



Medical Billing Application Development Project

Business Mentor - Ms. Ruth Ramos

Organization - STEMEd Consulting LLC

Ji Yoon Lee

4/22/2020



Executive Summary

The following report gives a detailed description of the internship carried out by Ji Yoon Lee throughout the duration of the 2019-2020 internship cohort at the Illinois Mathematics and Science Academy. The final product created, the process followed in order to create the product, as well as the research and methods are explained. The report documents the limitations and constraints encountered throughout the project creation and development duration. An inclusion of values, skills, and information resulting from the internship experience are detailed below as well as recommendations on how to improve the results for both the business and for future interns.

The final product created is an application that can take billing information about a medical procedure or treatment, whether it is billing information given by the medical provider or the insurance provider, and show an overview of the budgeting information in an easy to interpret manner.

Business Context

Throughout the duration of the 2019-2020 academic calendar year, there were many changes that occurred concerning the business context of the internship. Originally, the purpose of the internship was to create an educational application for mobile devices, personal computers, or other more creative devices that taught STEM subjects such as mathematics and physics simulations. The research into the use of Virtual Reality headsets was heavily researched, as it provides students a greater ability to visualize and put information that they are learning into a real-world context. This project was to be a part of the work done by the company STEMed Consulting LLC, a consulting firm that works with educators across the nation to assist in developing curriculum and using tools for engaging students in STEM education. The STEM education industry is very large in variety, but because of the amount of variety, the businesses that are a part of the industry are spread out among each of the varieties. Specifically for educational applications in STEM, there are limited applications that struggle to cover all of the information necessary for a fully complete and holistic education. For example, there are a fair pool of elementary educational math games that assist students in learning how to quickly solve basic arithmetic questions, but as mathematical subjects get more difficult, such as multivariable calculus, differential equations, etc. it becomes more difficult to find educational applications besides calculators, and finding a game-based application is nearly impossible. Partially because of an inability to do intense computations in the calculus sector of mathematics



on a simple processing computer, these apps are scarce, but with basic calculations, such as basic derivatives and simpler integrals, these mathematical concepts can be quickly created into a fun and educational game.

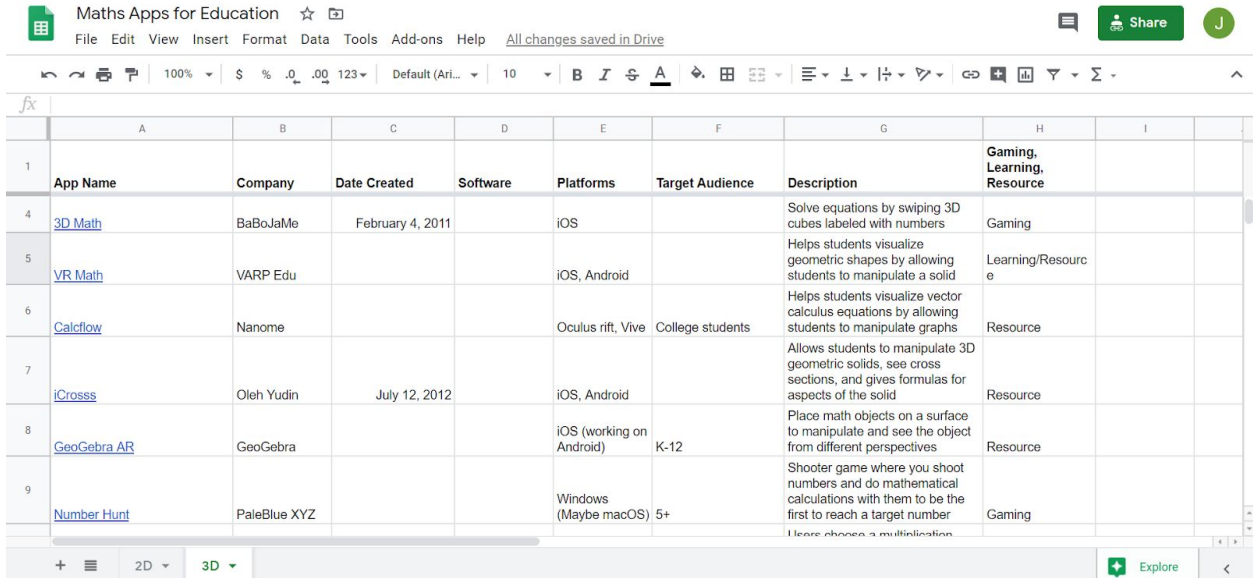
Throughout the course of the internship, rather than seeking to pioneer an app in the STEM education industry, the CEO of STEMed Consulting LLC., Ms. Ruth Ramos, became connected with the Rush Copley Medical Center and realized the problems that people were facing in properly understanding and organizing the benefits packages from insurances as well as the billing information given by medical providers, insurance providers, and care providers. While anything related to the medical field, whether it be books, applications, etc. is bound to be large and heavily populated, the world of medical billing information compiling is largely left untouched due to the difficulty and complexity of the process. As such, the internship project agenda shifted to creating an application that would be able to take in information on a medical bill and be able to organize all of the information based on the provider, id number, cost, etc. to help create an organized database for all of the information. This would thus help customers to understand what is described on the official billing information papers. This would work similarly to a budget managing application, such as expensify, and was planned to eventually have a scanning feature that would allow it to obtain information from a picture rather than manually typing in all of the information.

Business Project Description

The application that was created during the duration of the internship was a simple application that stores data inputted through a form on a mobile device. Unfortunately, it was not optimized to have many exciting features due to the project only being introduced halfway during the internship cycle. Otherwise, the first half of the internship was spent on researching for the aforementioned project of developing an education application or game.

Because of the unexplored nature of higher level math educational game applications, a majority of time was spent on researching pre-existing, approximate or similar products on the market. A spreadsheet was created that held information on different kinds of math applications, the company that developed them, the date the application was created or launched, the type of software, the platform required to use the application, the target audience, a quick description of the application, and whether

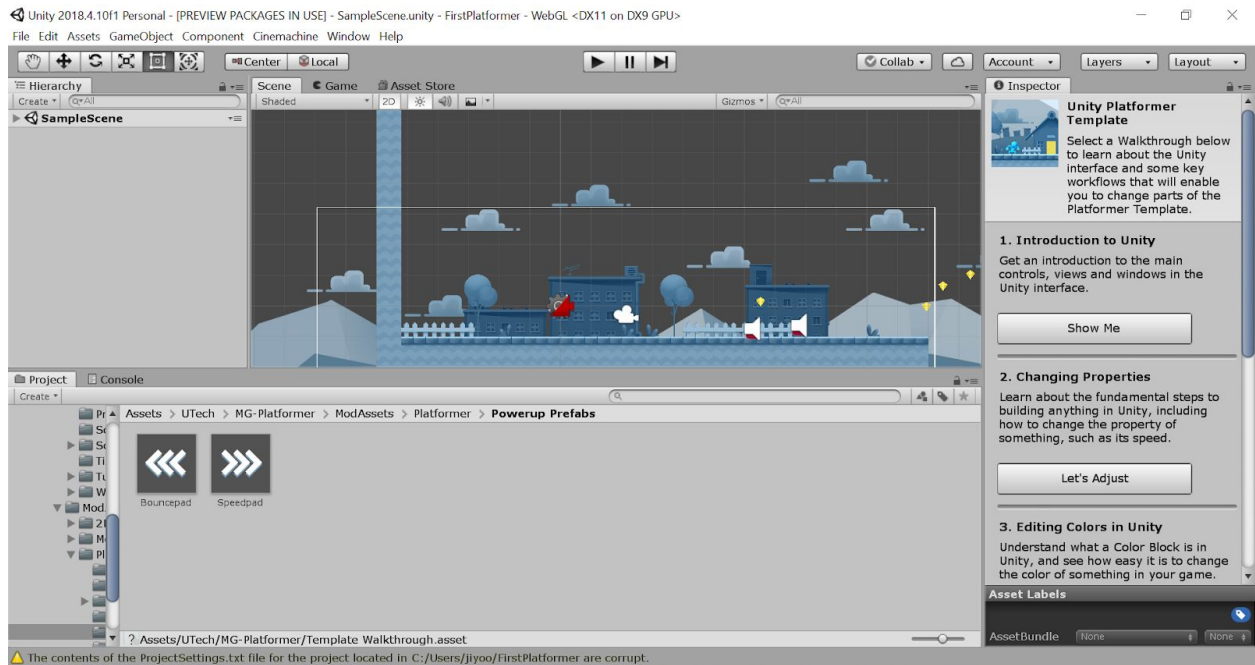
the application was a game or a learning resource or tool. The table was created as follows:



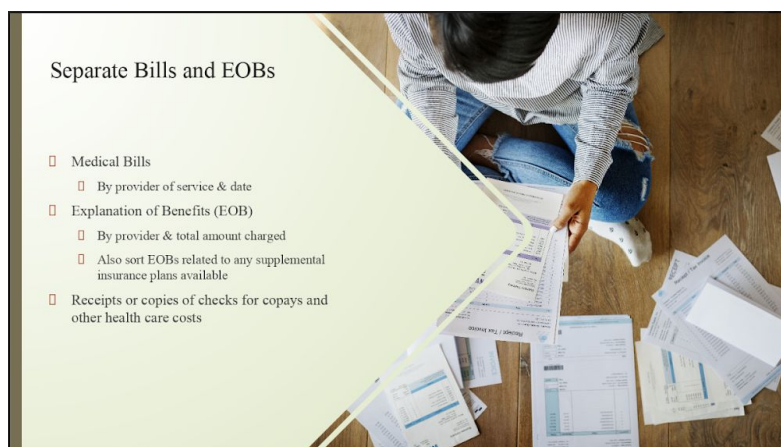
App Name	Company	Date Created	Software	Platforms	Target Audience	Description	Gaming, Learning, Resource
3D_Math	BaBoJaMe	February 4, 2011		iOS		Solve equations by swiping 3D cubes labeled with numbers	Gaming
VR_Math	VARP Edu			iOS, Android		Helps students visualize geometric shapes by allowing students to manipulate a solid	Learning/Resource
CalcfLOW	Nanome			Oculus rift, Vive	College students	Helps students visualize vector calculus equations by allowing students to manipulate graphs	Resource
iCrosss	Oleh Yudin	July 12, 2012		iOS, Android		Allows students to manipulate 3D geometric solids, see cross sections, and gives formulas for aspects of the solid	Resource
GeoGebra AR	GeoGebra			iOS (working on Android)	K-12	Place math objects on a surface to manipulate and see the object from different perspectives	Resource
Number Hunt	PaieBlue XYZ			Windows (Maybe macOS)	5+	Shooter game where you shoot numbers and do mathematical calculations with them to be the first to reach a target number	Gaming

Tables were created for both applications that used 3D software, such as Virtual Reality headsets, as well as 2D software, where the main focus of the research was on 3D software. Because it was such a new market, much time was spent researching and not much was available for the desired target audience.

With an interest in further developing a 3D software application targeting audiences involved in higher level mathematics, the learning process of Unity began as the calendar year was coming to a close. Unity provides basic lessons on creating a first-person driving kart game as well as a platform game. Starting with the platform game, as the versatility of a platform game was much more advantageous to the expected final application, the learning process was started.




During the Unity learning process, the project was changed. There would be many opportunities for other people to use the pre-researched information, but there was an opportunity to work with Rush Copley Medical Center and Omar Ramos, a professional who helped medical provider and medical insurance provider customers understand the difficult, complicated, and confusing exchanges of medical billing information, such as medical bills and explanation of benefits papers. Omar Ramos provided these pieces of information through a presentation. The following is a sample of some of the information provided.



Match Them Up

- Take the **provider bill** and look for the **service date** and the **amount** of the charge.
- Next, match them up to the **EOBs** and **supplemental EOBs**. The service date and amount should match.
- Place the provider bill on top, then the EOB second, and then the supplemental explanation of benefits form last.
- Attach receipts.
- Proceed with the rest of the provider bills and follow the same format.
- Place any **duplicates** in a separate stack to be disposed of later.



Create a Filing System

- A large accordion folder, a file cabinet or large binder
- Label the files or sections for the following (Examples):
 - Procedure/date
 - EACH provider of service
 - Hospital
 - Surgeon
 - Anesthesiologist
 - Radiologist
 - Pathologist
 - Radiation Oncologist
 - Medical Oncologist
 - Prescription information
 - Miscellaneous

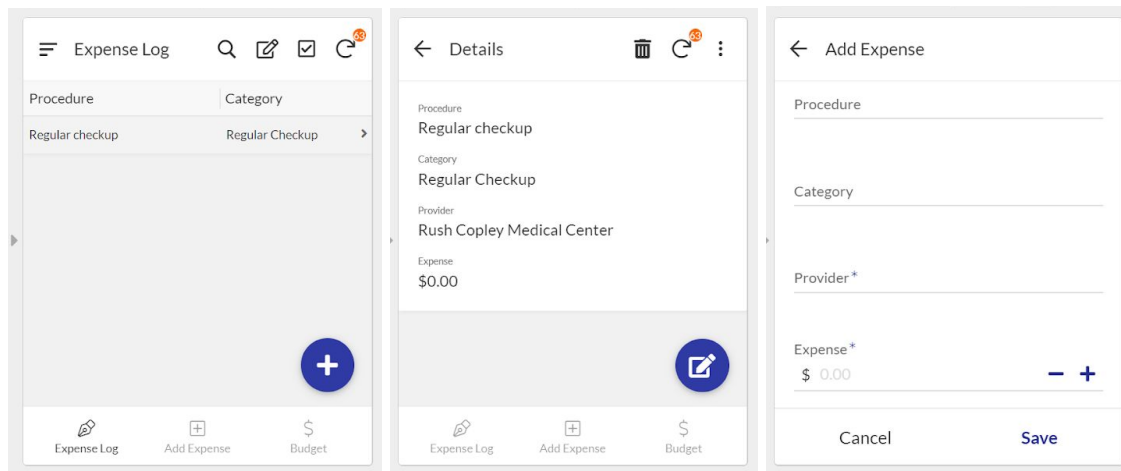


The project itself began with sample medical bills and explanation of benefits papers and understanding how to match them up and how to organize the information. Sometimes, the explanation of benefits papers and the medical bills would have different wording for the same procedures, thus identifying and matching them by provider, date, etc. were key to understanding the billing process. For the sake of privacy, the sample medical bills and explanation of benefits papers used for educational purposes will not be shown in this report. Then research was carried out on the most similar apps on the market: personal finance budgeting applications. Expensify, one of the most highly regarded personal finance and budgeting applications in the market, was extensively studied as a reference for the product creation throughout the remaining duration of the internship.

For the actual creation of the application, Appsheet was used. Appsheet is a platform that creates applications without requiring any code for development. It is versatile in that it allows people to create a single application that is usable on mobile, tablet, and web devices. It saves data to cloud-based databases and spreadsheet platforms such as Google Sheets, which proved to be advantageous for analytical research. The final created application had three sections: an overview log, a form for adding expenses, and a budgeting and statistics portion.



The application was created so that the user can edit the information uploaded into the database, look at the specifics behind a particular exchange, or have a general overview of the expenses incurred.



Business Project Research

A couple of key concerns that were worked with throughout the duration of the initial internship project were the engagement of the audience, the capability to teach the material through an application, and the ability for current software to handle the necessary computations in higher level mathematics. To find out more on the background of education through applications, research was done on pre-existing applications for math education. Using a combination of the Apple app store, Google play store, and looking up reviews for different educational applications, specifically that used 3D software. All the information, as mentioned earlier, was put into a spreadsheet with detailed information that would assist in addressing the initial concerns. For example, the Times Table VR application showed the capabilities and demand for engaging educational math games with its software and unique gameplay experience being well received across its users. The application Calcflow, on the other hand, was made specifically for college students in higher level mathematics. It helps students visualize vector calculus graphs, vector plots, etc. and shows that there is still teachability in a high level, difficult to visualize mathematics course. Working with the capabilities of the Unity software environment was to help with addressing the concerns



with handling the computations. The 3D software would allow for better rendering of objects to help students connect information to the real world.

With the second project more extensive work on the billing process was required, as limitations in the available products for the specific market made it difficult to gather information for the specific situation. The primary concern for the second project was how to match up procedures on the medical billing papers to the procedures listed on the explanation of benefits papers, as well as what the information meant and demonstrated. A presentation by Omar Ramos was provided, detailing the information listed, where it was listed, how to match up the information, and what the information means, as well as sample medical billing papers and explanation of benefits papers were provided. This only took a few days worth of work, but the largest learning curve in the process of making the application was learning how to utilize Appsheet in the most effective way possible. While reference applications and templates were provided by Appsheet, an added level of complexity and catered detailing was necessary. As such much of the time was spent reading the Appsheet tutorial provided by StepSheet, alongside trial and error.

Neither project was able to be fully completed in the final form that was originally envisioned by the planning process due to a lack of time, as both projects were allotted half of the time that it had originally called for. This, along with the lack of products in the same nature as the product being created, while good, made research in the demand and capabilities to be difficult. That being said, the application for the medical billing information processing was created in its basic structure.

Business Project Key Learnings and Recommendations

This unconventional internship experience gave valuable lessons in workplace happenings and soft skills as much as it developed technical skills. With the large shift in project, the most important thing that everybody was reminded of, regardless of how normal the situation may seem at the moment, was how to maintain composure in a time of great change and how to stay flexible regardless of circumstance. The original second plan was far too difficult and extensive to be completed in the remaining time of the internship, but doing an inexcusably terrible job in a hurried and panicked attempt to complete the task would be equally, if not more, detrimental to the product and its



reception. As such, it was also necessary to accept the sacrifices made in the complexity of the final product in order to make sure that the remaining time would not be squandered on a half finished attempt at gathering data. The final product functions in the basic purpose of the original product outline, to sort and organize difficult to navigate information in a singular application, in a secure fashion. It simply does not have the elaborately planned features such as scanning. Another workplace skill learned was the ability to gather information and to understand how to teach oneself the technical skills required using the technical skills already acquired. Before going through the tutorials, no experience in using Appsheet or Unity was had, but because of a background in computer science, it was possible to develop new skills in application development. Through this, technical skills were also learned.

Overall, the business had given ample amounts of resources and information to complete the task, with the biggest constraint being the limited amount of time due to various circumstances. As a recommendation for the business, it seems that it will be difficult to be able to use a scanner function using the preset Appsheet software tools. Scanning capabilities, while improving, are not quite at their best, and especially considering the differences in formatting for different medical treatment and medical insurance providers' billing papers, it will be difficult for the application to do a self-processing task. Especially considering the monumental importance placed on medical billing information, it could potentially be difficult for current software to keep up with the high quality demanded from the project. It definitely would not be impossible, but it may be a development that needs to be looked into a bit more in terms of technological capabilities.

In terms of how to help new interns that are to work on the same project, it would be best if interns started off learning and developing a strong understanding of the relation and organization of medical billing papers and explanation of benefits papers. Afterwards, having the interns read through and work on a smaller sample application using the instruction and information provided in a tutorial would assist with the learning curve that may be faced, especially for interns with limited experience in software or application development.



Reference List

Geogebra. (2017, September 28). GeoGebra AR - IntroDeck. Retrieved from <https://www.geogebra.org/m/R8Qd7U8y>

Appadvice. (2019, May 13). 3D Math by BaBoJaMe. Retrieved from <https://appadvice.com/app/3d-math/417589215>

CalcFlow by Nanome. (n.d.). Retrieved from <https://nanome.ai/calcfLOW/>

CalcVR (Calculus in Virtual Reality). (n.d.). Retrieved from <https://calcvr.org/>

Free Tutorial – EZ Hardware app. (n.d.). Retrieved from <http://stepsheetcourse.com/freetutorial/>

iCross. (n.d.). Retrieved from <http://iappideas.com/>

Ramos, O. (n.d.). A presentation about navigating the process of organizing medical bills.

Shapes 3D Geometry Learning Apps - Spark curiosity for 3D geometry. (n.d.). Retrieved from <https://shapes.learnteachexplore.com/#volume-purchase>

Times Tables VR. (n.d.). Retrieved from <https://times-tables-vr.soft112.com/>

VR Math. (n.d.). Retrieved from <https://vrmath.co/>

Appendices



DATE	CHECK IN	CHECK OUT	BREAK TIME	TOTAL HOURS
03/11/2020	8:56 AM	4:36 PM		7 Hours 39 Minutes
03/04/2020	9:00 AM	4:01 PM		7 Hours 1 Minutes
02/19/2020	8:55 AM	4:05 PM		7 Hours 10 Minutes
02/12/2020	8:56 AM	4:01 PM		7 Hours 5 Minutes
02/05/2020	8:55 AM	4:00 PM		7 Hours 4 Minutes
01/29/2020	9:12 AM	4:03 PM		6 Hours 50 Minutes
12/11/2019	8:55 AM	4:00 PM		7 Hours 4 Minutes
12/04/2019	9:00 AM	4:01 PM		7 Hours 0 Minutes
11/20/2019	8:57 AM	4:00 PM		7 Hours 3 Minutes
11/13/2019	9:00 AM	4:04 PM		7 Hours 4 Minutes
11/06/2019	8:58 AM	3:56 PM		6 Hours 57 Minutes
10/30/2019	9:19 AM	4:00 PM		6 Hours 41 Minutes

The following table only provides attendance information for the duration of the internship in which the program began to use the ImBlaze suite. There has also been data that is inaccurate as occasionally mistakes were made in the remembering of signing in and signing out before and after beginning work.