**Literature/Patent + Social Impact**

**Orthopedic Surgery Gaming App**

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* **The Perry Initiative** - Building the Pipeline for Women in Engineering and Medicine (AG)

<https://perryinitiative.org/>

1. **What is the product or solution you looked at?**The Perry Initiative is a program that inspires young women to become Engineers and Orthopaedic Surgeons through hands-on outreach programs across the country. It is directed toward students who identify as female in high school. The program, founded in 2009, includes an integrative educational curriculum for middle school and high school students, and runs over 40 one-day outreach programs nationwide. To date, they have reached over 7500 students in high school, college, and medical school through 260 outreach events.
2. **How is it like what your product does?**This program is like our application in that it is attempting to inspire more young women to pursue a career in orthopedic surgery on a national level.
3. **How is it different from your project?**This program is different from our application in many ways. First, it is a selective program requiring an application and essays, and only students who have not participated before may be admitted. Our app will be available to anyone, regardless of age or gender identity. A second key difference is that it is only a one-day program. Our application, being mobile rather than in person, will be available to students any time.
4. **What are the legal and cost issues?**A legal issue with this program is that it requires a liability waiver to attend. However, like our app, this program is free.
5. **Why (or why not) are you using this (or not)?**This program is not something we can use, because it is very different in structure being an in-person event rather than a gaming app. However, it may be very valuable to advertise events like this in our app to make users more aware should they become interested in learning more about orthopedic surgery. This is an idea we can pass on to our sponsors and could be implemented in the future.

* **Bonedoc -** , <https://www.imedicalapps.com/2014/04/bonedoc-game-orthopedic-surgeons/> - CZ

1. **What is the product or solution you looked at?**Bondoc is a serious game which allows users to perform virtual orthopedic surgery. For high school students, they can have fun, taking virtual X-ray as you fix the patient’s broken hips. For orthopedic trainees, they could get real-time feedback on facets of their surgical performance.
2. **How is it like what your project does?**One of the main purposes of Bonedoc is to attract high school student to have orthopedic surgery simulation and have fun with it. It shares same professional level as we do. Medical term and surgery process are precisely.
3. **How is it different from your project?**Our purposes are making App free for everyone and lower the entry-level cost for people who interested in. To download Bonedoc for any reason, it needs cost $1.99 on Appstore which is unlikely that high school students would play it. Bonedoc has professional graphics and real-world images, to introduce to high school students, our app will design cartoonish.
4. **What are the legal and cost issues?**You needs to accept Terms and Conditions before the user can pay and play. There is no other cost in App.
5. **Why (or why not) are you using this (or not)?**We will use technical format or constructs of this app to make the model of ours, but our App will more focusing on education rather than professional. And we want to make our app more acceptable for a beginner. And our app won't charge for any reason.

* **Stanford Extension of Perry Initiative** - ND

<https://scopeblog.stanford.edu/2013/08/20/teen-girls-become-orthopaedic-surgeons-for-a-day/>

1. **What is the product or solution you looked at?**This is a medical mentorship program for high school students in the area surrounding the Carolina Coast Surgery Center. Students submit applications to their health science teachers and then the surgery center’s community liaison narrows down the applicants and picks out the group.
2. **How is it like what your project does?**This program in particular chose 50 female students out of the 55 that attended. The article noted how 95% of orthopaedic surgeons were male in the U.S. in 2015. However, there are also a record number of women enrolled in medical school now, so this program is trying to continue that trend to balance out the field. This is similar to our project because we are trying to even the playing field for both males and females with our app.
3. **How is it different from your project?**Our app does not allow students to speak with surgeons directly or get in-person, hands-on surgical experience, but it does let students learn about orthopaedic surgery in a much more accessible way. The app is also intended to be much less gory than real life surgery which turned several students off to surgery in this story.
4. **What are the legal and cost issues?**Similar to the Perry Initiative, the only legal issue would be having students fill out a waiver for safety reasons. This program is also free to attend.
5. **Why (or why not) are you using this (or not)?**This solution is not as inclusive as our app would be. We are using the concepts of real surgery, but we want the app to appear cartoonish so that students aren't too grossed out. This app also doesn’t require an application which makes it more accessible to any student.

* **Amateur Surgeon 4** (Apple/Android)- ND

1. **What is the product or solution you looked at?**This is a surgery gaming app. It includes surgical puzzles that help you navigate through levels of ridiculous surgery scenarios including pizza cutters, giant squids, chainsaws and more.
2. **How is it like what your project does?**This app is similar to our project in the way that it is intended to attract younger smartphone users. It also is very cartoonish in the way that is displays the human body and surgical tools.
3. **How is it different from your project?**Our project will need to be more educational than this gaming app. Amateur Surgeon is very engaging to younger students, but it does not teach them any real surgical procedures or any useful anatomy information.
4. **What are the legal and cost issues?**The game makes you accept Terms and Conditions before the user can play. The app is also free, but there are many in-app purchases the user can choose to spend money on.
5. **Why (or why not) are you using this (or not)?**We will want to use their animations to effectively make our game engaging to younger students, but we will want to do it in a way that is still educational. If the game is too cartoonish, students will not seriously consider a career in orthopaedic surgery.

* **Operate Now: Hospital** (Apple/Android)- ND

1. **What is the product or solution you looked at?**This is another surgery gaming app. It involves realistic trauma scenarios that also takes the user through surgery simulations. The user is able to build and customize their hospital as well.
2. **How is it like what your project does?**Our project also plans on employing some brief storylines to make the game interesting and engaging for younger students. This will also put these injuries in perspective for each user. The surgery simulations are realistic but are still illustrated like our visuals will be. It also provides a score based on the user’s performance which we are trying to include as well.
3. **How is it different from your project?**This game is better than most simulators, but it still does not specify a lot of surgical terms that we want to include to make our game educational. Many of the games themes are also somewhat dark and morbid, which is what we want to avoid so that young students don’t feel pressured when playing the game. This game puts a lot of emphasis on the side project of building the hospital which is too complex for our purposes.
4. **What are the legal and cost issues?**This app also asks to collect the analytical data the user creates while playing. The app is free, but is another game with in-app costs to increase the amount of money you can spend in the game.
5. **Why (or why not) are you using this (or not)?**We won’t be using the intricate storylines and hospital building aspects of this game because it takes away from the learning portion of the game. We want to take note of their interesting scenarios and simulator graphics in order to make our game as appealing as possible.

* **Touch Surgery** (Android/Apple)- CZ

1. **What is the product or solution you looked at?**Touch Surgery is a multi-award winning surgical training platform for doctors and surgeons, and it has been researched by world-leading institutions and published in peer-reviewed journals.
2. **How is it like what your project does?**The basic concept of this app is to provide an educational platform. It has introduction for tools, organs and procedures. Like our game, it divides the human body into several parts, and in each part, it has instruction or article to read. And this app has a test part to test user as surgeon to do what next step is right.
3. **How is it different from your project?**This app is more focusing on researches and articles which is obscure for high school students, and it doesn't have any interactive system. App has a professional orthopedic surgery simulation which including crucial images, our app needs to avoid crucial images and find the balance between professional and entertainment.
4. **What are the legal and cost issues?**This app is free to download and free to use. But the user must create an account to access these articles and relative surgeon operation. This app needs to collect user data and linking email.
5. **Why (or why not) are you using this (or not)?**We are not using this solution because this app is too professional for a high school student, Although the user doesn't need to pay to download, the user still need to create an account to login which won't work if there is no internet. And this app has more weight on articles and researches, entry-level learner (high school student) will lose interests at begin.

* **Surgeon Doctor 2018** (AG)

1. **What is the product or solution you looked at?**Surgeon Doctor 2018 is a game that is available on the Android app store.
2. **How is it like what your project does?**It is similar to our product in that it presents surgical scenarios with cartoonish visuals, and it guides the user through the procedures.
3. **How is it different from your project?**It is different from our project because it is not specifically for orthopedic surgery. There are different varieties of procedures including burn treatment, wood and glass removal, and scoliosis surgery. Some levels must be played to unlock new levels, and the user may only perform one option to complete a task, rather than having to make a choice. A key difference between this game and the one we will develop is that it contains no educational component. No bones are identified.
4. **What are the legal and cost issues?**The game has no cost to download, but the user must navigate through advertisements several times throughout the game. The company that makes the game, Tapinator, also collects data on its users, including browsing history and approximate location. The game also has the option to link with various social media platforms.
5. **Why (or why not) are you using this (or not)?**We are not using this solution because it does not provide an educational component and it does not provide choices to the user to perform the surgery. The game is only a “point and click” type of game, and it is not specifically for orthopedic surgery.

* **Surgeon Simulator** (Apple/Apple)- CZ

1. **What is the product or solution you looked at?**Surgeon Simulator is a mobile game available on both Android and IOS app store. In the game, you will be a surgeon to ‘save’ those patients. It sells more than 2.5 Million.
2. **How is it like what your project does?**In the app, tool use is the most important part. In our project, users need to pick a right to tool to make surgery right. It has a physical reaction when player picks a tool and make a reaction with an organ. Survive of a patient is depends on the correctness of surgical procedure.
3. **How is it different from your project?**Different from our game, surgeon simulator is not an educational app, it’s a spoof app. The purpose of playing is to kill the patients and to the worse, as they can.
4. **What are the legal and cost issues?**The app is a commercial game, it need cost $4.99 to download, and there has no in-app purchases or unlock system.
5. **Why (or why not) are you using this (or not)?**We will not use this solution, because the basic idea is contradicted with ours. We want to make orthopedic surgery as a serious job and more professional. But this game is design for entertainment and charges money.

* **Hospital Surgery: Operate Like a Master Surgeon 3D** (Android) - AG

1. **What is the product or solution you looked at?**This is a cartoonish surgery game that is available in the Android app store.
2. **How is it like what your project does?**It is like our game in that it provides the user with a scenario of how the patient obtained an injury. It also provides the user with some choices for actions to take, but those choices do not always lead to a relevant action.
3. **How is it different from your project?**It is unlike our game because it does not contain an educational component. It is also not specifically for orthopedic surgery.
4. **What are the legal and cost issues?**The app is free to download, but requires some in-app purchases and contains multiple pop-up ads.
5. **Why (or why not) are you using this (or not)?**We are not using this solution because, while it does contain some of the details we are intending to use, it is not a solution to the problems we have. Additionally, this game is not very accurate in the actions performed reflecting the actions selected by the user.

* **Social Impact** (AG)
* The issue we are attempting to address with our gaming app is a lack of diversity in the field of Orthopedic Surgery. Women account for roughly 10% of the field, and that disparity is due to a variety of factors, including a lack of exposure to the field, leading to a lack of awareness. Becoming a doctor, and specifically an orthopedic surgeon, requires years of school and training, so reaching students to increase their awareness of the field before they begin college is how we see our game having a positive social impact, increasing the number of women in orthopedic surgery.
* According to a recent poll by USA Today, nearly 89% of teens have smartphones, which makes creating a mobile gaming app a solution with the potential to be very effective. By creating a gaming app, we can reach nearly every teen in the country regardless of geological and socioeconomic constraints, access to education, and any other barrier preventing individuals from entering this field. While there are many successful in-person programs across the country for teaching teens, specifically young women, about orthopedic surgery, they have limits to how many students they can reach due to budget restrictions and location.
* One such program that has been very successful is the Perry Initiative, a program with the specific purpose of encouraging young women to enter the fields of orthopedic surgery and engineering. This program recently conducted a five-year program evaluation, and found that 93% of students who went through their program are enrolled in STEM fields in college with 56% intending to go to medical school and 23% likely to become orthopedic surgeons. For an outreach program that is both selective and geographically confined, they have had over 7500 students participate in their program, yielding a potential increase of 1725 new female orthopedic surgeons. Considering that there are roughly 29,613 orthopedic surgeons in the US, according the a 2016 report from AAOS, The Perry Initiative has the potential to be responsible for a 5.8% increase in female orthopedic surgeons.
* This is accomplished by providing awareness and access to orthopedic surgery. Because our game will reach an even wider range of students, we anticipate a positive social impact in this field as well.

Sources

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