Overall, Space Apps Challenge has been a unique experience in which we have had the opportunity to grow both personally and professionally!

Over the weekend and the month prior to the challenge, we have planned out as much as possible our GUMS system and have tried to get a basic mycology background in order to better understand how mushroom growth in hydroponics based systems. We are looking forward to continuing the development by adding the additional subsystems to the main porous tube nutrient delivery system. We believe that the solution we have came up with will certainly make a difference not only in long distance space travel, but also on Earth.

Overall development of the project started with planning stage. We started with initially coming up with a few ideas of projects that we could work on, and after brainstorming some ideas around hydroponics and tomato/lettuce growth, ordered pizza. Rebeca ordered a pizza with mushrooms on it, to which Bruce responded by voicing his dislike for mushrooms. Rebeca asked what Bruce would do if he was stuck somewhere and all there were to eat were mushrooms, to which Bruce responded, “hmm.. well we could use our hydroponic system to grow mushrooms”, and there we are. With the decision made, we spent a few weeks doing background research, ensuring that on the weekend of the hackathon, we could put together our report, and build the system from scratch. Alongside this, we placed any orders of hardware or parts that they would arrive for the weekend.

On the weekend of the hackathon, we started bright and early at 9am beginning the build. First creating the growth tubes (connector ends, black ABS tube, ceramic tube), then connecting them together to the pump and nutrient tank. With a quick trip to B&Q to pick up some extra sealant and pipe 90 degree turns, this system was mostly complete, with a few worries about leaks due to how quickly it had been put together. Then on day two, the wooden base was built, along with finishing touches to the tube system. The polycarbonate encasement alongside PIR insulation was then constructed around the box, ensuring that all gaps were sealed shut with aluminium tape. Nearing the end of day two, we recorded the walkthroughs and turning on of the pump for the first time.

Our biggest challenge was faced with the heating element. Our original plan called for a 2L cola bottle to be cut and an aquarium heater placed inside, however it proved too difficult to seal once it had been opened. With some other attempts with plastic bags, cut parts of a tube, and a trip to Tesco to quickly by a cereal container in a last-ditch attempt. Unfortunately we were unable to get the heater working and in a safe, sealed environment by the end of the hackathon. Alongside this, our fears were met with reality with a few small leaks from the tubes upon the pump being ran for a few minutes. We will drain the system and fix the leaks with epoxy.

Overall, we were very content with what we have been capable to build, considering how quickly it was manufactured. It was greatly aided by the 3D printed pipe connectors and fast drying epoxy/solvent cement. While we have bought the substrate and mushroom spores in a syringe, we have yet to put the substrate in the tubes. This was due to the leaks appearing and lack of time near the end of the weekend. We fully intend on still attempting to use the system in the coming weeks.