

**Lab 1 - AskMissy Product Description**

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## 1. Introduction

Students face two large problems in the domain of reading. The first is that they lack easy access to relevant resources in relation to assignments they receive in school, notably in grades 6-12. The second is that there is a general downward trend in the interest in reading for students of all ages. This is due to a lack of awareness of resources (most notably books) which are written in, or are related to, the points of view of readers. Whether they come from historically underprivileged backgrounds or they are exploring concepts that are underrepresented in traditional literature, this leads to a lack of interest, trust and reliance on reading skills that many professionals after their school careers find necessary for their day to day lives.

In a 2007 study, researchers from the National Endowment of the Arts found that American students are reading less (Fuglei, 2019). From 1992 to 2002 students showed a five percent decline in independent reading. This decline grows more severe for adults in this time frame, increasing to seven percent. Additionally, a study by the Pew Research Center found that adults who have lower levels of education, or are members of economically disadvantaged demographics are less likely to read (Gelles-Watnick & Perrin, 2021). This shows that interest in reading likely decreases as people age because of an influx of other interests and responsibilities.

One way in which the harmful nature of a lower reading skill level presents itself is in the Virginia Standards of Learning assessments, or SOLs. These assessments are the state's method of determining the learning and retention of the students in elementary, middle and high school for subjects such as math, reading, science and social studies. The curriculum and teachings of public schools are built around the SOL, and many students are taught that the SOL is the most important part of the school year as the culmination of all the work. The Department of

Education uses SOL pass rates, among other statistics, to determine a school's accreditation.

When students do poorly on SOLs, schools are at risk of losing accreditation. This can cost them valuable resources necessary to maintain or improve the student's ability to learn.

When COVID-19 shut down the in-person learning for schools in the 2019-2020 school year, students were thrust into an alien world of distance learning. They and their parents suddenly had to shoulder a much greater burden in terms of school organization and scheduling, and a greater focus on independent study to keep up with the standards put in place. Simultaneously, teachers now had to learn a completely new mode of teaching, disseminating lessons when they couldn't verify that students were paying attention. Even when students returned to school for the 2020-2021 school year, the damage done was obvious by the drop in the SOL pass rate (*Sol Test Pass Rates & other results*). Math SOL pass rates dropped an average of 30% between the 2018-2019 and 2020-2021 school year. For reading SOLs the drop was lower at around 11%, though this isn't cause for relief. Math skills can be buffered through memorization and practice of the same set of skills. Reading SOLs measure the test taker's comprehension, which requires the intake of a wide range of books. Reading comprehension is another practice based skill, but requires different learning strategies than math which can be difficult when learning by oneself.

The drop in SOL pass rates brings into clarity the need for all parties involved in primary education to revolutionize the learning process for students whose performance is non-optimized because of a lack of materials tailored to their learning preferences. This, along with an inherent lack of interest in reading is having a monumental impact on the skills that young students will need to develop in today's world.

To address both the symptoms and core problems, AskMissy will be a software application designed for students, teachers and librarians in grades six through twelve to help users find the resources necessary for them to bridge the gap between conventional and digital learning for a more personalized experience. Machine learning algorithms will be implemented to personalize the experience for users, and to better predict the types of resources that the user is searching for.

## 2. Product Description

AskMissy is a web based software application designed to help users in grade school find resources such as books to both aid them in their school careers and to invigorate their interest in reading. AskMissy will be more efficient in its recommendations by implementing machine learning algorithms to learn from the search results of the users over time and incorporate the learned preferences into future results. AskMissy databases will connect directly to the library databases of school libraries to allow users to plan out their resource acquisition through a number of options. Students will be able to search for books in the library based on a number of criteria such as book title, author, isbn, or subject matter. Teachers will be able to upload the subject matter of their SOL curriculum and receive recommendations on resources that correspond. They will then be able to directly recommend those resources to their students who are organized in groups based on their classes. Librarians will maintain their libraries inventory and receive feedback from students and teachers for specific resources, as well as see statistics to reflect the popularity of those resources.

## 2.1 Key Product Features and Capabilities

AskMissy will be a web based application that connects to the existing systems of each school that participates. The software would be centered around each specific school that has registered to use it. Schools will be able to authenticate users either manually by way of an administrator or automatically connecting the registered user's information to the school database of students, teachers or librarians. Once registered a user may access AskMissy anywhere so long as they have a device with internet access.

The AskMissy database will retrieve input from two types of database; internal and external. The internal database will be both the school's database of students, teachers and librarians, as well as the libraries inventory. The external database will consist of data taken from APIs that connect to Amazon Web Services in order to find information on each book in the libraries database.

Machine learning algorithms will be implemented to both fill in the specific data for each resource in a school library as well as find resources that match a user's interest and expand their horizons. Once AskMissy is connected to a school library database, the algorithm will go through the current inventory and connect those items based on their title, author and isbn number to the external database. Language recognition will parse through the external database's resources and draw primarily from the synopsis and reviews to find out what the subject matter of the resource is. This populates the tags for that resource which is stored in the AskMissy database. When a user searches for a resource they will be given the chance to look for specific subject matter by entering a list of words. The algorithm will then search for resources whose tags most closely match the search criteria and return that resource to the user.

Users will be able to supply feedback to AskMissy based both on their overall impression of the resource and how well a given tag fits that resource. The feedback will take the form of a ‘swipe left or right’ rating, as well as the chance to submit a short (less than 200 characters) written feedback. Once this feedback is received, AskMissy’s search algorithm will take this into consideration when supplying similar searches in the future, learning what resources best match any given search criteria.

A user who never registers or wants to access the software before logging in will have limited access to the AskMissy software; a basic search function of the database with limited ability to input search criteria. Users who register will have full access to the user-facing features of AskMissy, namely the machine learning search algorithms and group interactions. There are three different user types, but a single user may only ever be registered as a single type. The authentication process will ensure that a user is not placed in the wrong category, but if an error does occur then the administrator will have access to correct this.

A student user may create a profile for themselves and input information about themselves to a limited extent. This limit will be based around their school career, such as their grade or school club participation. Students will have access to the AskMissy search algorithm and can view their previous search results as well as the specific searches themselves. The specific amount of data saved for each student to view and retrieve will be decided at a later date. They will be entered as a member of their specific class group as established by their teacher. They will have the option to view recommendations from other student users in their class and share their own recommendations. There will be limited ability to share details of their feedback that take the form of short (maximum 100 characters) reviews which other students may observe. Students may submit longer forms of feedback that are sent directly to higher tier users they are

connected to, namely their teacher or one of the librarians in their school group. This will take the form of resource requests for items like books that are missing from their school library.

Teachers will also have access to the AskMissy search algorithm. They will be able to create class groups and connect their students into the group. Once a teacher has a group that teacher can then forward resources they have found to their students either individually or in sets of students. These recommendations will not affect the AskMissy search algorithm of any students until they submit feedback on that resource. Teachers may also submit resource requests to librarians. Teachers will have the option to create lesson plans in AskMissy based on the subject matter of each program. Teachers can then use AskMissy to provide them a list of resources that correspond to each lesson. Teachers will also be able to review the feedback that their students submit, and run personalized reports on what students are searching and responding to.

Librarians will function similarly to teachers, though their groups will be school groups, and they will be connecting all registered teachers to the same group. They will also maintain the inventory of their school library. Librarians may receive the resource requests of the students and teachers. They may also directly contact administrators for bug support.

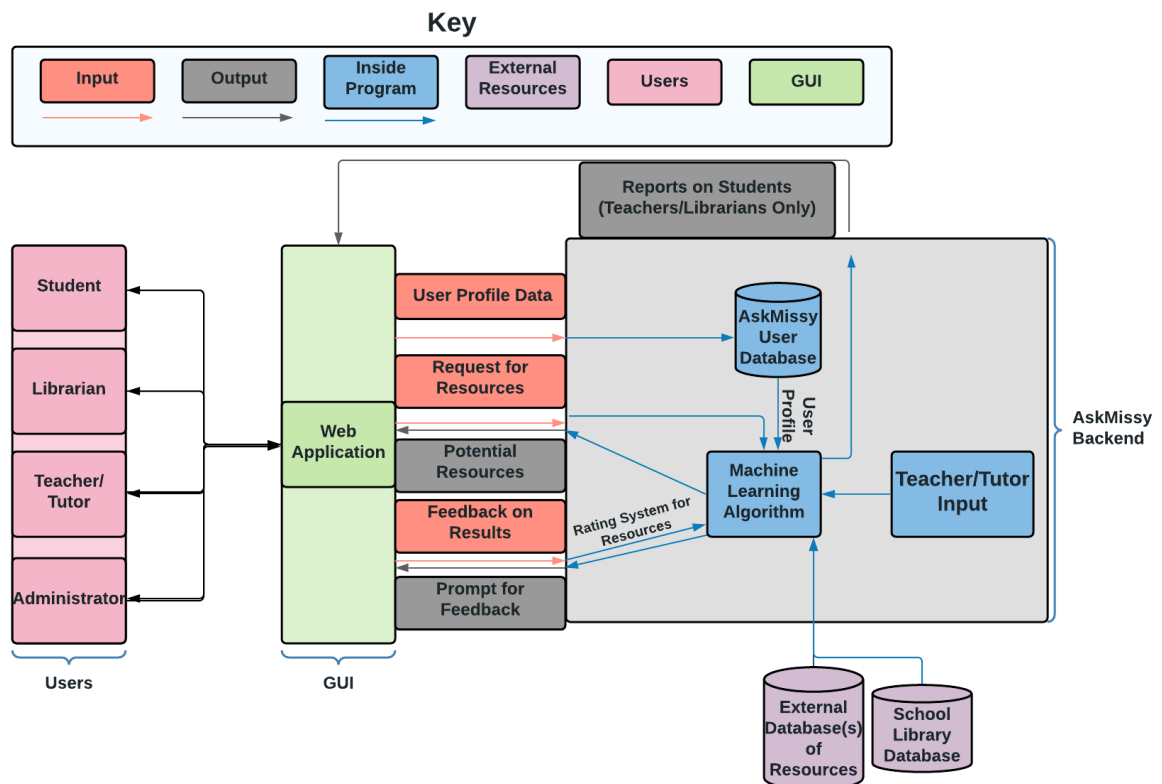
Administrators will have access to all the features that the other user types have, as well as having access to the AskMissy data servers to ensure data integrity. They will do so by maintaining the 3rd party APIs and their web-scraping functionality. They will have access to all user profiles and user metadata. They will be responsible for authorizing librarian users and connecting the AskMissy program to the school's systems.



## 2.2 Major Components (Hardware / Software)

AskMissy will require the user to have access to some device capable of accessing the internet. On the backend, there will be one or more servers dedicated to each of the following: The frontend website, the main backend database (holding user information and school library data), the web scraping process, the machine learning algorithm, and the external database (up to date data from web scraping). The full view of the components necessary is listed in Figure 1.

**Figure 1**



AskMissy will be centered around the Python programming language and the application server will be decided at a later date, though most likely be chosen from Django, Gunicorn or Python Paste. The data that AskMissy collects from web scraping will be stored in mySQL file format.

The frontend of the website will be written in a combination of HTML5, CSS3 and Javascript. The backend will be python. The team's programming IDE will be Microsoft Visual Studio Code.

### 3. Identification of Case Study

AskMissy's main intended users are students, teachers and librarians in grades 6-12 whose school curriculum is centered around the Virginia SOL. The schools in which AskMissy is connected are some of the primary stakeholders, along with the parents of the students as secondary stakeholders.

The main goal of AskMissy is to supply a user with a tool that allows that user to obtain a list of resources tailored to their intended subject matter and interests. This goes beyond a customary search engine tool to look for a book on that user's interests; instead, AskMissy will learn how the user reacts to certain subjects and the quality of resources, then tailor future searches to zero-in on one type of resource, exclude others that offend their sensibilities, or open the user to a new world of subject matter in a way that encourages expanding horizons.

Other parties that might benefit from AskMissy are publishers of resources who get overlooked in favor of more popular businesses. Because AskMissy is made to connect users to lesser known resources, it follows that lesser known publishers would glean a net positive from this as well.

### 4. AskMissy Prototype Description

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## 5. Glossary

**Administrator:** A user who is responsible for managing a majority of AskMissy's working data.

**Agile:** Set of frameworks and practices where solutions evolve through collaboration between self-organizing cross-functional teams.

**AskMissy:** A software application that will help users find more relevant resources.

**API:** Application Programming Interface that defines interactions between software applications or hardware-software intermediaries.

**CSS:** Cascading Style Sheets is a style sheet language used for describing the presentation of a document written in a markup language such as HTML.

**Data Retention:** The continued storage of an organization's data for compliance or business reasons.

**Database:** Structured data held in a computer.

**Economically Disadvantaged:** A student in Virginia is considered economically disadvantaged if the student:

- is eligible for Free/Reduced Meals
- receives TANF, or
- is eligible for Medicaid

**Exact Match Search:** A search for a single specific type of resource.

**File Server:** Controls access to separately stored files.

**Guest:** A user who is not a student, teacher, librarian, or administrator; has limited access to the AskMissy program.

**HTML:** Hyper Text Markup Language. HTML is the standard markup language for creating Web pages. HTML describes the structure of a Web page. HTML consists of a series of elements. HTML elements tell the browser how to display the content.

**JavaScript:** a programming language that conforms to the ECMAScript specification. JavaScript is high-level, often just-in-time compiled, and multi-paradigm

**Librarian:** Responsible for managing the library's inventory/database, communicating with teachers and students.

**MySQL:** an open-source relational database management system. Its name is a combination of "My", the name of co-founder Michael Widenius's daughter, and "SQL", the abbreviation for Structured Query Language.

**Personal Learning:** An educational approach that aims to customize learning for each user's strengths, needs, skills, and interests.

**Student:** A person studying at a K-12 education institution in need of reliable resources.

**Teacher:** A person who helps students (K-12) to acquire knowledge; Responsible for making plans, managing students' groups/communication.

**Temporary Assistance for Needy Families (TANF):** Provides eligible families with a monthly cash payment to meet their basic needs.

**Tester:** Responsible for designing and conducting testing suites for usability testing.

**User:** A user will be anyone using the AskMissy Interface and will fall into the category of a guest, student, teacher/mentor, librarian or admin.

**Web Scraping:** Extracting/scraping data from websites.

**Web Server:** A computer that runs websites.

**Windows:** Series of operating systems developed by Microsoft.

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