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| DCW – User Story to User Needs | Group activity |

To Do

* Read the User Story for this Module.
* Fill out the User Needs table below
* Be prepared to disucss your User Needs as written
* 8-min

User Story

Many engineered tissues require some type of bioreactor to allow cells to proliferate and grow or establish communication pathways, remodel the underlying hydrogel matrix, and even begin producing vasculature through angiogenesis. These bioreactors can differ pretty broadly, but many of them use some form of microfluidics or small environmental chambers as the bioreactor. These microfluidics usually require pumps. These pumps can be syringe pumps, gas-pressure pumps or peristaltic “roller” pumps. We often end up using these roller-style pumps in my lab to support tissue constructs in small microfluidic systems. Overall these pumps are inexpensive, and they get the job done but they could always be improved. For one thing, it would be ideal for several of these pumps to run off one motor with a way to detach or stop individual pumps when necessary. So, we could have multiple pump heads without the need to replicate the stepper motor, driver, Arduino etc. Also, these stepper motors can get pretty hot when they are run at low RPM, and these motors are often inside of an incubator. This can cause the roller pump assembly to warp. So, finding some way to avoid that from happening would be good. We could also use a really good user interface so the user could input some variables regarding tubing type and desired volumetric flowrate and the Arduino code would automatically set the step speed. Lastly, we could use a well-designed PCB or board layout for soldering or assembling all of the small electrical components, so we don’t have things like breadboards in the incubator. Or fixing the Solidworks CAD files to add configurations so the pumps could be resized based on using different tubes. Or really any other advancement on the user interface or function of these pumps would be great.

**User Needs**

*User Needs Matrix*

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| ID | Description |
| UN-1 | Improved UX / UI to allow for operator control. |
| UN-2 | Improve Solidworks files to include assembly, hardware, configurations and drawings. |
| UN-3 | Eliminate warping of printhead resulting to motor temperature when located in incubator. |
| UN-4 | A method to stop or detach pump heads individually when part of a multi-pump design. |
| UN-5 | Eliminate breadboard or prototype parts in circuit . |
| UN-6 | Multiple pump heads driven by one motor. |