Lab 1 – AskMissy Product Description

Tanner Henderson

Old Dominion University

CS 411W

Professor Janet Brunelle

January 31, 2022

Version 1

Table of Contents

1 Introduction 3
2 Product Description 4
2.1 Key Product Features and Capabilities 5
2.2 Major Components (Hardware/Software) 8
3 Identification of Case Study 9
4 AskMissy Product Prototype Description 10
4.1 Prototype Architecture (Hardware/Software) 11
4.2 Prototype Features and Capabilities 12
4.3 Prototype Development Challenges 13
5 Glossary 15
6 References 17

List of Figures

Figure 1 - Math SOL by Year (Virginia Department of Education, 2021) ……...3

Figure 2 - AskMissy Major Functional Component Diagram ……..8

Figure 3 - AskMissy Prototype Major Functional Component Diagram ……12

List of Tables

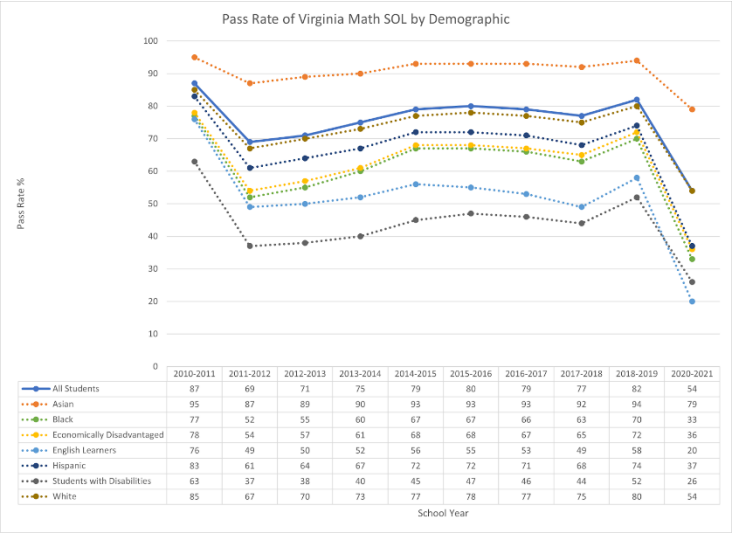
Table 1 – AskMissy Real-World Product vs. Prototype Table……..13

1 Introduction

Within the current society, attempting to persuade students to read is a difficult problem to undertake. This problem has only been getting progressively more difficult as students have recently been transitioning into the classroom through virtual means with the onset of the recent COVID-19 pandemic. This lack of reading presents a large problem in modern society, as reading influences numerous other subjects and students' grades or performance with them. The problem of lack of reading due to difficulty finding resources is apparent through SOL, or the Virginia Standards of Learning, scores that have been gathered. These SOL scores, seen in Figure 1, show that students have been largely underperforming due to the effects that COVID-19 has had on the population and the implementation of online learning.

Figure 1

Math SOL by Year. (Virginia Department of Education, 2021)



	2010-2011	2011-2012	2012-2013	2013-2014	2014-2015	2015-2016	2016-2017	2017-2018	2018-2019	2020-2021
All Students	87	69	71	75	79	80	79	77	82	54
Asian	95	87	89	90	93	93	93	92	94	79
Black	77	52	55	60	67	67	66	63	70	33
Economically Disadvantaged	78	54	57	61	68	68	67	65	72	36
English Learners	76	49	50	52	56	55	53	49	58	20
Hispanic	83	61	64	67	72	72	71	68	74	37
Students with Disabilities	63	37	38	40	45	47	46	44	52	26
White	85	67	70	73	77	78	77	75	80	54

The lack of resources available through searching, either by teacher or student, have greatly impacted interest in learning, as well as the lowering of SOL scores, and is a great problem that needs to be fixed in modern society when wishing to better help school systems.

Through this line of thought, where COVID-19 affects reading and thus affects the SOL scores of students and their given schools, it can be seen that a solution to the problem, that students' performances are non-optimized due to lack of materials and resources available to students through online learning, needs to be presented. This needed solution is what the AskMissy software will provide to society.

The AskMissy will help its users, primarily being users confined to a school system, to find materials and resources, such as books and supplemental instructional materials, necessary to bridge the gap between conventional and virtual learning for a more personalized experience for each user. The AskMissy solution will be a web application that finds resources for its users, specifically personalized based on their preferences as well as feedback they give on a given resource. AskMissy will primarily be intended for middle to high school students, or grades 6-12, as those students would best benefit from this software. AskMissy will be implementing a machine learning algorithm to allow better recommendations on what a given user may be preferential toward based on their user profiles and their previous feedback on resources that AskMissy had found. The software will also allow teachers and librarians to input their lesson plans into the software in order to have a resource recommended to students for each lesson plans that they have.

2 Product Description

AskMissy will be a software application that has the purpose of allowing more preferential recommending of resources for given users and allowing teachers and librarians to have resources entailed to specific lesson plans for students. It is intended to be a web-based

application, available with only internet access, and will utilize a machine learning algorithm to constantly improve future recommendations for users, as well as being an ever-learning software that adapts based on each specific user. The primary goal in creating AskMissy is to improve resource finding capabilities for students, teachers, and librarians. A secondary goal to be achieved due to the first goal, is that this software will allow better SOL scores and SOL preparation in the future for students. There is also a goal that the SOL preparation eventually extends to the teachers and librarians, as they are also a crucial aspect of student SOL preparation and finding them adequate resources for their students is a priority for the software.

2.1 Key Product Features and Capabilities

The initial idea of AskMissy is that the main functions of the software will be placed inside of a school system and will be accessible via web application to users that have valid school IDs, both inside and outside of the actual school's network.

Authentication and user differentiation is a large aspect of the AskMissy software. Non-registered users, or guests, within the AskMissy system will be allowed to access the system, though only to a limited extent. This limited extent will only be a basic search functionality, similar to searching a standard library database, as well as the ability to create a registered profile within the system. Having limited functionality for guests will reduce the risk of a potential malicious user ruining ratings or algorithm searches/tags within AskMissy, if they are not the intended audience of the program. Registered users, on the other hand, will have access to the AskMissy system and its search and feedback algorithms. The authentication of these users will be completed using school IDs, to verify they are a valid school user, and will be

completed with general ease since the application will be placed and positioned within a school system. These registered users are broken down into students, teachers, librarians, and administrators, each with differing degrees of permissions and capabilities.

Students will have access to the AskMissy search algorithm in order to find resources personalized to them. They will also have the ability to share resources with other users on the platform, such as sharing a book that was recommended to them by the algorithm to another student or a teacher. They will also have the ability to message higher-tier users, such as teachers. The message functionality has the primary intent of being used to ask for a resource that is not available in the current library, or by asking teachers or librarians for specific resources that they may be preferential toward. The students will also have limited access within the group or courses that they are apart of, such as joining, leaving, or accessing reviews from the teachers who are the owners of the group/course.

Teachers will be a higher-tier user than students and will thus have all the permissions that a student would have, as well as others. The other permissions include receiving resource requests from students, sending resource requests to librarians, and course group creation and management. The management of course groups will also provide them the ability to remove students from their course group and will allow them to have access to students' reviews of resources that are made available within their course group. Teachers will also have the ability to create a lesson plan with specific resources attached to them, to allow for easy shareability with other teachers or students.

Librarians will have access to all student and teachers features, except the teacher ability to make and manage a course group. The librarian does not have a course group, so they will instead be able to create and manage a school group in a similar manner, which contains students, teachers, and courses. Librarians will also have the ability to maintain and update the school library inventory within the AskMissy program to allow the program to remain as current as possible. They can also manage lists of requests from teachers with a priority order list for resources that have been requested by students or teachers. They are also able to contact administrators for technical support on the system.

Administrators are the last user type in AskMissy and will have all accesses of the previous user types mentioned. The main role and features of the administrators are to ensure data integrity and maintain databases within the program and will thus be given access to all user profiles and metadata and will be allowed limited database management capabilities. They will also be able to authorize librarians to create school groups within the system and contact the administrators of the school for data requests.

Feedback is another major function and aspect of the AskMissy solution. Feedback of a resource will be requested by the software after that resource was recommended to the user. The software will prompt the user, asking for their feedback; this feedback will then be fed into the machine learning algorithm to optimize the results in the future. An important note is that within the AskMissy software, overall ratings of a resource will not actually affect a user's personal profile recommendations, thus keeping the initial idea of personalized searching intact.

The databases within AskMissy are the primary concern aside from machine learning. The school database, comprised of the school library and other resources, will be available with to AskMissy through its integration within the school system, and these databases will be managed by the librarian and administrator user types. External databases will also be a feature of AskMissy and will be accessed by web scraping algorithms and APIs to allow for more resources to recommend to prospecting users. There is also the AskMissy user profile database which will store all users, their preferences, and tags that they prefer.

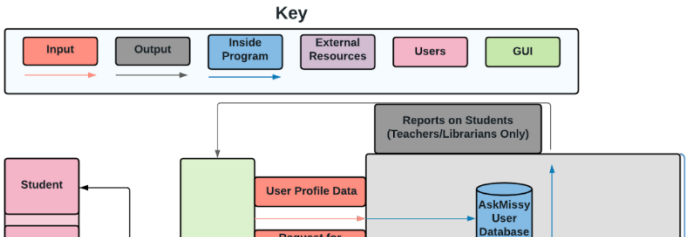
The other aspect of AskMissy that will set it apart from any potential competition is the machine learning algorithm that will be implemented. The machine learning algorithm will allow for personalized search results found for each specific user based on the data acquired from account creation and feedback received about past recommended resources from AskMissy. This machine learning algorithm will allow the product to constantly grow alongside its users for a more optimized experience. It is intended for AskMissy to be more optimized each time it is used, meaning more use of the software leads to more preferential results for its users.

2.2 Major Components (Hardware/Software)

AskMissy has both front-end user interfaces and backend servers, databases, and components. Figure 2 shows the major functional component diagram, or MFCD, for AskMissy, which will detail the large portions of the software and the moving parts that make up the AskMissy application.

Figure 2

AskMissy Major Functional Component Diagram



AskMissy need various hardware in order to run effectively. The hardware to access the AskMissy application, however, only needs a device capable of accessing the internet, as AskMissy will be a web application. In terms of the servers needed to properly run the AskMissy program and application, additional hardware is needed. The list of servers that are needed is a main frontend server, a main backend server, a web scraping backend server, a machine learning backend server, and a server dedicated for the main database.

There are also many software requirements for AskMissy. The frontend software will be programmed in the languages of HTML5, CSS3, and JavaScript, to allow developers to interface as a web application effectively. The backend will primarily be programmed using the Python language, due to Python's extensive machine learning based libraries available for use. The development environment that will be primarily used for the AskMissy development will be PyCharm. Automatic navigation libraries can be seen through the use of PyAutoGUI. The repository that the development team will use to version control the current build of the project will be GitLab, allowing updates and forks to the project when necessary. The databases within AskMissy will be using standard choices such as Amazon RDS, MySQL, and connector/python. The machine learning, which is a large part of the backend, will be programmed using Python, specifically using the library of scikit-learn, to properly utilize machine learning based functions. The natural language processing algorithm will also be programmed using Python as well.

3 Identification of Case Study

The AskMissy product is intended for students, teachers, and librarians, and is primarily intended for middle and high school students between grades 6-12. The product initially intends

to increase SOL scores for students and schools in the future but can be expanded on its intended use as well. AskMissy is intended, in general, for assisting students in searching for personalized resources to make their experience with gathering resources more optimized and particularly making said resources pertain to their interests, allowing students to become more invested. The AskMissy program will also be used for teachers and librarians in order to enable them to find appropriate resources for themselves, their lessons, and their students.

As AskMissy grows – in addition to assisting these students, teachers, and librarians with their academic careers – it will also have a potential to benefit resource publishers, as they would receive additional sales of their resources if requested resources are not available in the school library. The software will also help students' parents, as they will also benefit from their child's success and accomplishments.

4 AskMissy Product Prototype Description

The prototype for AskMissy will be a scaled-down yet functional version of the fully realized and developed AskMissy product, allowing for the main innovational aspects of the AskMissy product to be realized without having to fully develop parts of the software that will use standard practice techniques. The prototype will still allow for each variant of user, those being guests, students, teachers, librarians, and administrators, and will have an additional user and role of tester, which will test the prototype to ensure its functionalities are intact and will have capabilities of all other users. The tester also has the ability to create or change data that would otherwise be immutable in the real-world product of AskMissy, in order to simulate testing criteria. The AskMissy prototype will have the standard and personalized search function

implemented as it is the primary function of AskMissy. The machine learning algorithm within the prototype will be a pseudo-machine learning due to time constraints of implementing a real machine learning algorithm. The pseudo-machine learning algorithm will be largely logic-based to allow it to be comparable to a standardized machine learning algorithm. The prototype will have simulated accounts and data created and placed within its databases in order to fully test the application and its algorithms. The amount of data that will be available will be less than the real-world product but will be sufficient for the needs of the testers to fully develop and test the algorithms used within AskMissy. The security within the prototype of AskMissy will largely not be implemented, as it is typical to use standard practice for securing data within the system and information is available on this, meaning that it is not relevant specifically to the product and would hamper already constrained development time.

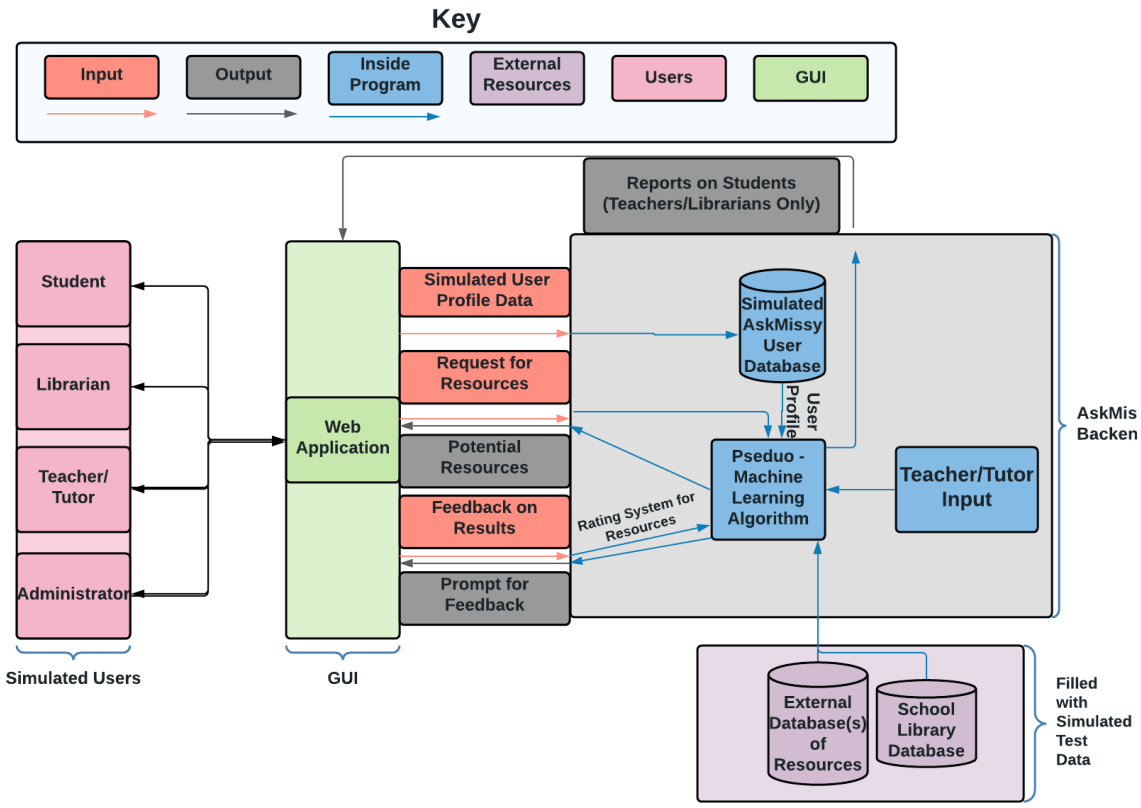
4.1 Prototype Architecture (Hardware/Software)

The AskMissy prototype will also have slightly differing hardware and software requirements. The hardware utilized within the AskMissy prototype will mainly be the ODU Computer Science Department's virtual machine. This hardware will allow hosting of servers for databases and the web application. Aside from the virtual machine, there will be no other specialized hardware in order to develop and run the AskMissy prototype, only needing a standard computer with internet access. However, the software required for the prototype is a larger list. For version control of the prototype code and database scripts, Git will be used with a personalized Git repository for the development team of the AskMissy prototype. Development of said code and algorithms will be done using the IDE of PyCharm and using the Python programming language for its pseudo-machine learning algorithms due to its extensive libraries

involving machine learning. The pseudo-machine learning algorithm will be using implementations of the libraries Pandas, NumPy, SciPy, Matplotlib, and Jupyter Notebook. The front-end of the prototype will be implemented using HTML to develop the webpage, as well as CSS, and JavaScript. The backend database structure will largely be using MySQL for the AskMissy prototype. Below is the adjusted MFCD for this prototype.

Figure 3

AskMissy Prototype Major Functional Component Diagram.



4.2 Prototype Features and Capabilities

The AskMissy prototype will retain all core functionalities of the real-world product of AskMissy, including personalized recommendations and the enabling of inter-user resource

sharing. The utilization of a tag-creation algorithms will be implemented specifically in the prototype, but not implemented in the real-world product. The simulated data and user testing reports will also not remain when being developed as the real-world product and will only be an available function in the prototype. For a full breakdown of changes between the AskMissy prototype vs. its real-world product counterpart, see Table 1 below.

Table 1

AskMissy Real-World Product vs. Prototype Table

Category	Feature	RWP	Prototype	Reasoning
Data Retrieval	Metadata Report	Full	Partial	Limited test data as a proof of concept
	Basic Search	Full	Full	
	AskMissy Search	Full	Full	
Data Management - Live Product	Machine Learning	Full	Partial	Limited test data as a proof of concept
	Source Tag Creation	Full	Full	
	Source Tag Management	Full	Full	
	Lesson Plans	Full	Partial	Limited test data as a proof of concept
	Internal Database Manipulation	Full	Full	
	External Database Manipulation	Full	Full	
Data Management - Development	Source Tag Development	None	Full	Use to develop default tags
	Machine Learning Training	None	Full	Use to develop algorithm defaults
	Simulated Data	None	Full	Use to fill database with simulated data for testing
	User testing reports	None	Full	Use to develop user interface
Security	Login/Authentication	Full	Partial	Limited test data as a proof of concept
	Data Encryption, moving	Full	None	Best practices will be put in place
	Data Encryption, resting	Full	None	Best practices will be put in place
Account Management	User Profile	Full	Partial	Limited test data as a proof of concept
	Feedback	Full	Full	
	Group Management	Full	Partial	Limited test data as a proof of concept
	Login/registration	Full	Full	
UI	Group Interaction	Full	Partial	Limited test data as a proof of concept
	Bug Report	Full	Partial	Limited test data as a proof of concept
	Basic Search	Full	Full	
	AskMissy Search	Full	Full	
	Communication	Full	Partial	Limited test data as a proof of concept
	Personal Data Report	Full	Partial	Limited test data as a proof of concept

4.3 Prototype Development Challenges

There are expected challenges the development team must overcome when developing the AskMissy prototype to be functional and ready to present in the designated time available. One large challenge that is at the forefront of the team going forward is the lack of knowledge and experience in certain aspects and areas of the development process. Recently having lost the team's lead subject matter expert on machine learning and algorithms has made this challenge even more prevalent for the algorithm development team. To couple with this issue, most of the team is also learning new development tools alongside this, meaning that learning sufficient skills to achieve a functional prototype in the time allotted is a difficult hurdle to overcome. There is also the challenge pertaining to the simulated data for the prototype. The leading concern in this area is that there is a large amount of data that must be simulated in order to fully test algorithms that are developed and multiple databases with a variety of tables to store said data. With a surplus of data that is needed, the problem of where this data comes from arises, as well as the problem of properly being able to parse through said data to obtain the information that is needed.

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 K-12 students 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 data from websites.

Web Server: A remote computer that stores, processes and delivers web pages to the users.

Windows: Series of operating systems developed by Microsoft.

6 References

Allreaders.com features detailed book and movie reviews from many different genres of books! Detailed Book review summaries. (n.d.). Retrieved December 14, 2021, from http://allreaders.com/

Amazon. (2016). *Amazon.com: Kindle eBooks: Kindle Store: Nonfiction, Literature & Fiction, Foreign Languages, Business & Money & More*. Amazon. Retrieved December 14, 2021, from https://www.amazon.com/Kindle-eBooks

Education, V. D. of. (n.d.). *Sol Test Pass Rates & other results*. VDOE :: SOL Pass Rates Results & Other Results. Retrieved December 14, 2021, from https://www.doe.virginia.gov/statistics_reports/sol-pass-rates/index.shtml

Education, V. D. of. (n.d.). *Sol Test Pass Rates & other results*. VDOE :: SOL Pass Rates Results & Other Results. Retrieved December 14, 2021, from https://www.doe.virginia.gov/statistics_reports/sol-pass-rates/index.shtml

Fuglei, M. (2019, July 22). *Why students who read for pleasure are stronger academically*. Resilient Educator. Retrieved December 14, 2021, from https://resilienteducator.com/classroom-resources/how-reading-for-pleasure-helps-students-develop-academically/

Garcia, E., Weiss, E., & Welshans, I. (2020, October 7). *What teaching is like during the pandemic-and a reminder that listening to teachers is critical to solving the challenges the coronavirus has brought to public education*. Economic Policy Institute. Retrieved December 14, 2021,

from https://www.epi.org/blog/what-teaching-is-like-during-the-pandemic-and-a-reminder-that-listening-to-teachers-is-critical-to-solving-the-challenges-the-coronavirus-has-brought-to-public-education/

Gelles-Watnick, R., & Perrin, A. (2021, November 1). *Who doesn't read books in America?* Pew Research Center. Retrieved December 14, 2021, from https://www.pewresearch.org/fact-tank/2021/09/21/who-doesnt-read-books-in-america

Goodreads. (n.d.). *Meet your next favorite book*. Goodreads. Retrieved December 14, 2021, from https://www.goodreads.com/

Ingraham, C. (2021, November 24). *Leisure reading in the U.S. is at an all-time low*. The Washington Post. Retrieved December 14, 2021, from https://www.washingtonpost.com/news/wonk/wp/2018/06/29/leisure-reading-in-the-u-s-is-at-an-all-time-low/

What should I read next? book recommendations from readers like you. (n.d.). Retrieved December 14, 2021, from https://www.whatshouldireadnext.com/

Rosalina, E. & Nasrullah. (2019). The correlation between self-esteem and student's reading comprehension. English Language Teaching Educational Journal, 2(2), 70-78.