GNG1103 Section #B02 Team #B05

Project Deliverable D: Conceptual Design
GNG 1103 – Engineering Design
Faculty of Engineering – University of Ottawa

Our aim for this report is to develop eighteen conceptual designs for our problem statement, therefore each team member will come up with 3 ideas. Depending on the team members, the ideas will focus on different categories such as the aspects of colours, the spatial environment, the interface and the functionality of the prototype. The plan is to analyze and evaluate these concepts to then be able to have one solid and realistic conceptual design of the virtual reality application we want to create. Each group member will benchmark their individual designs against each other, then we will take the top designs and benchmark those as well. From the final benchmarking, we will compile the best concepts and features to create and sketch our final design.

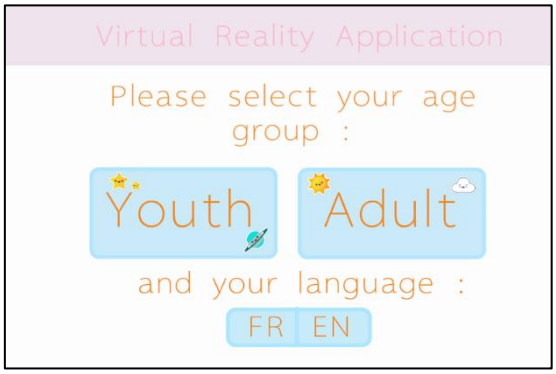
Overall Design Ideas

Colours: Béatrice Pelletier

The colours used in the application, will play an important role in shaping its impact on the patient's mood and anxiety levels. [1]Our application will contain colours in the aim to reduce stress levels and put the patient at ease. The colour blue will be used since it has been known to soothe illnesses and treat pain as a means of therapy ; white and pink both have calming effects and bring peace of mind; green brings feelings of safety; orange increases happiness and enthusiasm. We will vary the tones of the colours depending on the age group in question.

Design 1 - The first but least complex idea is to have both the youth and the adult side have identical colour schemes. We will choose light shades. The pros of this are that it will be less complicated to implement. It will also make the application look more cohesive. However, the interest of the younger age group might be decreased since the application won't be as vibrant and lively.

[1] Cherry, Kendra. "Can Color Affect Your Mood and Behavior?" *Verywell Mind*, Verywell Mind, 17 July 2019, https://www.verywellmind.com/color-psychology-2795824.



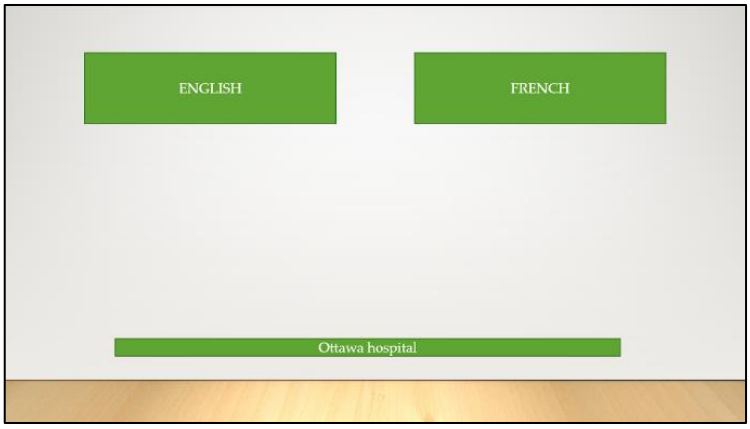
Design 2 - The second idea is to have different colour schemes based on the age group of the patient. Once the patients have landed in their correct age group, the adult patient will have different colours than the youth patient. We will use light and pastel tones for the older age group and brighter tones for the younger age group. This is in favour of every age group. Two disadvantages of this idea are the time it will take to construct as well as the possible lack of cohesion in having more colour shades.

On the left is the adult interface and the right is the youth interface.

Design 3 - The last idea is slightly more complex, it is to have the same concept as the second idea whilst adding special colours to the sub-titles and to point at various objects using arrows. The negative side to this is that it will take more time to get done. However, it will encapsulate all the pros as the second idea as well as making the application even more attractive.

Functionality: David MacPhee

Design 4 - A simple take. This design is a simple menu with the user only inputting the language in which he/she wants to hear the video (and read the subtitles). After the selection, the program will go straight to the videos which will play in a logical order It will be efficient and easy to make but not very stimulating or fun for the user; it will mostly be educational. It also will be very efficient for the nurses to set up since it's just one click of a button and the application starts.

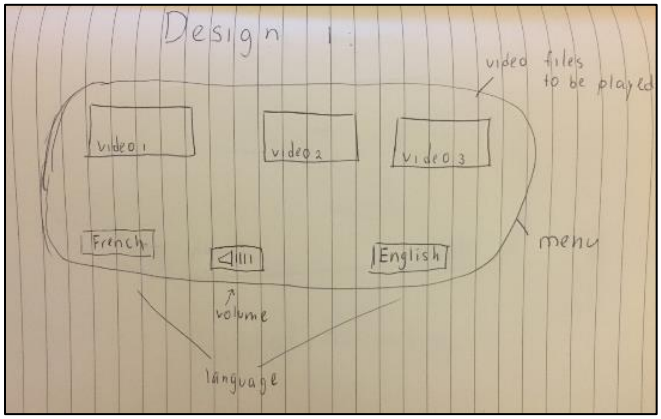


Design 5 - This design is the same as design 4, however, goes more into detail. The setting is a hospital waiting room. Walking around brings the user to different "stations" with a video title, and this makes it so the user chooses what video/procedure they would like to watch. The stations can be seen as the little green boxes below.

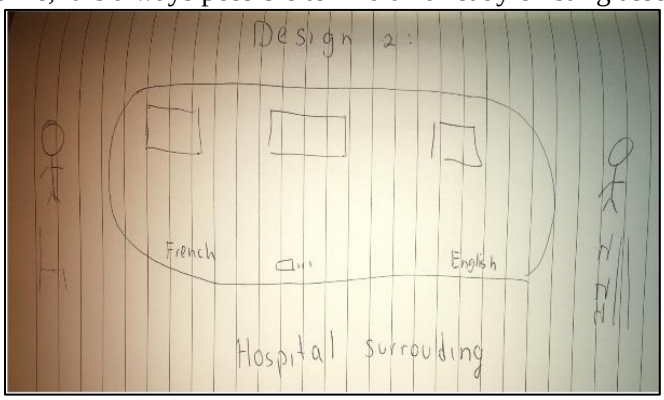
Design 6 - This is the most complex design, first, the user is asked what language they prefer (like conceptual design 1), then they are asked their age. There are three different age ranges: youth, teen/adult and Senior. When selected each age group will bring the user to a new virtual world. Starting with age group youth, the user is brought to an animated world menu with fun music in which the user can interact. For the teen/adults the user will be asked how confident they are using VR software (two choices very little or confident) they will either be able to select what videos they would like to see or just go watch the predetermined video sequence. Finally, for the seniors users will simply be told to lie down choose the language and watch the predetermined video sequence.

Environment: Alexandr Levchenkova

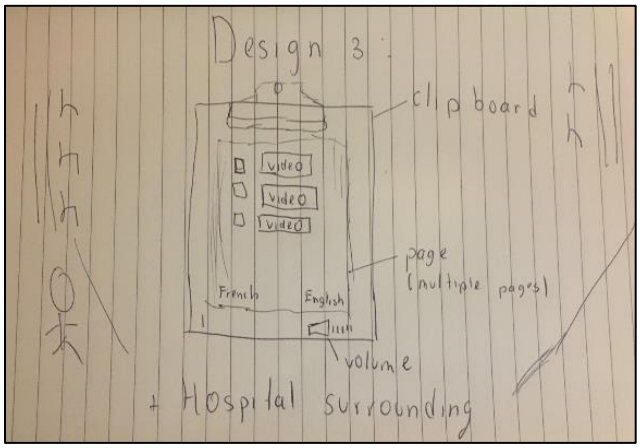
Design 7 - This is the simplest design. When the user logs in, his surroundings will be a black space with a basic menu in front of him. The menu will have language selection, an option to adjust the volume and video file selection. This is a simple design that does not require a lot of time to make and you can start the experience almost instantly. However, a con of this design is the fact that it is the least engaging and fun for the patient.



Design 8 - This is design similar to design 7, but the surrounding of the user is completely different. While we are keeping the menu the same, the user will find himself in a hospital-like waiting room with chairs and doors. The experience would be much more vivid and interactive, and the user would be more immersed. The hospital waiting room would be difficult to create from scratch. Therefore if we don't have enough time, it is always possible to find an already existing asset of the waiting room.

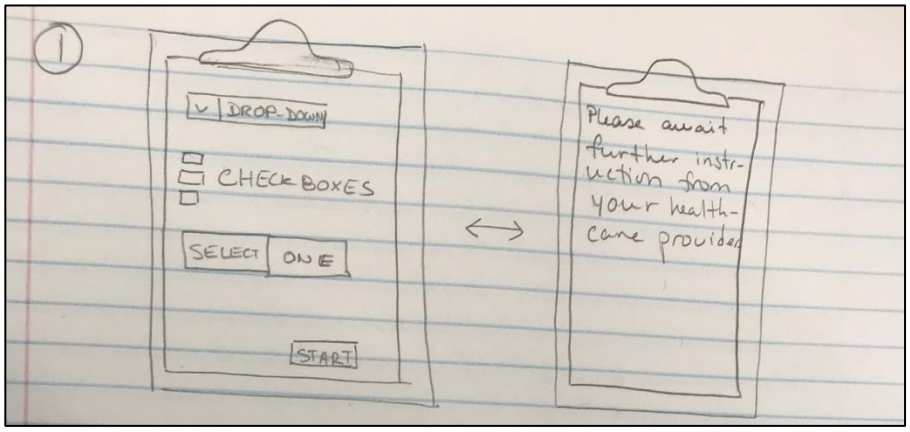


Design 9 - This would be the most complicated design, but also the most immersive and entertaining while still being educative. We take the surrounding from design 2, which means when the user logs in we would have a hospital-like waiting room surrounding. However, the menu this time would be represented by a clipboard that would make the whole experience even more immersive. The clipboard would have language selection, volume adjustment and video selection. The clipboard could possibly even have several pages to choose different options which would simulate filling out a medical form in an actual hospital.

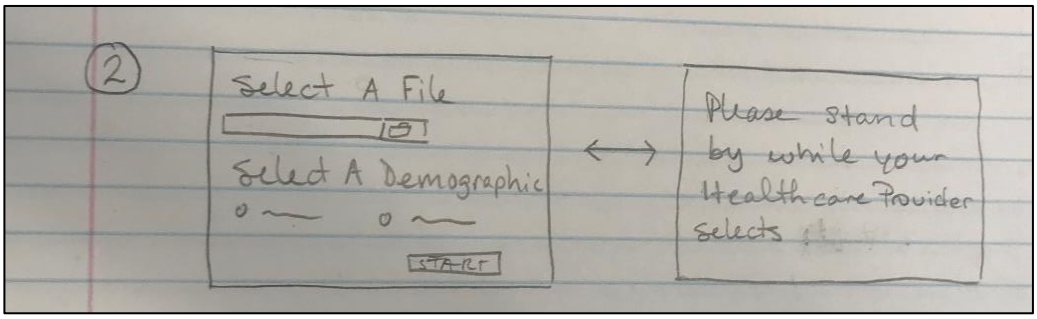


Menu Interface: Juan Hiedra

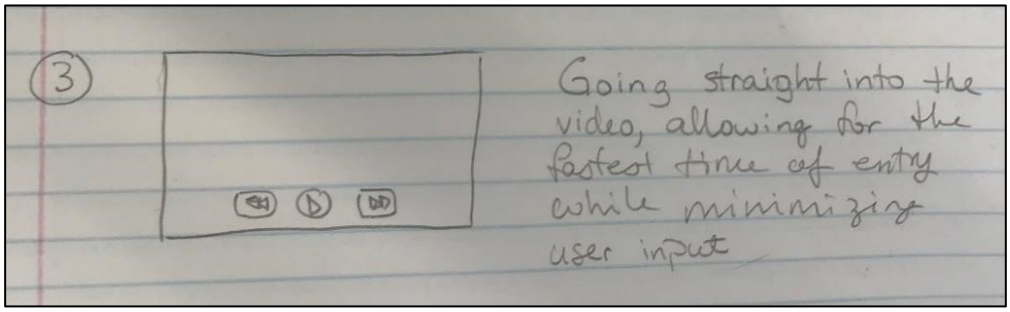
Design 10 – Features a variety of menu features, such as drop-down menus, checkboxes, and toggleable switches to provide the easiest use for the health-care practitioner managing the simulation. It displays the menu layered atop a clipboard model and is designed to look like a medical patient intake form, in order to facilitate immersion. It could be modified to display a "Stand-by" message instead, if the practitioner would rather not show the patient the process of filling out the parameters. Overall, the "Clipboard" design would be the most challenging to produce and code but would also be the most immersive.



Design 11 – Features a much simpler design, of a white outlined menu atop a black background, surrounding the environment of the patient, which makes it easier for the practitioner to navigate. It features the same menu options as Design 16, including the toggleable switches, checkboxes, and drop-down selections. Design 17 would be the most balanced of the three designs, having an aesthetically pleasing design (although less immersive than Design 16), and an easy-to-use and modular interface.

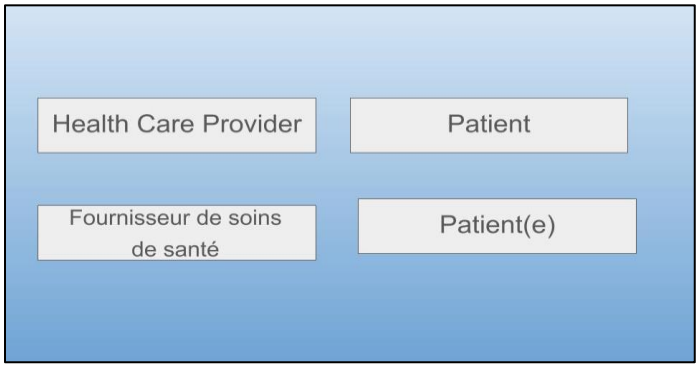


Design 12 – By contrast, it is the simplest of the three ideas: it would feature no user interface for the patient, and a user interface with sleek aesthetics but much more in-depth customization options than Designs 16 and 17, including file browsing capabilities and more specific menu options. This would be the most modular and straight-forward of the interfaces but does not lend to immersion nor aesthetics for the patient.

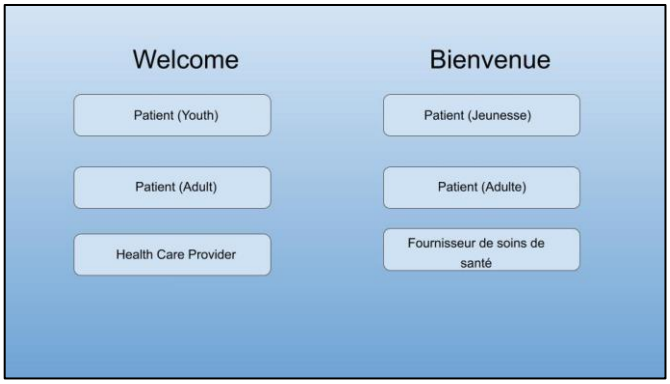


Menu Interface: Ritaj Abdoulla

Design 13 –This initial design is very basic showing the user a one menu list. Included in this list are options for health care providers and one for patients. Also included in this design are menu options for french speaking as well. Once the user selects their title, the health care providers will be able to add or select sequences of videos to play for the patient. The patient option will allow patients to choose the video they would like to view.



Design 14 – In this design I have again separated the french and english from one another really tailoring to the user. I have also added an option for the next menus to be a custom experience by age. In the youth menu it would include more fun colors and interactions. Their experience would be a bit simpler as we wouldn't want to overwhelm the user. In the adult section descriptions of each video could be provided to give a bit more information. Again, similar to the first patients will be given menu selections and the health care provider will be given options to add videos or play a sequence of existing videos.

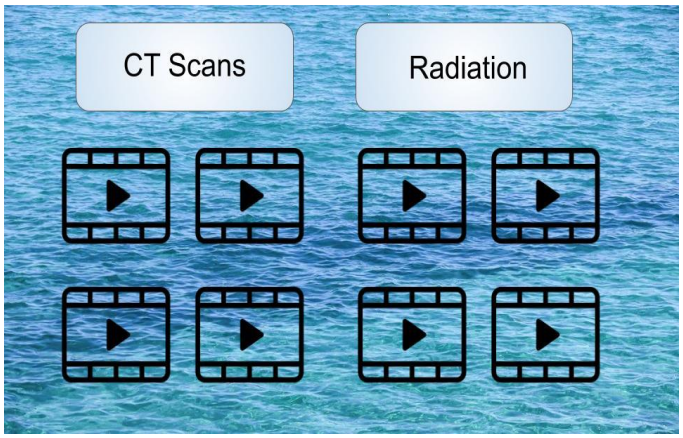


Design 15 – In my final design I incorporated all my initial ideas but made it into a more "simplistic" menu. Rather than having all the options thrown at the user at once, I have made a sequence of menus to not overcrowd the user. Relaxing backdrops and more aesthetically pleasing options will provide comfort before they even watch the videos. Same options as before for video selection.

(1)

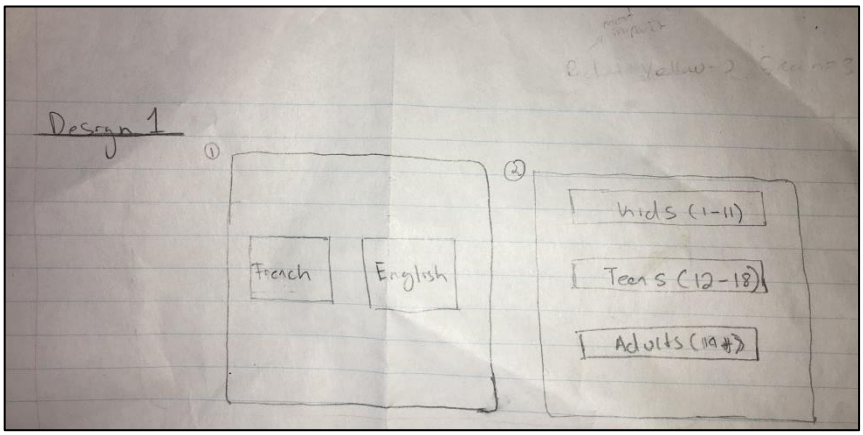
(2)

(3)

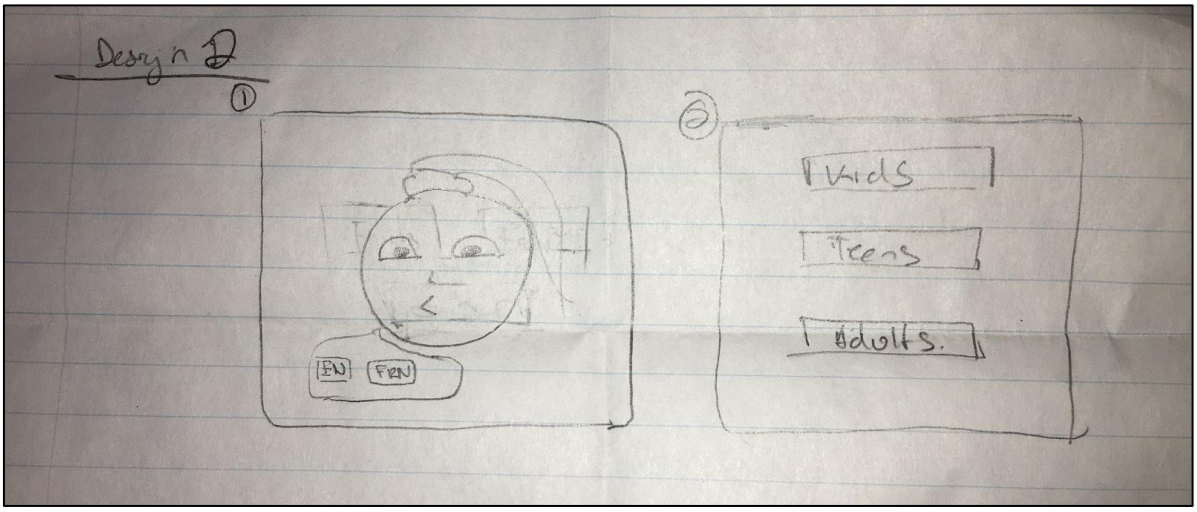


<u>Menu interface:</u> Jeta Thavarasah

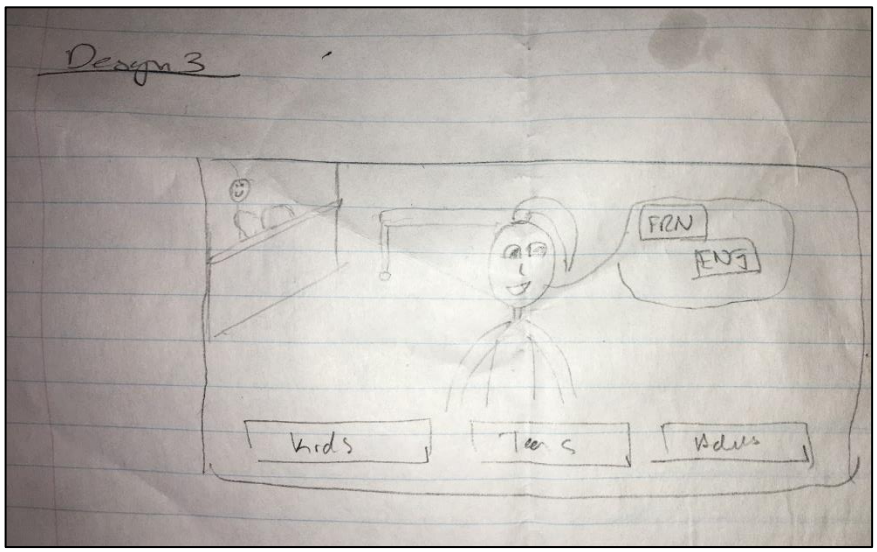
Design 16 – In this design we have a very simple structure of how the front screen would initially be for the user. They have the option of choosing between french or english. This is mandatory in the application as the patients may speak different languages. There is a menu drop for the application to be used according to different age groups, kids aged 1-11, teens aged 12-18 and adults.



Design 17 – The second design has an image of a nurse that will explain the options to the users and allow the user to decide which language they would like to take. This then follows a second section where the nurse will then explain verbally the different age group options as well. This way for those that are unable to decide for themselves get a better comprehension with a verbal explanation.



Design 18 – The last design displays the nurse explaining the process and options in an actual hospital setting. This view will allow the user to feel more comfortable using the VR application, all while educating them on the system. This more creative approach provides the user with a visual and verbal perspective of the menu.



Benchmarking

Each team member has benchmarked their three designs. This will be effective for the following step, where we will be evaluating our six best ideas to compile a final design concept.

Tables 1 – 7 : Benchmarking three designs per team member

Béatrice Pelletier	**Importance**	Red=1, Yellow = 2, Green = 3			*David MacPhee*	**Importance**	Red = 1, Yellow = 2, Green = 3		
Specifications Design		Design 1	Design 2	Design 3	**Specifications Design**		Design 4	Design 5	Design 6
Production Time	3	3	2	1	Production Time	3	3	2	1
Ease of use	3	3	3	3	Ease of Use	3	3	2	3
Aesthetics	2	2	3	3	Adaptability	2	1	3	2
Simplicity	1	3	2	1	Aesthetics	1	1	2	3
Adaptability	1	2	2	1	Simplicity	1	3	2	1
Immersion	2	2	2	3	Immersion	2	1	2	3
Navigation Time	2	3	3	2	Navigation Time	2	3	2	1
Total		37	35	30	Total		32	30	28
Alexandr Levchenkova	**Importance**	Red = 1, Yellow = 2, Green = 3			*Juan Hiedra*	**Importance**	Red = 1, Yellow = 2, Green = 3		
Specifications Design		Design 7	Design	Design 9	**Specifications Design**		Design 10	Design 11	Design 12
Production Time	3	3	2	1	Production Time	3	1	2	2
Ease of use	3	3	3	2	Ease of Use	3	2	2	2
Aesthetics	2	3	3	2	Adaptability	2	3	3	2
Simplicity	1	1	2	3	Aesthetics	1	1	2	2
Adaptability	1	3	2	1	Simplicity	1	3	2	3
Immersion	2	1	2	3	Immersion	2	2	1	1
Navigation Time	2	3	3	2	Navigation Time	2	1	2	2
Total		36	35	27	Total		27	26	27

Ritaj Abdoulla	**Importance**	Red = 1, Yellow = 2, Green = 3			*Jeta Thavarasah*	**Importance**	Red = 1, Yellow = 2, Green = 3		
Specifications Design		Design 13	Design 14	Design 15	**Specifications Design**		Design 16	Design 17	Design 18
Production Time	3	3	2	2	Production Time	2	3	2	1
Ease of Use	3	2	2	3	Ease of Use	3	3	3	2
Adaptability	2	3	3	3	Adaptability	2	3	3	2
Aesthetics	1	1	1	2	Aesthetics	1	1	2	2
Simplicity	1	3	2	3	Simplicity	1	3	2	3
Immersion	2	1	2	3	Immersion	2	2	1	1
Navigation Time	2	3	2	2	Navigation Time	2	1	1	3
Total		33	29	37	Total		34	29	26

Final Conceptual Design : Hospital Surrounding

After conceptualizing eighteen individual ideas, we have combined them to find a solid final idea. The final idea will contain aspects of the different sub-categories we had talked about previously : the colours, the environment, the functionality and the menu interface.

To begin, the nurse will ask a few basic questions to the patient:

1. What language do you prefer French or English?
2. How adept are you with Virtual Reality?

The nurse will already know the patient's age and they will be able to land in their correct age group.

The patient then puts the VR headset on and finds themselves in a three-dimensional modeled waiting room. This will hopefully resemble the Ottawa Hospital's waiting room to enhance the realistic experience the patient will obtain.

Whilst the patient is in the waiting room, the nurse will input the answers into the computer with a simple menu (similar to conceptual design #3, design #13) as well as the videos pertinent to the patient. This will make the VR experience unique depending on the users' selection and the criteria they fit.

If the patient is not adept with VR or has poor motor skills, the user experience will be very minimal. The clipboard will read "Please lie down and wait for further instructions from your health-care provider". Shortly after the videos will start.

The clipboard will have a different design and colour depending on the patient's age group. We have chosen to go with pastel tones for the adults and bright tones for youth. The colours we will use are green, pink, blue, white and orange. The design for youth will either include shapes such as stars (see design 2) or a cartoon character.

Each member individually conducted a benchmark for their own three designs (see table 1-, then as a team we created a final benchmarking to decide the best design from the top three other designs. We also included a sketch of our final idea.

The group has decided that the best design to use in our project is the Hospital surrounding design, in which the user has a 3D Modeled Hospital-like surrounding and a clipboard in their hand that they have to "fill out" which would simulate filling out a medical form. The reason for this conclusion is because this design relates and fulfills numerous design criteria, as well as fulfilling the problem statement defined in deliverable B: design a virtual

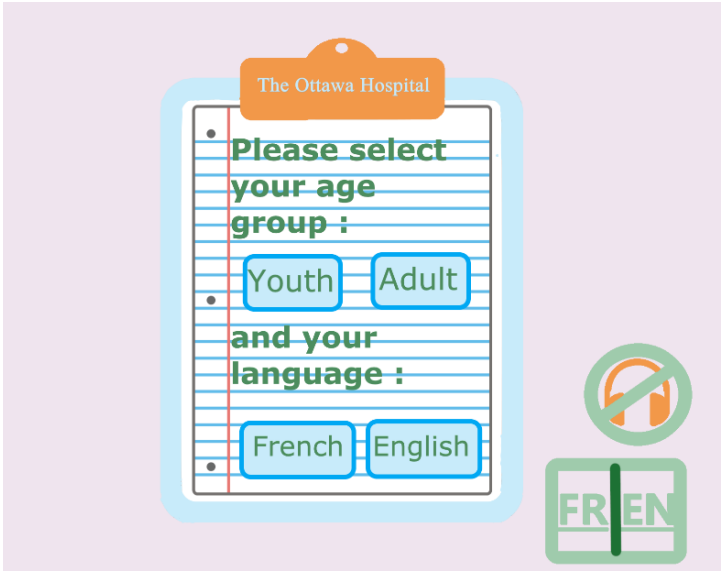
reality (VR) application that would simulate the stages of radiation that patients have to undergo while remaining cost-effective and meeting the patient's needs.

The group chose this design since it is the most immersive, intuitive and malleable to use in other medical fields. It is very easy for health care providers to add or remove any videos if they wish to do so. The application would be easy to use and wouldn't take much time to set up. Chosen by the heath care provider, it will either play the videos right away or let the patients do that by themselves. It can be used for several purposes and adjusted for different patients need and age.

Table 7 - Benchmarking top designs

Specifications Design	**Importance**	**Red = 1, Yellow = 2, Green = 3**					
		Design 1	**Design 4**	**Design 7**	**Design 12**	**Design 15**	**Design 16**
Production Time	3	3	3	3	2	2	3
Ease of Use	3	3	3	3	2	3	3
Adaptability	2	2	1	3	2	3	3
Aesthetics	1	3	1	1	2	2	1
Simplicity	1	2	3	3	3	3	3
Immersion	2	2	1	1	1	3	2
Navigation Time	2	3	3	3	2	2	1
Total		37	32	36	27	37	34

Final idea sketch :



The audio setting can be turned off and on. The language settings on the bottom right stay once the next interface shows up. The following interface will have the videos playing in a sequence.

As can be seen, the group has decided that the best design to use in our project is the Hospital surrounding design, in which the user has a 3D Modeled Hospital like surrounding and has a clipboard in their hand to fill out which would simulate filling out a medical form. The group will use the Hospital surrounding design since it meets all the requirements and design criteria. It is the best design based on our benchmarking and group discussions. The group will now start to develop the application in Unity.