



# **Requirements Specification Document**

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# Contents

<b>1   Introduction</b>	Pg. 1
<b>2   Problem Statement</b>	Pg. 1
<b>3   Solution Vision</b>	Pg. 2
<b>4   Project Requirements</b>	Pg. 3
<b>4.1   Functional Requirements</b>	Pg. 3
<b>4.2   Performance Requirements</b>	Pg. 8
<b>4.3   Environmental Requirements</b>	Pg. 9
<b>5   Potential Risks</b>	Pg. 10
<b>6   Project Plan</b>	Pg. 12
<b>7   Conclusion</b>	Pg. 14
<b>8   Glossary</b>	Pg. 14

# 1 | Introduction

When faced with the task of taking medicine, it can be hard to do correctly, especially with how complicated medicine labels can be. This can lead to providing an incorrect dose of medicine, which can be very dangerous, especially for children. The knowledge of correct medicine dosing and many other concepts is encompassed by the field of health literacy. Health Literacy is the degree to which people can find and use information to make better health decisions for themselves and others. Health literacy is especially a problem for parents of young children, and these parents find it difficult to care for their children and administer medications properly and with the correct frequency and dosage. It can especially be hard for families in rural or indigenous communities to find health information or increase their health literacy. The Client is Dr. Olivia Lindly, a professor and researcher at Northern Arizona University. She studies child and maternal health, focusing primarily on the behaviors relating to child health. The world is always looking for improvements in healthcare, and Dr. Lindly especially wants to improve life for families in rural and indigenous communities.

## 2 | Problem Statement

Dr. Lindly has noticed problems in the quality and dissemination of information related to health literacy and child health practices. For example, community doctors will often provide parents with information on how to care for their children in the form of pamphlets and other physical media. This media usually contains fairly accurate and comprehensive information, informing parents on how to do things such as giving their children proper medicine or informing them about proper developmental milestones. Some problems with this include:

- Parents reading over the information and then quickly forgetting it

- Parents discarding the information
- This information may not be widely available, especially in indigenous or rural communities
- This information can be technical and hard to understand for parents with a lower level of health literacy.

Despite the high quality of the information that is given, parents tend to ignore the information or not engage with it, forgetting it later. These problems lead to higher rates of child illness and mortality. Parents would benefit from an easier way to access this information that is easy to understand and helps them to engage with the material.

### **3 | Solution Vision**

Looking at how to address this problem, we realized that there is one thing that most parents have access to: a smartphone. The group's solution is to create a mobile app designed around increasing the health literacy of parents. This app will provide access to interactive modules that parents can complete to educate themselves about child health. We will include modules such as determining the correct dose of medication for a specific child given their weight, tracking expected growth milestones for children ages one to five as well as access to digital versions of credible health information resources that a parent might expect to find at a doctor's office. Parents will be able to create accounts with an email and password to save and track their progress through these activities, so busier parents can progress at their own pace. This app will solve the previously mentioned problems by:

- Increasing information retention by increasing engagement with the material
- Storing the information on a device that the parents will keep with them often
- Making the information easily accessible

- Making the information easy to understand

The group's goal -- as well as the goal of the client -- is to effectively disseminate accurate information and increase the health literacy of parents of young children so that they can provide better care. With all this in mind, we have discussed with the client the kinds of features and information that this app must contain.

## **4 | Project Requirements**

The functional and performance requirements for this project are measured with the client's vision in mind for the final product. These requirements will help the team create a plan that will allow proper measurements of how each segment will be worked on.

### **4.1 | Functional Requirements**

The functional requirements are high level functionalities that the application will perform with the client's vision in mind. All the functional requirements are related to each other in terms of the performance of the application, therefore each one is a focal point of implementation. The functional requirements consist of:

- Module structure: Creation and implementation
- Data: Storage and analysis of data
- Gamification: Visual aesthetic
- User: Target audience and Ease of Use

#### **4.1.1 | Module structure: Creation and Implementation**

The module structure for the application will revolve around informational health literacy documents that the client has given the team, alongside the module that the team has prepared as

well. Figure 1 shows the basic module structure.

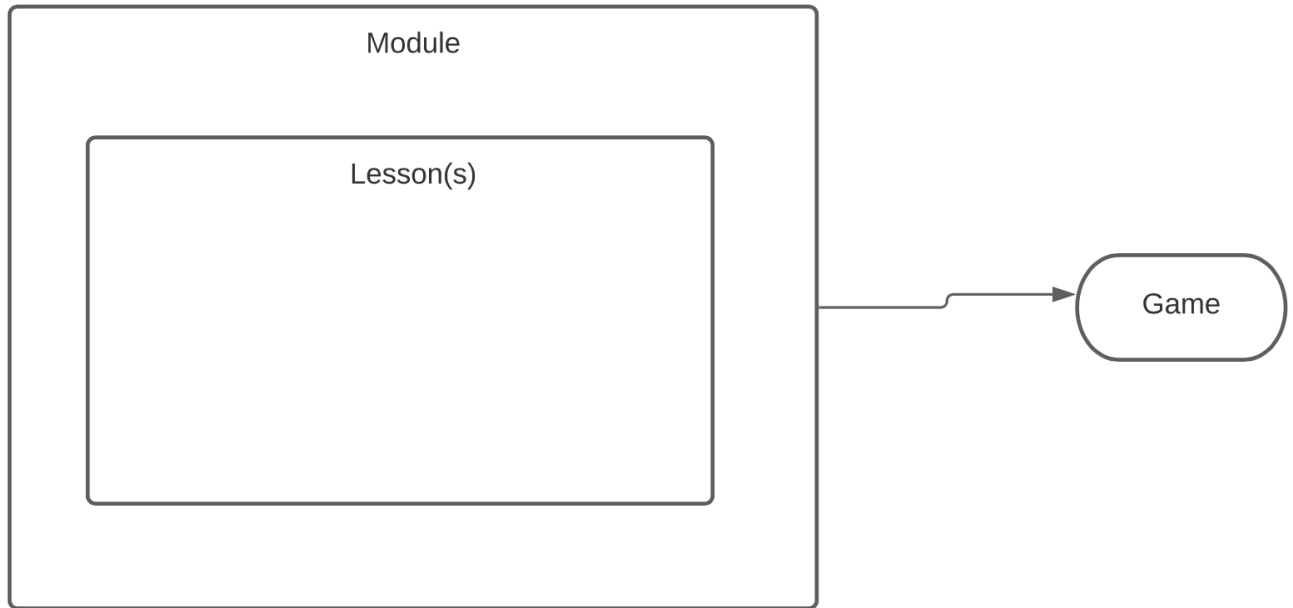


Figure 1: Visual representation of Module hierarchy

Each module will contain a lesson that relates to it, and a game or quiz to serve as an interactive component that ties the module together and facilitates learning.

Modules will begin as a basic text version to ensure that the client is satisfied with the components they contain. Having the modules in text form will also help to ensure that the application is capable of holding and displaying the data. The modules will then evolve to feature a quiz or game after the text information is read. This game or quiz will act as a flag for completion of the overall module. We have chosen to gamify these modules to increase the information retention of the users by requiring them to engage with the material.

To better understand why the team is focusing on this functionality there will be a comparison of the *Minimal Viable Product* and *Stretch Goals*:

- *Minimal Viable Product:*

For the MVP the application will need to function with one module, therefore we will need to implement the module itself, the lessons that the client has pre-approved and one game or quiz that wraps up that module.

- *Stretch Goals:*

For some stretch goals the team wishes to implement at least 3 modules that consist of the lessons that the client desires and a game or quiz that follows the modules.

#### **4.1.2 | Data: Storage and Analysis of Data**

For data collection, the application users will need to fill out some information about themselves and their children, and then take the NVS. The NVS (Newest Vital Sign) is a valid and reliable screening tool available in English and Spanish that identifies a patient's level of health literacy.

After the initial information input and NVS are complete, data will be collected from the application on module and lesson completion. This will include completion of the module and the user's performance in the games and quizzes. From this the client will be able to see that the modules are interactive to the users and help improve their health literacy. Alongside the completion of the NVS, other assessment quizzes will be present for the user to take. These include the Brief Health Literacy Screen (BHLS) and the Health Literacy Skills Instrument Short Form. The BHLS takes approximately 1 min to complete and has been validated when administered by trained research assistants, therefore the test would not be valid for the user, but act as a test to see the user's health literacy level. The Health Literacy Skills Instrument Short Form (HLSI), measures the ability to read and understand text and locate the information in

documents. We will give the user the choice of which test to take after the initial assessments with the NVS and personal information are collected, and a number of modules are completed.

The assessment and collection of data must meet HIPAA guidelines, meaning that the administrators need to just collect basic information from the users. This data collection will consist of the name of the parent and child(ren), ages of parents/child(ren), and the gender of the child(ren). The client wants to be able to see the user's performance from the beginning of the app with the NVS and how well they do on the quizzes and games as well. The data for the client will be shown in the administrator web application, which will be tied to the application itself.

- *Minimal Viable Product:*

The administrator will be able to open the administrative portal to study participants and download resulting data sets for analysis. The data collected will include who is using the application, how they manage to complete the module and how well they advanced through the NVS, BHLS, or HLSI.

- *Stretch Goals:*

Stretch goals will consist of a graphing tool to visualize the data collected. Using the user data to customize the application for the user's benefit.

#### **4.1.3 | Gamification: Visual Aesthetic**

In order to implement gamification for each module the team has decided to ensure that the games and quizzes represent what the user should be able to retain from the module. The game itself is going to be documented as a pass or fail achievement rather than a point system. Users will be able to play the game until they have passed it since clearance of the game is needed to clear the module and progress towards another attempt at the assessments.



The games will have sprite-based graphics and have user input through the touch of their mobile devices. Each game will vary drastically based on the module it is contained in. For example, we may have a quiz where the user just has to respond with short answers to questions or multiple choice. There may also have users interact with different medical tools as a sort of simulation and obtain results on whether they did the given procedure correctly based on the module's lesson. The games should essentially "run separately" when the user is prompted to launch the interactive lessons.

- *Minimal Viable Product:*

At least one interactive game for one module must be created. It should allow for user input and be fully functional.

- *Stretch Goals:*

Once the MVP is reached, development of three to seven more interactive games for the different modules are to be fully functional for the user.

#### **4.1.4 | User: Target Audience and Ease of Use**

The target user for the mobile app is parents of 0-3 year old children. This target audience will allow the team to solely focus on implementing the modules for children in those age ranges. Since Dr. Lindly predominantly works with parents of children in this age range, the team believes that narrowing the target audience will help with creating an application that better suits her research. With this audience in mind, testing of the application can be narrowed down and provide more concise results.

Dr. Lindly has brought to the group's attention that parents of children in this age range have little interest in going out of their way to use an application that might take up more time than they need. Therefore, the team has made it a priority to create an application that the user

will need little to no training for. Since Dr. Lindly works with underprivileged clients, this application needs to be accessible to people with low education/reading capabilities.

Another ease of use requirement that the team wishes to achieve is making sure that the assessment tests in the beginning of the application can be audibly read to the user at any time.

- *Minimal Viable Product:*

The assessments are easy to take for a user with a low level of literacy, audio options are available for users to access at any time during the assessments, and a functioning basic calculator available for use any time during the assessments.

- *Stretch Goals:*

Provide audio options for all modules, and increase the age range of children that the application caters to.

## 4.2 | Performance Requirements

### 4.2.1 | Usability

Usability for the application will be measured by the completion of the modules, games and quizzes for each user. This will be measured by testing and interpretation of the data collected in the administrative portal. Some of these tests/data categories include:

- The amount of time that the user takes to complete their personal profile
- The amount of time that the user takes to complete each of the 3 assessments: NVS, BHLS, or HLSI.
- Whether users decided to skip a question in an assessment.
- The amount of time a user takes to complete a module.
- Number of attempts and amount of time a user takes to complete a module's game..

These tests and data will be visible in the application's web portal. If users demonstrate a high pass rate of 80% or better, then no adjustments will be made. If the passing rate of these tasks is less than 80% we will work with the client to improve these features further.

#### **4.2.2 | Game Response**

Games should be easy for the user to understand, but give the user a challenge to ensure that they have learned from the module. This will be measured by the number of attempts and amount of time that it takes the user to complete the game. The goal of the games is for the user to have enough confidence to complete it in their first attempt. The analysis of the game will be as followed:

- User's attempts at the game.
- How long it takes for the user to complete the game.
- Analysis of the pass rates for each game.

If user feedback and metrics are not up to standards, we will work with the client to improve the games further.

### **4.3 | Environmental Requirements**

Due to the nature of the application, there are not many environmental requirements. The only constraint relates to the nature of mobile applications and how their developers update their operating systems

#### **4.3.1 | Operating Systems**

The app being made will run on two primary Operating Systems: Apple's iOS for various phones produced by Apple (iPhone) and Google's Android operating system for various phones produced by different companies (Samsung, Google, LG, etc). We want the app to be accessible

to many people, but building the app to take into account older operating system versions is not sustainable. This will hurt general accessibility.

- *Minimal Viable Product:*

The Application will work on the most current version of each operating system.

It will also be updated to work on future versions of each operating system

- *Stretch Goals:*

In order to make the Application more accessible, it can be compatible with some previous versions of each operating system, as long as it doesn't inhibit its

compatibility with the current versions of each operating system. This does mean as each operating system updates, previous versions may become incompatible.

## 5 | Potential Risks

With this application's development comes a few risks that the group will have to address and try to mitigate. This comes with working with both mobile applications and personal/public health. The 3 main sources of risk are from Medical Misinformation, Database Security, and HIPAA Regulations.

### 5.1 | Medical Misinformation

The biggest potential risk is that the information the app presents could be incorrect, misleading, or out-of-date. This is the most serious risk because it goes directly against the app's purpose, which can not only damage both the Group and Dr. Lindly's credibility, but can potentially harm users if they act on incorrect or misleading information. In order to mitigate this, the group requires Dr. Lindly, or someone she approves, to parse through the information to make sure it is correct, clear, concise, and up-to-date before the information, or the gamification

of said information is released. This will help mitigate the potential of medical misinformation to be published.

## **5.2 | Database Security**

Another potential risk is the security of Google Firebase. One of the weaknesses of Firebase is that most of the security and authentication must come from the developers and nothing strictly comes from the Database itself. This can potentially lead to users being able to access information that is not theirs, and malicious users being able to “hack” the database. This can lead to the release of personal information, including medical information protected by HIPAA regulations (see 5.3). Keeping this in mind, the group will make it a priority to implement privileges and make sure that the only users that can directly access the database are the developers. The group will also try to mitigate any malicious code being sent to the database, but due to the ever-changing nature of malicious code, this will need to be regularly updated and tested.

## **5.3 | HIPAA Regulations**

The Health Insurance Portability and Accountability Act (HIPAA) of 1996 was established to create national standards regarding privacy towards personal medical information, health plans, and medical records. This also sets limits on what data can be accessed with and without a patient’s information. HIPAA Violations come in 4 different tiers, increasing in severity in regards to fines. For this project, one HIPAA violation can result in a fine somewhere between \$1,000 and \$50,000 US dollars. In order to follow these regulations and avoid being fined, by default, any information that cannot be accessed without a user’s consent will be locked out so that even administrators cannot access it, unless the patient opts-in to data collection, either with a pop-up after the app opens for the first time, or accessed elsewhere. Once a user

opts-in, they will have the option at any time to opt-out and revoke permissions to access said data.

## **6 | Project Plan**

Now that the requirements have been outlined and detailed, and the risks have been discussed, here is the plan in which the group will implement these features.

### **6.1 | Plan to Implement the Product**

In order to begin the implementation of this project, it is imperative that the team takes time to get familiar with the software and tools that will be used. This will allow for a greater understanding of the inner workings of these technologies and what to expect when the project is actually developed. These events should mostly occur now until the end of Winter Break (Nov. 19 - Jan. 10). Then development of the main page of the app will be next (Jan. 10 - Jan 31). This will consist of the administrative portal, along with a way for the user to log into the application. The information used for this should be stored in a database.

After that, development of the modules themselves will take place. Along with the modules, there will also be the NVS assessment and the form asking information about the parent's child(ren) implemented as well. These milestones will be developed at the same time (Feb. 1 - Feb. 25) In these modules, the structure and lesson topics will be coordinated by the client to ensure that everything is accurate and efficient for the user to learn about the different topics.

Once that is completed, the next course of action will be the gamification portion of the project (Feb. 26 - Mar. 28). There should be one game or quiz for each module and these should be completed in order to complete the module overall. All of the graphics and functionalities should be implemented to the number of modules that are currently made. The client will also

coordinate with the group in this section so we can ensure that the games allow for the user to display proficiency in the topic in a way that the client approves of.

The last part of the application's development is the data collection section (Mar. 29 - Apr. 12). The data that the user sends -- the information they insert at the time of initial login and the statistics of how they perform in the modules -- will be stored in a database so the client has access to all the information for data collection purposes. Once all of that is complete, the MVP will be fully implemented, and implementation of any stretch goals can begin, to be prioritized by the client. This will occur from April 13 to the end of the semester (May 6). As it stands right now, progress is on time in terms of what needs to be done.

## 6.2 | Gantt Chart

### Gantt Chart for Team HealthLit

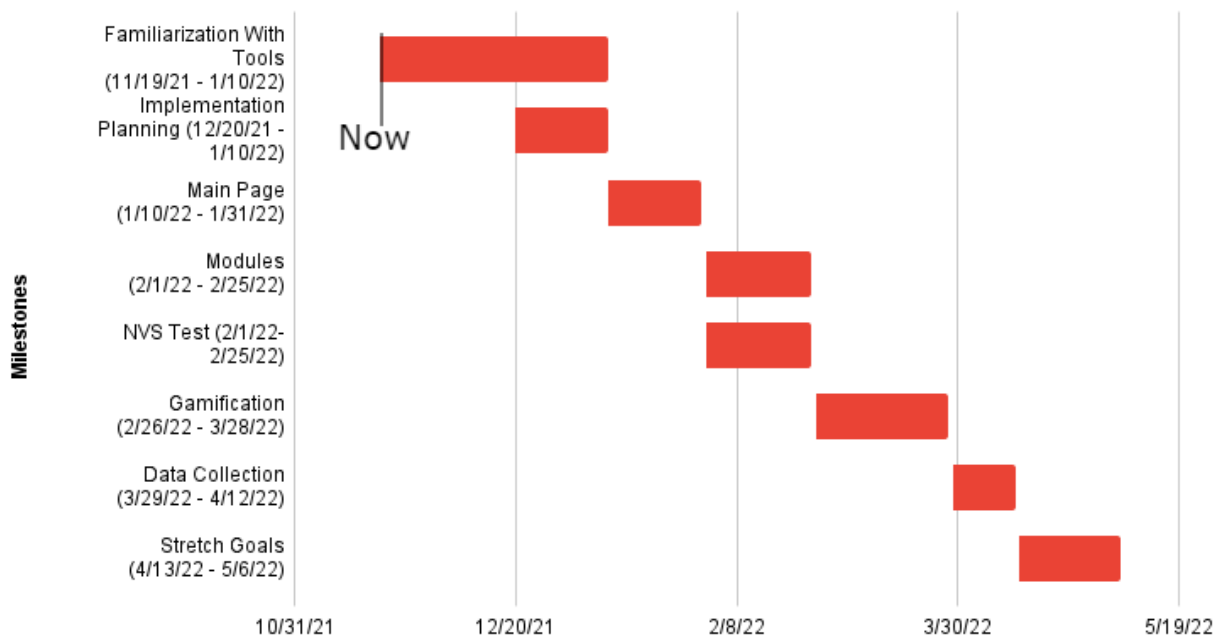


Figure 2: Gantt Chart for the Project Plan.

## 7 | Conclusion

In this document we have outlined what our team will be required to implement within this application and the standards to which we will test this implementation. To summarize our problem, low health literacy is a problem that affects many parents and leads to higher child illness and mortality rates. Our team, with the help of our client Dr. Olivia Lindly, seeks to remedy this issue through the development of a mobile app that aims to increase the health literacy of the parents of young children. This mobile app will teach parents about how to properly care for their children through the use of interactive modules that teach parents essential skills such as proper dosing of medications for children according to their weight. We have outlined here what must be included in this solution, and we will work closely with Dr. Lindly to ensure that we are developing the right tools for the job. Currently our team is exploring our chosen technologies to ensure that they are feasible for the application that we wish to develop. We want to ensure that we have chosen the best tools for the job. I believe that with the help of Dr. Lindly, our team will develop an app that will help many people.

## 8 | Glossary

**HIPAA:** Health Insurance Portability and Accountability Act

**NVS:** Newest Vital Sign

**BHLS:** Brief Health Literacy Screen

**HLSI:** Health Literacy Skills Instrument Short Form