11].

From this preliminary study, we learnt that ChatGPT is already a useful tool in supporting the teachers and therefore children, by adapting the results to the language and level of literacy, meeting

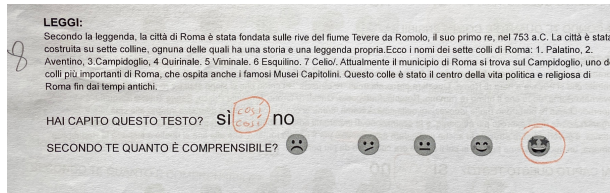
the students’ needs. It is also clear that ChatGPT needs to provide better-tailored responses to serve specific communities of users, as the readability of those responses examined in our study was not at the level the involved children deemed ideal. These results align with those of a recent preliminary exploration of linguistic traits observed on ChatGPT responses for prompts targeting mainstream, i.e., adult, users vs. 4th graders [19]. Furthermore, to be used effectively in the classroom ChatGPT needs the support of the teachers, as they are in charge of contextualising and personalising the didactic by intercepting the variability that is inherent to every classroom. This is why in our test we involved teachers as facilitators and experts in education. Lastly, it emerges how teachers have to be properly trained to be proficient in the use of these types of tools and be aware of the opportunities these bring for enhancing teaching at large by accounting for children’s individual needs [31].

One limitation of this study, apart from the restricted size of the sample of children involved, was the use of paper and pens for accomplishing the set task. In the future, we will ask children to use a digital device when repeating this experiment as there are differences in readability between printed and digital texts in primary school [23].

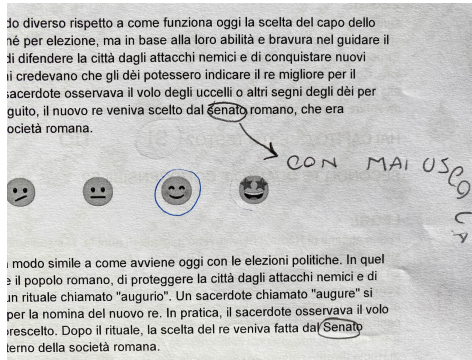
ChatGPT, and other popular LLMs, are known to learn and improve the more they are used. With that in mind, we aim to repeat this experiment to gauge ChatGPT’s ability to better adapt and respond to the reading skills of children. Other areas to expand this work include providing teachers and children with the right training to support them when engineering the right prompts [30], considering different perspectives of adaptation to the classroom: more topics—beyond history— inquiry tasks of different levels of complexity; in general, furthering the exploration of ChatGPT’s tradeoff of providing readable vs. trustable content.

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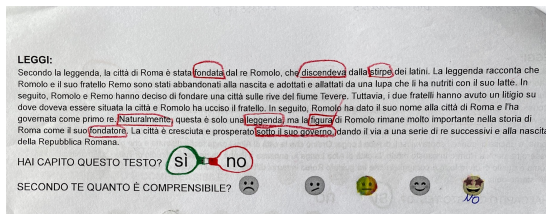
We extend our gratitude to every student and teacher that worked with us in the completion of this study, along with the director



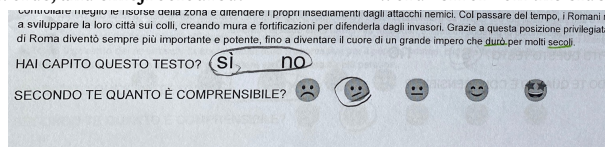
(a) The student provided their own response (i.e., so-so) as that alternative was not among the choices provided.



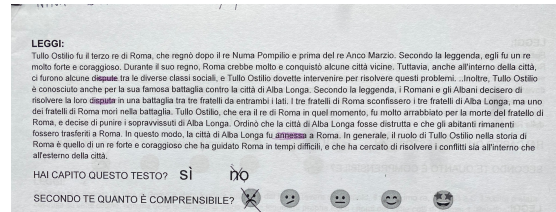
(c) The student identified the lack of capitalization for some terms, commenting on the side "with capital letter".



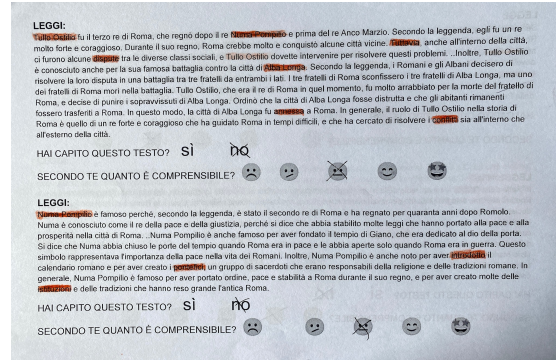
(e) The student accomplished the task but added a personal touch: yes and no bonded together, unknown words, and emojis coloured.



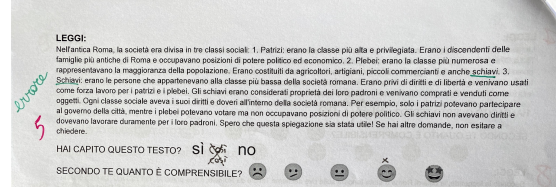
(g) The student felt the need to add an option between Yes and No so he/she connected both, meaning that it was something in the middle.



(b) This student coloured the terms that were not part of his/her vocabulary.



(d) The student coloured as unknown words even the ones in capital letters used to name a place or a person.



(f) The student observed that the same word has a capital letter only in one of the two responses and commented adding the word "error" on the side.

Figure 4: Sample feedback elicited from children who participated in the data collection exercise conducted in three 4th grade classrooms.

of the institution where the study took place, who welcomed the researchers and facilitated the procedures. Without them, this work could not exist.

REFERENCES

[1] 2023. The Artificial Intelligence Act. <https://artificialintelligenceact.eu/>
 [2] Mohammad Awad AlAfnan, Samira Dishari, Marina Jovic, and Koba Lomidze. 2023. Chatgpt as an educational tool: Opportunities, challenges, and recommendations for communication, business writing, and composition courses. *Journal of Artificial Intelligence and Technology* 3, 2 (2023), 60–68.
 [3] Mohammad Aliannejadi, Monica Landoni, Theo Huibers, Emiliana Murgia, and Maria Soledad Pera. 2021. Children’s Perspective on How Emojis Help Them

to Recognise Relevant Results: Do Actions Speak Louder Than Words?. In *Proceedings of the 2021 Conference on Human Information Interaction and Retrieval*. 301–305.
 [4] Caitlin Cassidy. 2023. Australian universities to return to ‘pen and paper’ exams after students caught using AI to write essays. <https://www.theguardian.com/australia-news/2023/jan/10/universities-to-return-to-pen-and-paper-exams-after-students-caught-using-ai-to-write-essays>
 [5] Debby RE Cotton, Peter A Cotton, and J Reuben Shipway. 2023. Chatting and Cheating: Ensuring academic integrity in the era of ChatGPT. *Innovations in Education and Teaching International* (2023), 1–12.
 [6] Scott A Crossley, Stephen Skalicky, Mihai Dascalu, Danielle S McNamara, and Kristopher Kyle. 2017. Predicting text comprehension, processing, and familiarity in adult readers: New approaches to readability formulas. *Discourse Processes* 54,

- 5-6 (2017), 340–359.
- [7] Michael D Ekstrand, Katherine Landau Wright, and Maria Soledad Pera. 2020. Enhancing classroom instruction with online news. *Aslib Journal of Information Management* 72, 5 (2020), 725–744.
- [8] Jerry Alan Fails, Maria Soledad Pera, Oghenemaro Anuyah, Casey Kennington, Katherine Landau Wright, and William Bigirimana. 2019. Query formulation assistance for kids: What is available, when to help & what kids want. In *Proceedings of the 18th ACM International Conference on Interaction Design and Children*. 109–120.
- [9] Geneva Gay. 2013. Teaching to and through cultural diversity. *Curriculum inquiry* 43, 1 (2013), 48–70.
- [10] Wilson Cheong Hin Hong. 2023. The impact of ChatGPT on foreign language teaching and learning: opportunities in education and research. *Journal of Educational Technology and Innovation* 5, 1 (2023).
- [11] Ole Sejer Iversen, Rachel Charlotte Smith, and Christian Dindler. 2017. Child as protagonist: Expanding the role of children in participatory design. In *Proceedings of the 2017 conference on interaction design and children*. 27–37.
- [12] Enkelejda Kasneci, Kathrin Seßler, Stefan Küchemann, Maria Bannert, Daryna Dementieva, Frank Fischer, Urs Gasser, Georg Groh, Stephan Günemann, Eyke Hüllermeier, et al. 2023. ChatGPT for good? On opportunities and challenges of large language models for education. *Learning and Individual Differences* 103 (2023), 102274.
- [13] Michael R King and ChatGPT. 2023. A conversation on artificial intelligence, chatbots, and plagiarism in higher education. *Cellular and Molecular Bioengineering* 16, 1 (2023), 1–2.
- [14] Monica Landoni, Theo Huibers, Mohammad Aliannejadi, Emiliana Murgia, and Maria Soledad Pera. 2021. Getting to Know You: Search Logs and Expert Grading to Define Children’s Search Roles in the Classroom.. In *DESIREs*. 44–52.
- [15] Chung Kwan Lo. 2023. What Is the Impact of ChatGPT on Education? A Rapid Review of the Literature. *Education Sciences* 13, 4 (2023), 410.
- [16] Ion Madrazo Azpiazu, Nevena Dragovic, and Maria Soledad Pera. 2016. Finding, understanding and learning: Making information discovery tasks useful for children and teachers. In *CEUR Workshop Proceedings - Search as Learning (SAL) Workshop, co-located with ACM SIGIR 2016*, Vol. 1647. CEUR-WS. https://ceur-ws.org/Vol-1647/SAL2016_paper_9.pdf
- [17] Ion Madrazo Azpiazu, Nevena Dragovic, Maria Soledad Pera, and Jerry Alan Fails. 2017. Online searching and learning: YUM and other search tools for children and teachers. *Information Retrieval Journal* 20 (2017), 524–545.
- [18] Ethan Mollick. 2023. <https://www.oneusefulthing.org/p/using-ai-to-make-teaching-easier>
- [19] Emiliana Murgia, Zahra Abbasiantaeb, Mohammad Aliannejadi, Theo Huibers, Monica Landoni, and Maria Soledad Pera. 2023. ChatGPT in the Classroom: A Preliminary Exploration on the Feasibility of Adapting ChatGPT to Support Children’s Information Discovery. In *Adjunct Proceedings of the 31st ACM Conference on User Modeling, Adaptation and Personalization (UMAP '23 Adjunct)*. 8 pages.
- [20] Emiliana Murgia, Maria Soledad Pera, Monica Landoni, and Theo Huibers. 2023. Learning Technologies & AI: Who are we designing for. In *CEUR Workshop Proceedings - Workshop 6: SOCIALIZE: Social and Cultural Integration with Personalized Interfaces, co-located with ACM IUI 2023*, Vol. 3359. CEUR-WS, 250–253.
- [21] Jodi Pilgrim. 2019. Are we preparing students for the web in the wild? An analysis of features of websites for children. *The Journal of Literacy and Technology* 20, 2 (2019), 97–124.
- [22] Cathy Ringstaff and Loretta Kelley. 2002. The learning return on our educational technology investment: A review of findings from research. (2002).
- [23] Lauren M Singer and Patricia A Alexander. 2017. Reading across mediums: Effects of reading digital and print texts on comprehension and calibration. *The Journal of experimental education* 85, 1 (2017), 155–172.
- [24] Kari Stunell. 2021. Supporting student-teachers in the multicultural classroom. *European journal of teacher education* 44, 2 (2021), 217–233.
- [25] Kevin R Sumayang, Kaycee Celendron, Neil P Declaro, and Deodato L Flandez Jr. 2022. MAINSTREAMING LEARNERS WITH SPECIAL NEEDS IN A REGULAR CLASSROOM: A SCOPING REVIEW. *Universal Journal of Educational Research* 1, 3 (2022), 1–1.
- [26] Viriya Taecharunroj. 2023. “What Can ChatGPT Do?” Analyzing Early Reactions to the Innovative AI Chatbot on Twitter. *Big Data and Cognitive Computing* 7, 1 (2023), 35.
- [27] Alex Vadukul. 2022. ‘luddite’ teens don’t want your likes. <https://www.nytimes.com/2022/12/15/style/teens-social-media.html>
- [28] John Villasenor. 2023. How CHATGPT can improve education, not threaten it. <https://www.scientificamerican.com/article/how-chatgpt-can-improve-education-not-threaten-it/>
- [29] Filippos Vlachos and Artemis Papadimitriou. 2015. Effect of age and gender on children’s reading performance: The possible neural underpinnings. *Cogent Psychology* 2, 1 (2015), 1045224.
- [30] Jules White, Quchen Fu, Sam Hays, Michael Sandborn, Carlos Olea, Henry Gilbert, Ashraf Elnashar, Jesse Spencer-Smith, and Douglas C Schmidt. 2023. A prompt pattern catalog to enhance prompt engineering with chatgpt. *arXiv preprint arXiv:2302.11382* (2023).
- [31] Xiaoming Zhai. 2022. ChatGPT user experience: Implications for education. Available at SSRN 4312418 (2022).