Lab 2 Section 1-2 – AskMissy Product Specification

Tanner Henderson

Old Dominion University

CS 411W

Professor Janet Brunelle

March 28th, 2022

Version 1

Table of Contents

List of Figures

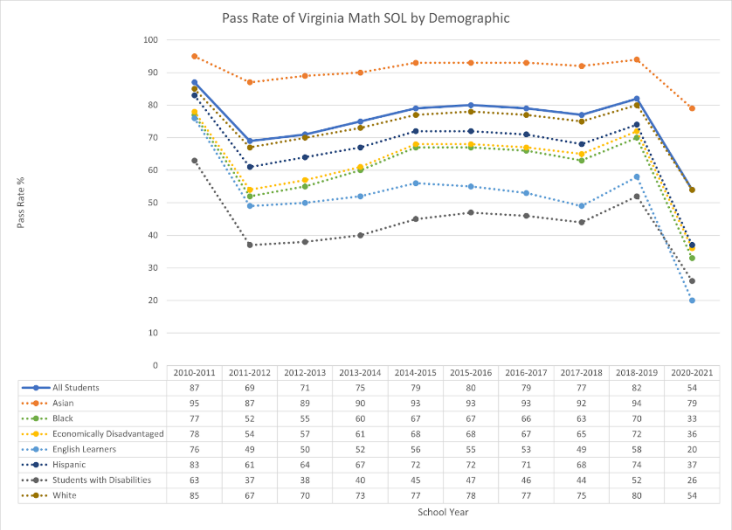
List of Tables

1 Introduction

For the educational system, a difficult problem is to persuade more students to read. This problem of attempting to persuade students to read is even more difficult now, since there is less connection between student and teachers/librarians. The disconnect being due to the COVID-19 pandemic that has shifted the classroom to a more virtual setting. The lack of reading presents a problem within our educational system, as reading can be directly correlated to a student's grades or performance in a specific subject. The lack of reading in the educational system under COVID-19 is apparent when viewing recent Virginia Standards of Learning (SOL) scores. These SOL scores, seen in Figure 1, show that students have been largely underperforming on these SOLs due to the effects that COVID-19 has had on the population and the implementation of online learning and its effects on reading.

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 conclusion to draw from these dwindling SOL scores during COVID-19, is that there must be a method or tool in which our educational systems faculty can implement to allow their

students to have an easier time finding resources in which to assist them in reading more. The solution that was created from this idea is the AskMissy software.

1.1 Purpose

AskMissy is a software application for users to search for resources pertaining to lesson plans established by teachers and librarians, as well as allowing for more user-based searches with preferential recommending of resources. AskMissy is intended to be a web-based application to be used on any device with internet access by guests, students, teachers, librarians, and administrators. AskMissy will utilize machine-learning based algorithms in order to provide any authenticated user more adequately with recommendations fit to their preferences for resources. The main goal for AskMissy is to improve resource finding capabilities for students, teachers, and librarians to have the impact of making reading more tailored to an individual, thus making them enjoy reading. The enjoyment of reading is crucial to allow further dives into reading which will allow the AskMissy software to also promote higher SOL preparation through said reading. AskMissy however is not meant to be a replacement for a library or librarian, as the software will only recommend resources to a given user and not actually point them to the proper place to get the resource that the user was recommended.

1.2 Scope

For the prototyping of the AskMissy software, the team shall only keep the necessary requirements to demonstrate the functionality of the main machine-learning based algorithm as well as group systems. The prototype shall not divulge resources into using proper standard practice methods of security, as doing so is not necessary to demonstrate functionality of the product and can be added with standard methodologies when proceeding beyond the prototype. For a full list of what is changing between the full product and the prototype, refer to Table 1.

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

[This space is intentionally left blank]

1.3 Definitions, Acronyms, and Abbreviations

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

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

Acknowledgement: A message delivered to an authenticated user in response to their submitted bug report.

Activity: Any action undertaken by a user in relation to the AskMissy application.

Announcement: A message delivered to lower-level users from a higher-level user, usually in the case of a Librarian or Teacher to a student.

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

AskMissy Library: The total collection of metadata from which other libraries and functions Extract data from.

Application Programming Interface (API): A software intermediary that allows two applications to talk to each other.

Apriori Algorithm: An algorithm designed to find Itemsets in a dataset for boolean association rules. Itemsets are groups of books found to be read together with a high frequency, implying similar future association.

Authenticated User: A user who possesses an account in AskMissy, i.e., not a guest.

Association Rule (Algorithm): A statement that a book or group of books implies the presence of another item with some probability.

Basic Search: A search function that lists the highest rated books based on the search criteria, including genre, author, title, and publication date. This search does not utilize the Apriori Algorithm or any specific school library.

Book Data: Data about a book entry in either a School Library or the AskMissy Library, describing the book's title, author, isbn number, genres, average rating, number of ratings, publication date, original title (if any), and language.

Bug: An error in the AskMissy application that causes it to produce an incorrect result or behave in unintended ways.

Bug Report: A Message from an AskMissy user describing an error they encountered which is delivered to the Administrator.

Bug Report Database: The central repository containing all the bug reports.

Categorize: A feature of the bug reporting system which lets a user assign greater specificity to the nature of a bug.

Classes: The sections of a course that are scheduled for a specific academic year, assigned to Teachers, and include a roster of Students.

Confidence (Algorithm): The ratio of transactions that contain book A and B to transactions that contain book A.

Conviction (Algorithm): The ratio of expected support of book A occurring without book B assuming that books A and B are independent, to the observed support of A occurring without Y.

Courses: The programs of study which the Authenticated Users of AskMissy are enrolled in.

Cascading Style Sheet Revision 5 (CSS5): A style sheet language used for the presentation of documents written in a markup language such as HTML, CSS5 is the fifth version of the original CSS version.

Comma-Separated Values (.CSV): A delimited text file that utilizes commas to separate values.

Current Books: The list of books that an Authenticated User has declared they are actively reading.

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

Database: An organized collection of structured information, data, typically stored in a computer system.

Economically Disadvantaged: A student eligible for Free/Reduced Meals who receives Temporary Assistance for Needy Families (TANF) or is eligible for Medicaid.

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

Extract: To receive or collect data from a data source, usually one of the library databases associated with AskMissy.

Federal School Code: A six-digit character code to identify a specific school or educational institute.

Feed Database: The central repository containing group interactions.

Flask: A micro web framework primarily written in Python.

File Server: A device that controls access to separately stored files.

Filter: To specify the results to view from an inquiry.

Goodreads: A subsidiary database of Amazon that stores books, annotations, quotes, and reviews.

Group: A collection of users organized into two possible levels - Classroom or School. Students and Teachers will be part of a classroom group and a school group, Librarians will be part of a school group.

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

Hypertext Markup Language Revision 5 (HTML5): A type of markup language primarily used for implementing content in the World Wide Web, this is the fifth version of its original version.

Input: Supplying data to the AskMissy application, or the data being supplied.

Interaction: The means by which one user may share information or otherwise communicate with another user. This may be done predominantly through the use of Messages, unless otherwise specified.

Interests: Aspect of the User Profile based on the user's liked books.

Itemsets (Algorithm): a grouping of books found to be associated with each other across multiple user's past reading.

Lesson Plan: Input supplied by Teachers to the AskMissy application to provide a template set of search parameters which other Authenticated Users may use to perform an AskMissy Search, usually relating to one or more Courses.

Librarian: A user responsible for managing the library's inventory/database, communicating with teachers and students.

Lift (Algorithm): The ratio of observed support of book A and B to the expected support of book A and B.

List (Algorithm): a comma delimited file (.csv) consisting of one or more columns containing one or more entries in the format of rows, with each data form separated by a comma.

JavaScript: A programming language that is used for implementing websites on the World Wide Web.

Message: A communication in the form of a string data type between one or more users.

Metadata: Data that provides information about other data.

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

Profile: The displayed data for an authenticated user. This data describes the user's type,

Private (Data): Authenticated User Activity which cannot be viewed by other Authenticated Users.

Public (Data): Authenticated User Activity which can be viewed by other Authenticated Users.

Python: A high-level programming language.

Query: An action functions perform to obtain data corresponding to one or more Activities the user is performing.

Rate: A numeric measure of the quality of any given book on a scale from 1 (lowest quality) to 5 (highest quality).

Recommendation: A specific book that a Teacher or Librarian may submit for Students to view.

Request: A Message from a Student to a Teacher or Librarian specifically to bring attention to the Student's desire for a book to be included in the School Library. Individual Requests can also be sent from the Teacher to the Librarian to emphasize the importance of that Request.

Real World Product (RWP): Refers to the physical version of any digital abstraction described within the AskMissy documentation.

Register: The process that a guest user takes to create an account verified by their school's database.

Resolved (Bug Report): Any Bug Report which is marked inactive in the Bug report Database.

Review (Communication): A text assessment submitted by an Authenticated User regarding a particular book.

Review (Administrator): An activity the Administrator User can perform to access the AskMissy data in any form and make minor modifications according to the context of the documentation.

School Library: The database of books registered in the Real-World school.

Standards of Learning (SOL): An examination conducted by Virginia Public Schools that tests the minimum required expectations for every student enrolled in the state of Virginia.

Student: A user studying at a K-12 education institution.

Student Feed: A portion of the user interface that allows student users to view the most recent books read and/or reviewed by their fellow students, and view books specifically recommended by the Teacher assigned to their class.

Support (Algorithm): The ratio of transactions that contain an itemset to all transactions.

Shelves: Term used in the Test Library for attributes that describe a book's subject matter and metadata. Synonymous with Tags.

Short Message: A Message specifically no longer than 200 characters, spaces included.

Submit: The process of Inputting a required data type for the intended process.

Tags: Term used for attributes that describe a book's subject matter and metadata. Synonymous with Shelves.

Teacher: A user who helps K-12 students acquire knowledge. They are responsible for making plans and managing students' groups/communication.

Teacher Feed: A portion of the user interface that allows teachers to view the most recent books read by that teacher's students, and view recommendations by other Teachers and Librarians.

Temporary Assistance for Needy Families (TANF): A program that provides eligible families with a monthly cash payment to meet their basic needs.

Test Library: Database of books, users, shelves/tags, and ratings drawn from the goodbooks-10k GitHub repository.

Tester: A user responsible for designing and conducting testing suites for usability testing.

Unresolved (Bug Report): Any Bug Report which is marked active in the Bug Report Database.

User: An individual using the AskMissy Interface.

User Interface/User Experience (UI/UX): The visual representation of the data AskMissy provides to the user on the user's computer.

View: The current information being displayed in the UI/UX to the user, or the Activity of interacting with the UI/UX.

Web Scraping: The process of extracting content and data from a website.

Web Server: A computer program that distributes web pages as they are requisitioned.

Windows: A series of operating systems developed by Microsoft.

[This space is intentionally left blank.]

1.4 References

Albanese, A. (2021, May 6). *Report urges library leaders to address decline in public library usage stats*. PublishersWeekly. Retrieved December 15, 2021, from https://www.publishersweekly.com/pw/by-topic/industry-news/libraries/article/86256-rep ort-urges-library-leaders-to-address-decline-in-public-library-usage.html

"Allreaders.com features detailed book and movie reviews from many different genres of books!," *Detailed Book review summaries*. Retrieved September 22, 2021, from http://allreaders.com/.

"Amazon.com: Kindle eBooks: Kindle Store: Nonfiction, Literature & Fiction, Foreign Languages, Business & Money & More," *Amazon*, Retrieved October 01, 2021, from https://www.amazon.com/Kindle-eBooks/

Coates, T. (2021). *Freckle report 2021: Digital or diverse?- the future for public libraries*. Tim Coates Books.

Crain, C., & Waldman, K. (2018, June 14). *Why we don't read, revisited*. The New Yorker. Retrieved September 22, 2021, from https://www.newyorker.com/culture/cultural-comment/why-we-dont-read-revisited.

Ellard, C. (2020). *Covid-19 impact on Sol Assessments, verified credits, and graduation requirements for Spring/Summer 2020*. Newport News Public Schools. Retrieved December 14, 2021, from http://sbo.nn.k12.va.us/sol/covidimpact.html

Fuglei, M. (2019, July 22). *Why students who read for pleasure are stronger academically.* ResilientEducator. Retrieved October 1, 2021, from https://resilienteducator.com/classroom-resources/how-reading-for-pleasure-helps-student s-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 October 7, 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/.

GeeksforGeeks. (2020, August 29). *5 most-recommended career fields in computer science*. GeeksforGeeks. Retrieved January 25, 2022, from https://www.geeksforgeeks.org/5-most-recommended-career-fields-in-computer-science/.

Gelles-Watnick, R., & Perrin, A. (2021, September 21). *Who doesn't read books in America?* Pew Research Center. Retrieved September 22, 2021, from https://www.pewresearch.org/fact-tank/2021/09/21/who-doesnt-read-books-in-america/.

Gioia, D. (n.d.). Reading at Risk. Washington D.C., Virginia ; National Endowment for the Arts. https://www.arts.gov/sites/default/files/RaRExec_0.pdf

Henderson, T. (2022, March 25). *Lab 1 – AskMissy Product Description.* Old Dominion University. https://docs.google.com/document/d/1Bl0HtISTpI44PIRxl2SEjNdnkfnQHDoZ/edit?usp=sharing&ouid=116854284613374817034&rtpof=true&sd=true

Henry. (2021, May 27). *The importance of Reading* Retrieved September 22, 2021, from https://www.uopeople.edu/blog/why-its-important-to-read/

Ingraham, C. (2018, June 29). *Leisure reading in the U.S. is at an all-time low*. The Washington Post. Retrieved September 22, 2021, from

https://www.washingtonpost.com/news/wonk/wp/2018/06/29/leisure-reading-in-the-u-s-is-at-an-all-time-low/

"Meet your next favorite book," *Goodreads*. Retrieved October 01, 2021, from https://www.goodreads.com/

Frequently asked questions about Sol testing. Virginia Department of Education. (2015, October). Retrieved October 7, 2021, from https://www.doe.virginia.gov/testing/sol_faq.pdf.

Rosalina, E. N. (2018, November 30). *The correlation between self-esteem and student's reading comprehension.* English Language Teaching Educational Journal. Retrieved October 1, 2021, from https://eric.ed.gov/?id=EJ1283078

What should I read next? book recommendations from readers like you. What Should I Read Next? (n.d.). Retrieved January 25, 2022, from https://www.whatshouldireadnext.com/

Virginia Department of Education. (n.d.). *Sol Test Pass Rates & other results*. Retrieved October 7, 2021, from https://www.doe.virginia.gov/statistics_reports/sol-pass-rates/index.shtml.

Zygmuntz, *Goodbooks-10k*,. Retrieved February 10, 2022 from https://github.com/zygmuntz/goodbooks-10k

1.5 Overview

This product specification provides the hardware and software configuration, external interfaces, capabilities, and features of the AskMissy prototype. The information provided in the remaining sections of this document includes: a detailed description of the hardware, software, and external interface architecture of the AskMissy prototype; the key features of the prototype; the parameters that will be used to control, manage, or establish that feature; and the performance characteristics of that feature in terms of outputs, displays, and user interaction.

2 General Description

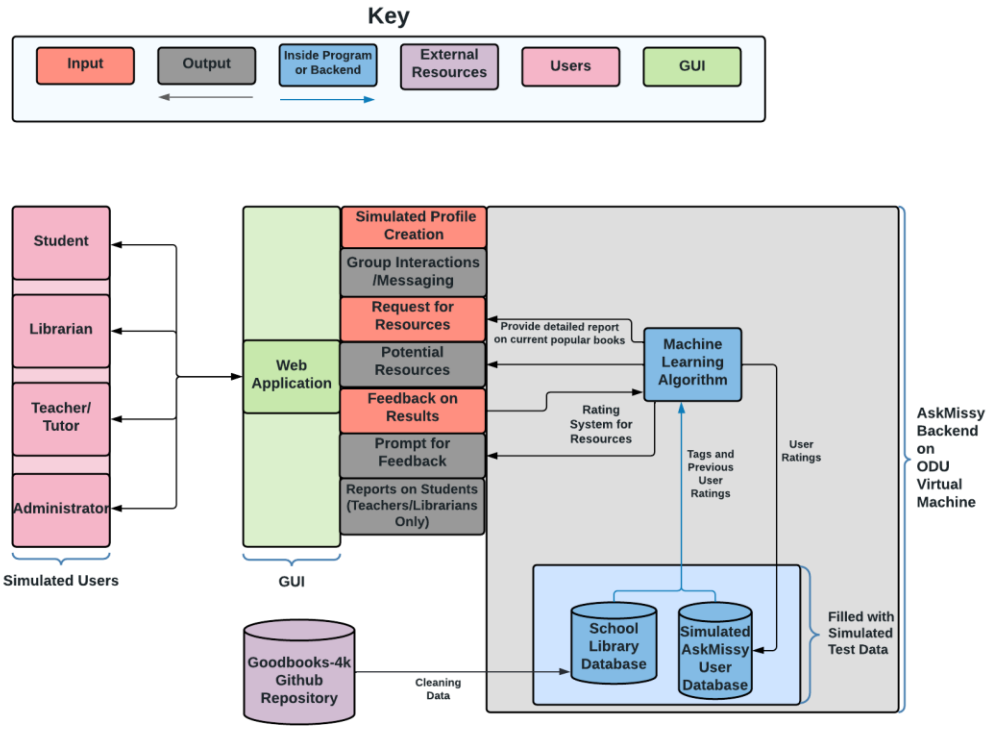
AskMissy has five main functionalities. The first main functionality is the aggregation of resources found within a school's library database and external sources and to subsequently insert these resources into a usable format for our other functionalities to use. The second is for the program to store user's preferences on resources into associated tag categories based upon their previous ratings of resources on the AskMissy software. The third is the ability for users to search those stored user preferences to find new resources that are preferential for each specific user. The fourth is a machine-learning based algorithm to allow the AskMissy software to learn what resources each specific authenticated user may be preferential toward based upon previous ratings and tags of their previously rated resources. The fifth is a messaging group system for authenticated users, as well as lesson plan creation and report system as an extension of the messaging system for teacher and librarian users.

2.1 Prototype Architecture Description

The AskMissy Prototype is composed of the following major components: a main frontend, a primary backend, a machine-learning backend, a main library/resource database, and a main user database. Any device with internet access can connect to the AskMissy in its web application form. Figure 2 shows AskMissy's Prototype Major Functional Component Diagram (Prototype MFCD), which lists the majority of AskMissy's features and capabilities during in its prototype form.

Figure 2

AskMissy Prototype Major Functional Component Diagram



All necessary hardware and software required for the AskMissy prototype will be hosted on the ODU Computer Science Department's Virtual Machine. This virtual machine is secured from external alterations by the CS Department's firewall and is largely the extent of security protocols used for this prototype. Docker will be used to create much of the databases and user interface elements needed for this prototype. Flask shall be specifically used in conjunction with Docker in order to create the user interface, and MySQL shall be used for management of databases within the VM. The machine-learning based algorithm will be largely developed separately and remotely for ease of testing purposes but will be placed within the VM once finalized in order to be able to read and write to the database and interface with the webpage. The prototype shall only be accessible to those who have Flask integrated into PyCharm and have pulled from the GitHub repository in the VM.

2.2 Prototype Functional Description

The major functional components of the AskMissy Prototype are largely similar to all the features that the real-world product of AskMissy would present, with the addition of testing features to allow for show of progress and ease of use for the proof of concept. For the list of features that are not implemented, partially implemented, and fully implemented within the AskMissy Prototype, refer to Table 1.

2.3 External Interfaces

The AskMissy Prototype makes use of specialized interfaces to accomplish the functionality needed to demonstrate the prototype.

2.3.1 Hardware Interfaces

The AskMissy Prototype shall largely only use one specialized hardware interface for the purposes of demonstrating its functionality, this specialized hardware being the ODU CS Departments VM to run all necessary database, backend, and frontend servers that are needed for the prototype.

2.3.2 Software Interfaces

The AskMissy Prototype shall make use of third-party software and libraries for development. Flask shall be used as a means for creating the user interface, MySQL shall be used for creating the needed databases for the user interface and algorithm to use, the machine-learning based algorithm shall use a modified version of the aPriori algorithm to properly make recommendations and update recommendations for users, and the database shall use the Zygmuntz Goodbooks-10k repository to populate its database with pre-registered tags, books, and ratings.

2.3.3 User Interfaces

The AskMissy Prototype shall be communicated to users as a web application. This means to establish a connection to the AskMissy Prototype, a device with an internet connection is needed. A mouse and keyboard or touch screen as well as a displaying screen (e.g., a monitor) are also required to interface with the AskMissy Prototype.

2.3.4 Communication Protocols and Interfaces

The AskMissy Prototype utilizes standard TCP/IP connections and HTTP for communication. A VPN to connect to the ODU CS Departments VM is also required to establish a connection to the web application.