**MinecraftEd Report**

The MinecraftEd project was from the start an extremely interesting venture, as I myself had an interest in the use of video games in education and was excited to begin work on the project. In this report I’ll go through my reflections on the project, addressing: Minecraft’s ease of use; the value of the realm; the project timescale; an explanation of the models I created and my thoughts on how Minecraft can be utilised in tertiary education.

**Minecraft’s Ease of Use**

As with all technologies Minecraft can be prone to the occasional glitch or other technical issues and in my personal experience when I first ran the program after installing it, I ran into significant technical challenges. I discovered it wouldn’t load due to a fault in my graphics card drivers and thus had to spend many hours troubleshooting and installing driver to solve the problem and update my graphics card – requiring significant time to research and additional technical knowhow. This could potentially cause problems if the use of Minecraft is implemented on personal computers opposed to standard issue university computers which could cause unseen very specific issues – which could take much time to solve.

Aside from this small blip, the software was incredibly user friendly and working with the program and the realm were easy – however I have had significant Minecraft experience before and thus am not a good metric to measure ease of use really.

The nature of the software is that it is very open source and customisable – due to its close relationship with java code – and it very much felt as if essentially anything desired could be accomplished given enough time and research. This originally can be somewhat off-putting as the almost infinite scope of the software can cause some amount of decision fatigue. However, the rather open source nature allows for large and in-depth projects and for enthusiastic users large things can be accomplished with relatively little research after the basic game concepts are understood due to the wealth of video tutorials and extensive wikis. The fun gamified element of the software creates a much more interesting and user-friendly experience in comparison to other programs which can be used to visualise, interact and teach scientific concepts.

**Was the Realm Valuable?**

It was extremely useful being able to build in a semi-public setting as it was wonderful being able to look at everyone else’s projects through their iterations and take inspiration from them to improve my oy own projects. Additionally, due to the realm permanently being up our schedules could be very flexible within a simple deadline and thus I never really build anything on the realm when anyone else was present, hence the potential pressure of being watched was never there for me. Seeing the creations other people had made additionally pushed me to work harder in order to keep up with everyone and meet deadlines and aim higher for more interesting projects

**Was the Prescribed Time Enough?**

The 12 hours a week was a very manageable and appropriate timescale and although almost every week I worked more than the prescribed it was more out of enthusiasm and taking on relatively ambitious projects. The nature of the set project can drastically change the timescale however as when I opted for larger 3D structural, more artistic projects took longer and depending on their complexity could quite easily require far more time depending on the additional research. However, with more technical projects I found they tended to be accomplished faster. The clarity of an idea in one’s head I found to take a largely variable time to solve and thus if Minecraft is used with a specific task in mind projects could be accomplished much faster as having a clear plan for the finished product really helps due to the very visual and graphical aspect of Minecraft

Explanation of Personal Concepts Used

Project 1 – CaMKII Model

Firstly, I ran with the idea of visually modelling CaMKII, as the current models of the enzyme are generally very complex, intricate and abstract – therefore at least in my experience the current visual models don’t add a great deal of understanding when viewed. In order to carry out this task I spent a large amount of time looking at broken down 3D models of CaMKII that others had come up with – primarily using abstract models from the protein data bank. From these models in the various cartoon styles I adapted the molecule into a 3D model built in Minecraft in a much more physical, understandable way. This process took a very large amount of time due to the lack of examples of visual models and the abstract complexity of any full models. It was also my first time really building a 3D model of a molecule and gaining the artistic skills and developing my spatial reasoning abilities which took time breaking down the complex structure of the protein into simpler, buildable shapes and then joining all of these together in a cohesive model. However, the physical building of the model once a clear picture in my head had been conceived didn’t take a long time, at least in comparison to the time I had to take to understand CaMKII’s physicality. If given more time I intended to colour code the different subunits and build individual subunits in order to better confer understanding of the molecular structure of the model. Essentially my intention with this model was to help teach and make others think about the physical nature of the protein and thus in order to explain my model it would be easy with me present to fly around the model and each element of the model through my viewpoint. If I was to convert the molecule to be self-explanatory, I would add large labels using in-game banners and then would transcribe by thoughts about the model into books on lecterns for user to read through for additional information. Due to the time spent I took getting a picture of the protein in my head a model of the same complexity would be hard for someone to reproduce in a manageable timescale, especially without much experience with art and spatial reasoning, however simplified (especially 2D) models could be easily recreated in order to convey a greater structural understanding to a student.

Project 2 – Heart and Animated Blood Flow

After making a purely structural almost artistic model of CaMKII I wanted to incorporate a structure aspect (because I feel that’s where the use of Minecraft shines and had had fun with it) but also include a mechanical/functional aspect as Minecraft is extremely pliable and I wanted to see what I could do with the open nature. Thus, due to a personal interest in cardiology I decided to try modelling my version of the heart in the game. I began with looking at pixel based art of a heart and through with other reference models of the heart, I recreated cartoon model of a heart with a decent reflection of reality and then incorporated a very basic redstone circuit in addition to somewhat basic use of the coding system in the game brining everything together with the foundational concept of animation – all together to produce a relatively simple animated heart. This project if given more time I could’ve labelled the different structures I included in the model and again included books with lecterns to conclusively explain everything going on in the model and its reflection of real life – however due to the autonomous nature of the model it is relatively selfexplanatory, and if a layman was walked through all of the basic concepts within Minecraft this specific project (or one similar using the same concepts) in a relatively short timescale.

Use in Teaching

As primarily Minecraft is a game and is there to entertain I believe it could be used as a far more engaging tool to teach people then conventional methods and due to the very open nature and integration of an in-game circuitry and coding system, it makes virtually anything possible – this is excluding the possibilities after modding the game which only requires knowledge of the Java programming language due to Minecraft being very open source and a wealth of tools and examples out there from Minecraft’s decade of history. In my experience with the whole research project I had to deal a great deal of research from peer-reviewed papers and journals and other university level resources and build a thorough, in-depth, scientifically relevant understanding of the basis behind my individual projects and with the right facilitation I believe Minecraft could be used in addition to self-study in order to build creations which as a side-effect require and build an extensive base of scientific knowledge. I could easily see a Minecraft based project take over from conventional nonlecture-based teaching methods such as the creation of posters and presentations and through Minecraft hopefully being more engaging prompt students to work harder and take more away then less interesting methods. As it stands there is still relatively little research and implementation of Minecraft and other video games in education and I believe there could definitely be further research in the form of honours or above projects into the use of video games in education (especially at secondary and tertiary levels) and the creation of more user friendly biomedical, biological and biochemical models in Minecraft due to the essentially endless possibilities of the game, allowing for extremely complex concepts to be modelled in the game.