Lab 1 – AskMissy Product Description

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21 March 2022

Version 2

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1 Introduction

The impact of COVID-19 has contributed to the decline in students' grades and resource availability as schools transition from face-to-face learning to remote learning. In the United States, an estimated 55 million students under the age of 18 were forced to transition to remote learning, while an estimated 1.4 billion children globally were moved to at-home learning (Garcia, 2020). The effects of online learning have caused a significant decline in testing performance, a rise in technological challenges within teachers and instructors, and a decrease in resource availability.

The Virginia Standards of Learning, or SOL, is known to be the pinnacle of standardized testing within the Commonwealth of Virginia. This testing program sets forth the expectations for each core subject for secondary students. As a result of the pandemic, school systems are changing the way the standardized tests are administered. Newport News Public Schools stated that the impact of COVID-19 resulted in students in grades 6-8 not needing to participate or make up any missed SOL exams during the 2020 school year. Moreover, students in grades 9-12 only need to take one SOL exam per subject— history, science, English— as opposed to the prior SOL requirement of taking an exam for each class the student registers for (Ellard, 2020). The pandemic changed the way standardized testing is administered and is a response to not only the students' change in learning environment, but also the effect on its instructional staff.

Teachers accustomed to face-to-face teaching fail to become universally proficient in remote teaching. According to the 2017 National Assessment of Educational Progress, only 32.5% of eighth graders have instructors who are knowledgeable about technology, and only

19.3% of teachers are willing to fully integrate technological software into the classroom. Furthermore, 24.1% of eighth graders are without teachers who are trained to use computers and educational software (Garcia, 2020). Even before the pandemic, technology will continue to evolve if the resources to create these programs and software are available. The lack of preparation the school systems provide has impacted the quality of learning within the virtual classroom.

Public libraries have shown a decrease in usage over the past eight years. As of 2018, the United States has an estimated 31% decrease in library usage (Albanese, 2021). However, a recent survey in the United States was conducted in April of 2021, which focused on the impacts of the pandemic on reading. The research found that about 87% of users read during the pandemic, as opposed to the 81% in 2019. Many libraries now have digital and online libraries/databases available for users to read remotely from home, hence the increase in reading by 6% (Coates, 2021). Due to a library's large digital resource and book databases, they can provide users an accessible way to read and view resources from home.

The COVID-19 pandemic impacted students' learning and development. The transition to remote learning failed to provide students daily access to materials and resources their schools would generally supply. Because of this, students fail to successfully complete their assignments.

AskMissy is a software application that is designed to recommend students with the proper resources to assist them with their assignments. A key design consideration in this software application is the ability to filter the user's recommendations through machine learning based on their interests, needs, and preferences.

2 AskMissy Product Description

The AskMissy software is an application that searches for resources pertaining to an instructor's lesson plans established by both the instructor and librarians. The main goal is to enhance resource finding capabilities to help improve their academic performances.

2.1 Key Product Features and Capabilities

AskMissy implements machine learning algorithms to create tags that help identify each resource for the student, teachers, and librarians. The number of times users utilize the search algorithm is directly correlated to the results the machine learning algorithm outputs. The more users use the AskMissy search tool, the better the resource results.

The machine learning algorithm provides personalized search results based on user feedback and ratings. A feedback/rating system is initiated and prompts the user to rate and provide feedback for the resources presented. The overall rating does not affect the user's personal profile recommendations because personalized searching is still intact.

The user's feedback/ratings can be viewed on their user profiles. AskMissy's personalized profiles allow users to view previously used and saved resources. The software application is not only for registered students, teachers, and faculty, but is utilized by non-registered guests. These guests are given limited access to ensure the safety of the registered students.

AskMissy is implemented through the school system. Those who are registered can link their respective school's six digit federal code to authenticate individual profiles and then be given special access to the AskMissy search tool. Illustrated in Figure 1 are the key features of AskMissy.

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Figure 1

Competition Matrix

	What Should I Read Next	Goodreads	Amazon	Allreaders	AskMissy
Specific Book Search	✓	✓	✓	✓	✓
Genre Search	✓	✓	✓	✓	✓
Cover Shown	✓	✓	✓		✓
Incorporated Synopsis		✓	✓	✓	✓
Incorporated Reviews And Rating System		✓	✓		✓
Personalized Profiles	✓	✓	✓		✓
Specified Groups/Communities		✓			✓
Community/School Library Integration					✓
Reading/Difficulty Level					✓
Reports for Teachers/Librarians					✓
Intelligent Feedback Usage					✓
Predictive Analytics Based Search Results					✓

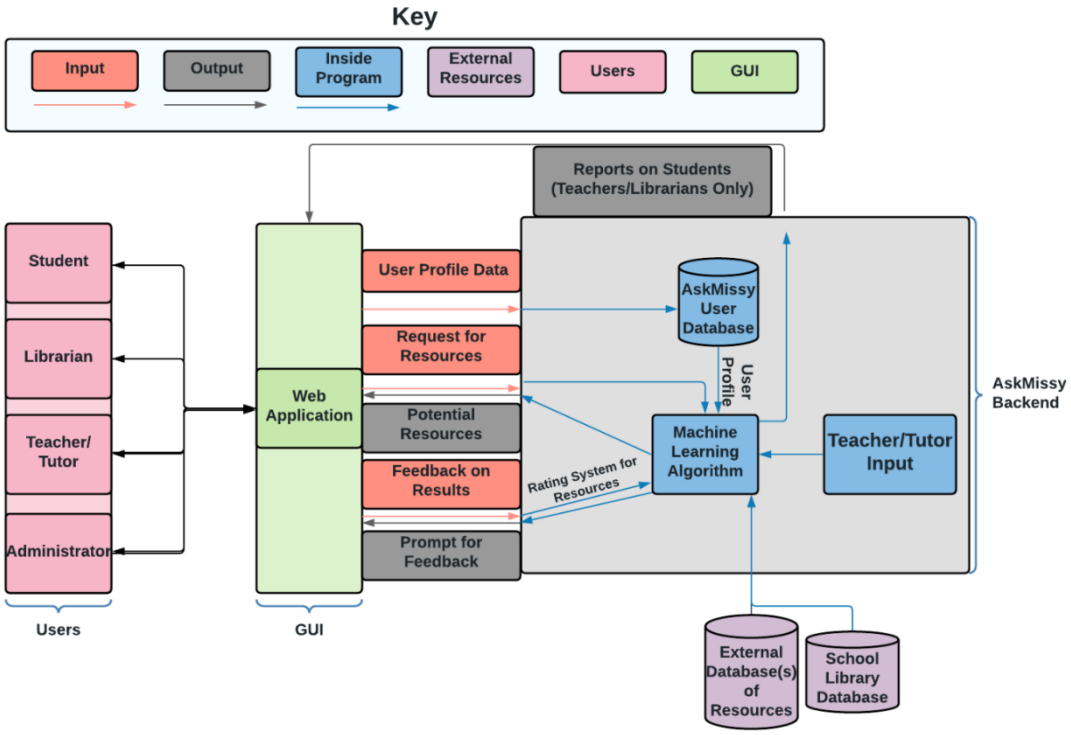
2.2 Major Components (Hardware/Software)

AskMissy is structured to hold multiple servers, such as the front-end, web scraping, machine learning, and main database back-end servers. The front-end servers are user

friendly, making it easier to navigate through, while the back-end server contains user and resource information, and the machine learning algorithm. The major functional component diagram shown in Figure 2 describes the interfaces, GUI, and external resources within AskMissy.

Figure 2

Major Functional Component Diagram



AskMissy's web application is written in HTML5, CSS3, and JavaScript. MySQL will be used to store resource information such as the author, ISBN, date published; and user information: profiles, ratings, recommendations, and feedback. Users would need a stable internet

connection to access AskMissy. Hardware requirements include any smart device that can connect to internet connection.

3 Identification of Case Study

AskMissy is designed for students, teachers, librarians, and guests. The students are from grade levels 6-12—the grades that are required to take standardized tests. The application's goal is to help users search for appropriate and reliable academic resources by having the machine learning algorithm learn their preferences and recommend resources to the users.

The specific case demonstrated for AskMissy is the user's local school system. Students in public school who need resources to utilize in their courses will create a profile linked to their respective schools. Teachers can request and send school resources to the librarians in the event it is not available within the library's database and create/manage groups throughout the school year, thus creating an interactive online experience in the classroom.

Librarians have access to all features the teachers and students have. In addition to those, they can update the school's library inventory within AskMissy, manage the lists of requests from both teachers and students, and approve/disapprove the requested resource.

Guests who do not attend secondary public school are able to use AskMissy; however, will only have access to basic searches and profile creation. Other users who might benefit from AskMissy are the resource publishers who require a referencing database and the students' parents who cannot locate a certain book due to a lack of a personalized search algorithm.

4 AskMissy Product Prototype Description

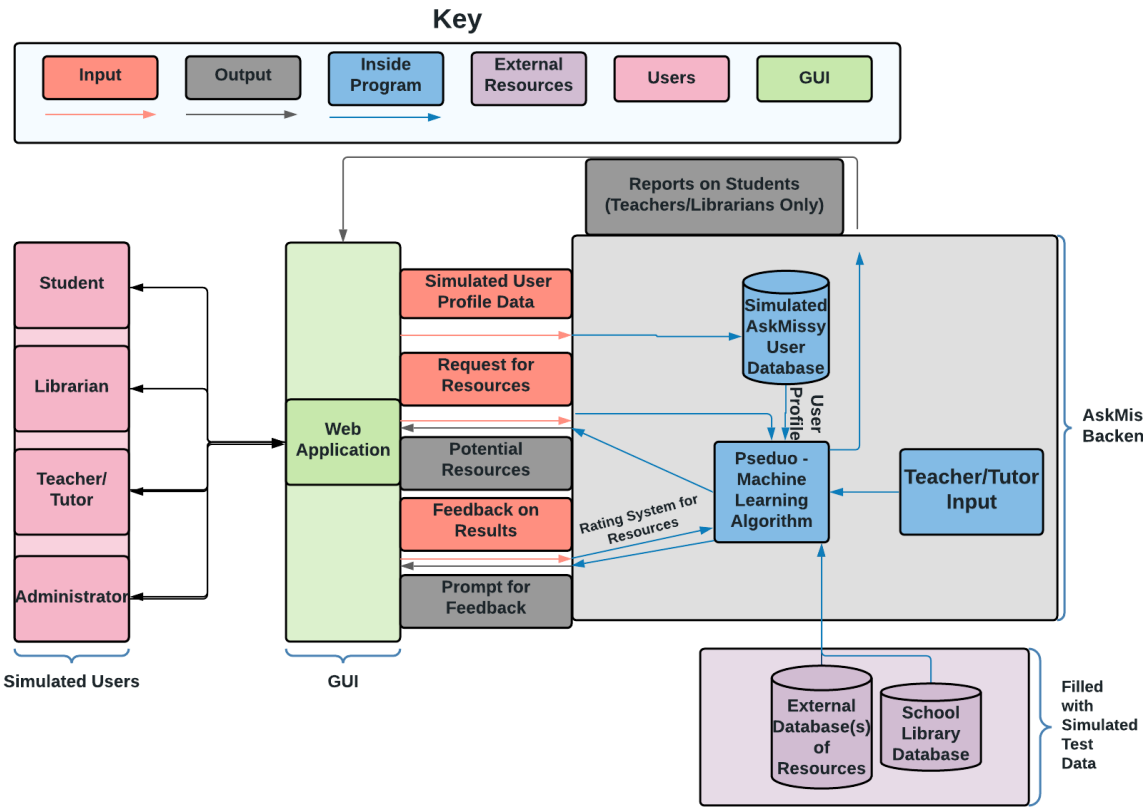
The AskMissy software application was designed to become a personalized resource finder using predictive analytics to recommend the best resources for its users. The prototype for AskMissy sufficiently demonstrates its main core features. User profiles, rating system, and group interactions are a few of the main AskMissy features. However, the AskMissy search tool is simulated due to the limited structured reference data, making this a partially implemented feature.

4.1 Prototype Architecture (Hardware/Software)

The prototype for AskMissy shall be completed using Flask, written in Python. The front-end of the application is made with HTML5, CSS3, and JavaScript. The back-end servers are implemented using PyCharm, with GitLab as its repository. For the automatic navigation, PyAutoGUI will be utilized. The Major Functional Component Diagram for the AskMissy prototype is illustrated in Figure 3.

Figure 3

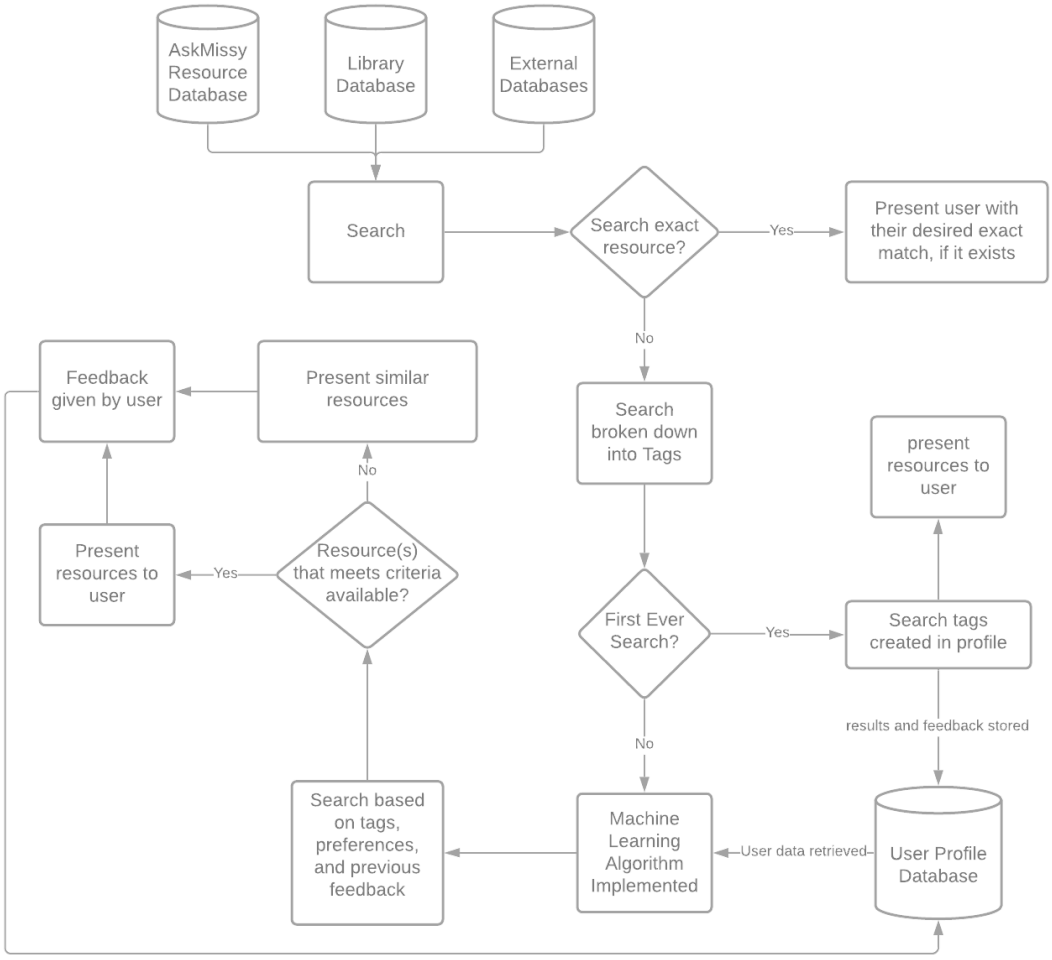
Prototype Major Functional Component Diagram



The database is stored on MySQL and is pulled from Goodreads. Both resource and user accounts are simulated to test its functionality. When running the AskMissy prototype, the tester can create a user profile, which is saved in the database. The tester can utilize the search tool and have the database output any stored resource information. Figure 4 shows the Work Breakdown Structure of the resource, library, and AskMissy library database components.

Figure 4

Work Breakdown Structure - Resource Matching



4.2 Prototype Features and Capabilities

The AskMissy prototype can fully implement all the RWP features of the data retrieval, data management of the live product, security, account management, and the UI. The only feature that is not implemented is the development aspect of the data management feature— the machine

learning algorithm oversees this section. Table 1 displays a comprehensive list of the functional and non-functional features of the RWP and the prototype.

Table 1

RWP vs. Prototype

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

AskMissy requires the development of several tasks for the software application to be functioning successfully. Convincing local school systems to invest in AskMissy is the largest challenge to overcome as the application is highly dependent on user interaction. One development challenge is the data retrieval feature. The metadata contains the information of authors, ISBN, and file size of the resources. The data retrieval tool is dependent on the metadata; however, the lack of user searches can result in limited structured reference data. Implementing fake data to store in the back-end server can mitigate this risk. A lack of knowledge with the development tools required to build the software prototype also poses a challenge in the creation of the prototype.

5 Glossary

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.

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.

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.

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.

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.

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