**4. Initial Study**

In this section we detail the results of an initial study conducted for validating the performance of Yum. Yum is more than a search engine for children, instead, it is an enhanced web search environment that incorporates features oriented to facilitate and foster learning. Therefore, in this initial assessment we focus on demonstrating the need and effectiveness for this environment.

We examine YouUnderstoodMe as well as a number of popular search engines oriented to children: Kiddle \footnote{ <http://www.kiddle.co/>}, KidRex \footnote{http://www.kidrex.org/}, SafeSearchKids \footnote{ <http://www.safesearchkids.com/>} and Gogoolingans \footnote{<http://www.gogooligans.com>}. Given that, as previously stated, studies show that children tend to prefer popular search engines, such as Google or Bing to perform their information-seeking tasks\cite{bil13}, even if these engines target a more general audience, we also include Google in our analysis.

Due to the lack of benchmark datasets available for evaluating search-related tools focused on young users, we collected our own sample of queries written by children, which we denoted ChildrenQS (Children query sample). This sample includes 300 unique queries written by 50 children between the ages of 6 and 13. In creating ChildrenQS, we asked various K-9 teachers in the Idaho (USA) area to propose their students an information discovery task for which the students had to create queries.

We submitted YY queries (randomly-sampled from ChildrenQS) to each of the search engines considered in this study and examined the respective retrieved resources as well as the challenges children need to overcome when using these search engines. The results of this assessment can be seen in Table XX and further details on each fact considered are discussed below.

**Inability to retrieve resources.** Children are known to struggle when composing queries, often creating queries that are too long and in a natural language form, as opposed to succinct keyword queries search engines usually expect [Dru09]. Based on our assessment using queries in ChildrenQS, we observed that for XX% of the queries, (child-oriented) search engines considered in this analysis do not retrieve any results, as of opposed to the X% that Yum could not handle. In a more in-depth manual analysis we discovered that YY% of the queries that only YUM could handle were queries containing more that YY terms, demonstrating the validity of using a children oriented search intent strategy.

**Readability.** Thereadability level of resources retrieved in response to a child query is also a relevant aspect to explore to quantify the success of a search from a child perspective, since, as previously stated, retrieving too complex documents can lead a child to frustration due to their inability to understand what has been retrieved. In order to measure this, we computed the average readability level of the top-N results retrieved for YY queries in ChildrenQS. Given that "children are known to systematically go through retrieved resources and rarely judge retrieved information sources" [r15] we computed the readability scores reported in Table Y based on the Top-3 documents retrieved in response to each query. For measuring the readability level of the retrieved resources, we selected Flesch\cite{fle48} readability formula as it is considered an standard nationwide\cite{gru80}. Recall that YUM filters our retrieved resources that do have a complexity level within +/- 0.5 deviation from the reading level of each user, assuring that retrieved resources can be comprehended by its users. Therefore, we only computed the average readability levels of resources retrieved in response to queries posted on (child-oriented) search engines considered in this analysis. As shown in Table XX, the readability levels of resources retrieved by child-oriented search engines are generally above XXX, and even one of the search engines XXX retrieved resources that average XXX, in terms of readability levels. Google, being the most used search engine achieved a score of XXX in terms of average readability in retrieved results.

**General experience.** The quality of a search engine is not only determined by its retrieved results, instead the general search environment is also important. In this paragraph, we highlight the most noticeable challenges children need to overcome when using current search engines. We observed that the presence of ads was recurrent among the search engines considered in this study. These ads were usually undistinguishable from relevant retrieved resources, which can be confusing, and more importantly, advertised products unsuitable for children. For example, we found ads that referred to drug rehabilitation programs or anti-aging products among results retrieved in response to queries such as “XXXX”. We also noticed that platform adaptability was also an issue for some of the search engines, since they showed poor support for small screens, such as the ones from phones or tablets, making it hard for a child to use the same system in all platforms. This supposes a significant drawback, given that 71% of children usually access the internet through a tablet [tabletRef]. Finally, most of the search engines oriented to children showed any or poor support for helping children improve their queries. XXX suggests query reformulations while typing them, however, these suggestions are not tailored to children and do not go beyond dictionary based auto completion. YUM currently meets the three criteria described, by excluding ads, being adaptable to smaller screens and supporting children to improve their queries by suggestions.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | YUM | Google | Kiddle | KidRex | Safe Search Kids | Gogooligans |
| **Inability to retrieve results** |  |  |  |  |  | 42% Cannot handle questions |
| Average readability(Flesh) | Chosen by the user | 12.4 | 12.8 | 10.6 | 15.6 | 11.6 |
| Non adequate contents | None | Ads not for children | Ads related to submitted query | None | Non- filtered ads | Ads filtered for children |
| Mobile friendly? | Yes | Yes | Yes | No | Poor adaptation | No |
| Can search on local/school libraries? | Yes | Yes | No explicit support | No explicit support | No explicit support | Can search in selective reference sites |
| Query suggestions | Yes | Yes, but for general audience | No | No | No | Yes |

In this initial assessment we focused on features that can intrude in the search experience. For every analyzed criteria YUM was the environment that intruded the least in the search process for children, enhancing the search experience and easing the learning process that can take place as a results of information-discovery tasks.

@inproceedings{Dru09,

title={How children search the internet with keyword interfaces},

author={Druin, Allison and Foss, Elizabeth and Hatley, Leshell and Golub, Evan and Guha, Mona Leigh and Fails, Jerry and Hutchinson, Hilary},

booktitle={SIGCHI},

pages={89--96},

year={2009},

organization={ACM}

}

@article{bil13,

title={Comparing google's readability of search results to the flesch readability formulae: A preliminary analysis on children's search queries},

author={Bilal, Dania},

journal={Proceedings of the American Society for Information Science and Technology},

volume={50},

number={1},

pages={1--9},

year={2013},

publisher={Wiley Online Library}

}

@article{gru80,

title={On the readability of surgical consent forms},

author={Grundner, TM},

journal={New England Journal of Medicine},

volume={302},

number={16},

pages={900--902},

year={1980},

publisher={Mass Medical Soc}

}

Tablets and internet: <http://stakeholders.ofcom.org.uk/binaries/research/media-literacy/media-use-attitudes-14/Childrens_2014_Report.pdf>

Children and Parents: Media Use and Attitudes Report Ofcom 2014

The ability to handle long natural language queries, the retrieval of documents adequate to children reading skills and the child friendly and adaptable environment, make YouUnderstoodMe and unique system in the area of search engines for children. Furthermore, the search engine is not everything YouUnderstoodMe has to offer, incorporating features such as student tracking that can enhance the learning experience. All this features, make searching as learning a continuous but pleasant (ameno?) for the education of children, allowing them to integrate in the information society at early stages, while also improving their reading skills at the same time.

Saved for conlusion

Finally, none of the search engines oriented to children showed any support for local searches, such as in libraries or school catalogs. We find this sources of information vital for children, since most of the information they need for academic purposes is usually condensed there.