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With a Little Help from My Friends: Use of Recommendations at School

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With a Little Help from my Friends: Use of Recommendations at School

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ABSTRACT

In this exploratory paper, we study the usage of recommendations by and for children (ages 9 to 11) in an educational setting. From our preliminary analysis, it becomes apparent that recommender systems (RS) could provide extra support to and help children successfully complete inquiry tasks. Nonetheless, children have difficulty in recognizing the role of RS, in terms of aiding information discovery for classroom assignments. Findings from our study set a foundation that can inform future design and development of RS for children that support classroom-related work.

CCS CONCEPTS

• **Social and professional topics** → **Children**; • **Information systems** → *Recommender systems*.

KEYWORDS

children, recommender systems, peer suggestions, classroom, trust, authority

INTRODUCTION

From serious games [2] to robots [1], technology is rapidly making its entry into education. Technology changes the classroom, as it offers new opportunities to teachers and redefines how students learn. One

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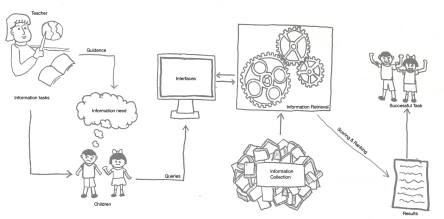

Figure 1: The paradigm.

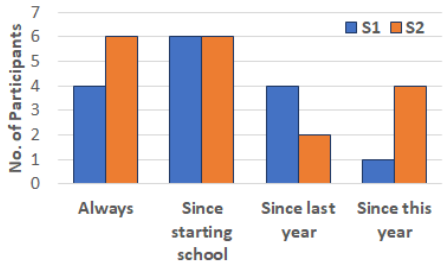

Figure 2: Participants' experience with information discovery.

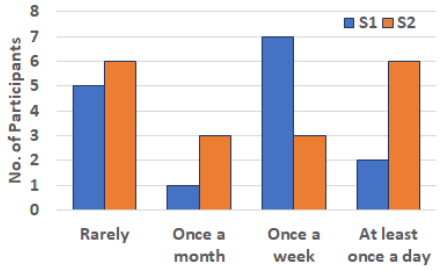

Figure 3: Participants' frequency of interaction with information discovery environments.

of the most important tasks for children is learning to develop their knowledge, for which availability of resources at their own reading level is a must. Traditionally, the teacher was the one pointing students to resources they could gather from the library. Nowadays, children spend considerable time online and rely on materials from various websites and apps to help with their homework. In their quest for educational materials, school children directly (and indirectly) rely on search and recommender systems to identify resources that might be useful for them.

Recommender systems (**RS**) are designed to ease decision-making and reduce information overload. These characteristics make them particularly useful for children, who are known to struggle with judging relevance and quality of content presented to them in online environments [4]. RS are also useful for teachers, offering assistance as teachers can no longer oversee each resource to determine its potential relevance for their students. Unfortunately, the majority of the literature pertaining to RS focuses on a general audience and thus directly responds to their needs and expectations [6]. While a few RS have been specially designed to better serve young users [5, 7], children need to be willing to accept and rely on the recommendations for them to be of any value.

We are interested in studying multiple aspects of the paradigm using search and recommendation technology in the classroom (see Figure 1). In this article, we explore (i) the added value of a RS to assist children in their autonomous quest for information and (ii) the degree to which children take advantage of RS. To control scope, and in order to fit in our framework, we focus on recommendations generated for the purpose of facilitating completion of inquiry assignments in the classroom setting. We depend upon a simple popularity-like strategy to generate recommendations. In this case, suggested resources are chosen based on their frequency of occurrence in the dataset that resulted from the study presented in [3], which examined how children ages 9 to 11 completed search tasks pertaining to school subjects using known search engines.

Children have difficulties with selecting relevant and reliable sources, while ignoring irrelevant ones. They could benefit from some guidance, and it is typically the teacher who undertakes this role. Unfortunately, in a digital environment this is not very practical. RS could play a pivot role. Thus, the question we tackle is "*to what extend do children use recommendations and how to improve this usage*". Lessons learned (i) offer insights on children' perceptions of RS when used to solve classroom-related tasks and (ii) provide foundations for RS that take into account content and context characteristics to enhance the recommendation process. More importantly, findings prompt us to acknowledge factors that can directly impact RS and their effectiveness: from expert involvement (to provide instruction on what RS are and their potential benefits within the classroom setting) and interface design (to make recommendations visible and accessible), to the level of detail needed on the source of the recommendations to inspire trust in and define authority of the generated suggestions.

Table 1: Sample questions presented to participants.

Type	Example
Fact	What is the highest Egyptian pyramid?
Open	How were the Egyptian pyramids built?
Multi-step	How tall is the tomb of Mycerinus' father?

Figure 4: Environment study participants interacted with to complete the proposed classroom tasks.

[1]Tasks in our study are a subset of those outlined in [3].

CONTEXT & STUDY SETUP

To better understand if children would choose to bypass browsing resources in favor of directly turning to resources curated and recommended for them, we recruited 33 **child participants** in the 4^{th} and 5^{th} grades (ages 9 to 11; 19 males and 14 females; demographic data that contextualizes participants' experience with online environments is shown in Figures 2 and 3). Following the study framework presented in [3], we asked children to complete an assignment that required them to respond to **four questions** about common subjects in the 4^{th} and 5^{th} grades: *volcanoes*, *tornadoes*, *pyramids*, and *endangered animals*. Two questions were fact-based, one open-ended, and one multi-step, to explore user interaction when addressing inquiries of increased complexity (see sample questions on Table 1).

To locate information to answer the aforementioned questions, children used a simple interface that resembles a popular search engine: Google. Instead of the common "*I'm feeling lucky*" option, they were presented with an option that, if selected, would lead them to a suggested resource that they could use to complete the question sheet. For recommendation purposes, we simulated a **popularity-based** strategy. For each of the 16 prompts (4 topics, 4 questions), we treated the resource that was most often selected as relevant by participants in the search study presented in [3] as the "popular" peer-suggestion.[1] By presenting recommendations based on the selections made by children of the same age when accomplishing the same tasks, we aim at providing information both relevant and at the right level of complexity for our target age group. There exists a number of RS for educational resources [8] we could have considered for recommendation purposes. Yet, they tend to serve traditional populations and rely on historical data–rarely available for children due to ethical constraints. This motivated our choice for a popularity-based RS as a starting point, with the caveat that popularity explicitly relates to our target audience.

To understand how children perceived recommendations, we conducted **two different experiments** using two disjoint groups of children. The 15 children in **S1** could either search for resources, or instead access recommendations when selecting the "Suggestions by other children" button. For the remaining 18 children in **S2**, the button instead read "Suggestions for you" (see Figure 4 for an illustration of the interface children used for study purposes).

RESULTS & ANALYSIS

As reported in Table 2, based on the **query logs** generated as a result of the aforementioned experiments, children in S1 used recommendations to address 15% of their assigned questions, a percentage that decreased to 10% in S2. At the same time, the number of search sessions is comparable for S1 and S2, but children in S2 used more queries per search session to locate the needed information (average 5.8 queries per search sessions for S1 vs. 8.9 for S2). From these results, we believe recommendations

Table 2: Statistics inferred from generated query log.

Description	S1	S2
No. of search sessions	25	18
Total number of queries	145	161
Avg. queries per session	5.8	8.9
No. of queries for which recommendations were selected	22	17
No. of sessions that used the recommendation option at least once	8	3
Transition from search to recommendation on same query	5	5
Transition from recommendation to search on same query	3	3
Transition from search to search on same query	34	51
Transition from recommendation to recommendation on same query	1	11

Table 3: Survey responses to the question "*Did you use recommendations to complete your assignment?*" .

Session	Yes [Would use option again]	No [Would try option]
S1	7 [6]	8 [3]
S2	6 [3]	12 [7]

were a contributing factor towards minimizing the time and effort required from children to locate relevant resources that contained the data necessary to complete the tasks presented to them.

We noticed that 32% of the search sessions in S1 included the use of the recommendation alternative at least once; a proportion that decreased to 16% for S2. We attribute this to distrust, as the source of the recommendations was not explicitly mentioned to the children in S2, unlike participants in S1 who were made aware that suggestions were based on children's use of resources.

Another insight that emerged from query log analysis refers to frequency of query repetition: children repeated their queries more often when using the search option than when using the recommendation option (85 total queries, as opposed to 12 queries). This, compounded with the fact that more often a query was repeated when search was used first followed by a recommendation than vice versa (10 vs. 6), lead us to believe that when the recommendation option was used, participants successfully completed their inquiry, i.e., no further action was needed.

In addition to query logs, we examined the results of a short **survey** presented to the child participants. Survey questions were meant to capture children's perception on RS and their willingness to use them as a proxy of search engines to complete class assignments. As shown in Table 3, during S1 the use of the recommendation option was uniformly distributed. That was not the case for S2, when the majority of the children favored searching over depending on recommendations. Furthermore, 85% of the children in S1 stated that they would use the recommendation option in the future, a percentage that decreased to 50% among S2 participants. Yet, more children in S2 than S1 would be open to trying the recommendation option, if presented with that choice in the future. This could suggest that children, in retrospect, see the value of recommendations and are willing to use them, just not in this iteration as they lacked information to identify the source of the recommendations. The "Suggested for you" label was too vague for them to trust: not knowing how recommendations were generated could have influenced the likelihood of relying on them to complete an assignment. The main reasons why children used the recommendation option were because they felt "*It showed what I needed*" and because it was "*Useful and complete: it showed me the right sources of information*", still 2 of the children stated not trusting the recommendations (see Figure 5).

CONCLUSIONS & NEXT STEPS

Given the struggles children face with successfully completing information discovery tasks in the classroom environment, we argued that RS could help ease this process for them. With that in mind, we conducted an initial study to understand children's perceptions and usages on RS. From the direct observation of the students engaged with the tasks, it emerged that they enjoyed recommendations and expected them to facilitate the completion of their tasks at school. Nonetheless, they also believed that it would be necessary to receive in advance instructions and/or insights on how to use RS. Based on the inferences made from query log analysis, responses to surveys, and completion of the

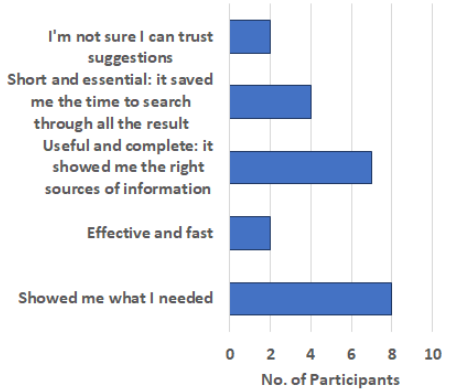

Figure 5: Survey responses for "*If you used the recommendations, please select statements that are true for you*".

presented assignments (i.e., responses to prompted questions), we can conclude that when used, recommendations have a positive impact on the achievement of inquiry-related tasks in the classroom setting. It became apparent, however, that children did not really trust and were less willing to turn to suggested resources, if they did not know the source of the recommendation and its authority (i.e., triggered by "Suggestions by other children" vs. the more vague "Suggestions for you").

The study findings prompt us to explore other suggestion-generation strategies that are not only popular among peers, but are also suitable to the target audience and the classroom context. We are also interested in interface design, so that the recommendation option is visible, intuitive to use, and transparent (i.e., declares explicitly the source of the recommendations). For this, participatory design sessions involving children and teachers will be the next step. Lastly, it became apparent during our preliminary studies that new algorithmic and interface developments will not be enough, which is why we will team up with teachers to develop the type of materials that can support classroom instruction, so that children can be more cognizant of the recommendation process and thus take full advantage of presented suggestions, even beyond completion of schools assignments.

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