

# DESIGN MODULE ONE: AN INTRODUCTION TO THE DESIGN THINKING PROCESS



Design Module 1 : Aquaponic System

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working with  
Dylan, Cole and Walker

ENVD 4363: Designing For & With Schools

# DESIGN MODULE ONE: AN INTRODUCTION TO THE DESIGN THINKING PROCESS

## PART ONE: GETTING TO KNOW THE GROUP OF IMAGINATION, NEGOTIATION, AND ARTISTIC ABILITY



Dylan  
'The Imagineer'

Dylan, 'The Imagineer', a sixth grader at Casey Middle School is an exceptional student full of charisma and work ethic. Throughout Design Module One, Dylan took on the role of brainstorming ideas, always coming up with design concepts both imaginative and realistic. Dylan has aspirations to become an architect one day, just as his grandfather.



Walker  
'The Negotiator'

Walker, 'The Negotiator', also a sixth grader at Casey Middle School is a very outspoken, well driven young man. Walker displayed exceptional ability to problem solve unforeseen issues during the design module through his negotiation tactics. Without Walker, the group would not only have lacked the ability to move forward during the module when design issues came up, but also the jokes and laughter that came with the process.



Cole  
'The Artist'

Cole, 'The Artist', also a sixth grader at Casey Middle School is a very self-motivated, promising young artist. Cole took on the role of drawing and communicating the groups ideas, while also brainstorming 'out-of-the-box' ideas for the group. Cole was a key member of the group, and without his artistic ability, the group would have lacked the ability to effectively communicate their ideas and bring them to fruition.

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## PART TWO: PROJECT SUMMARY

### PROJECT GOALS

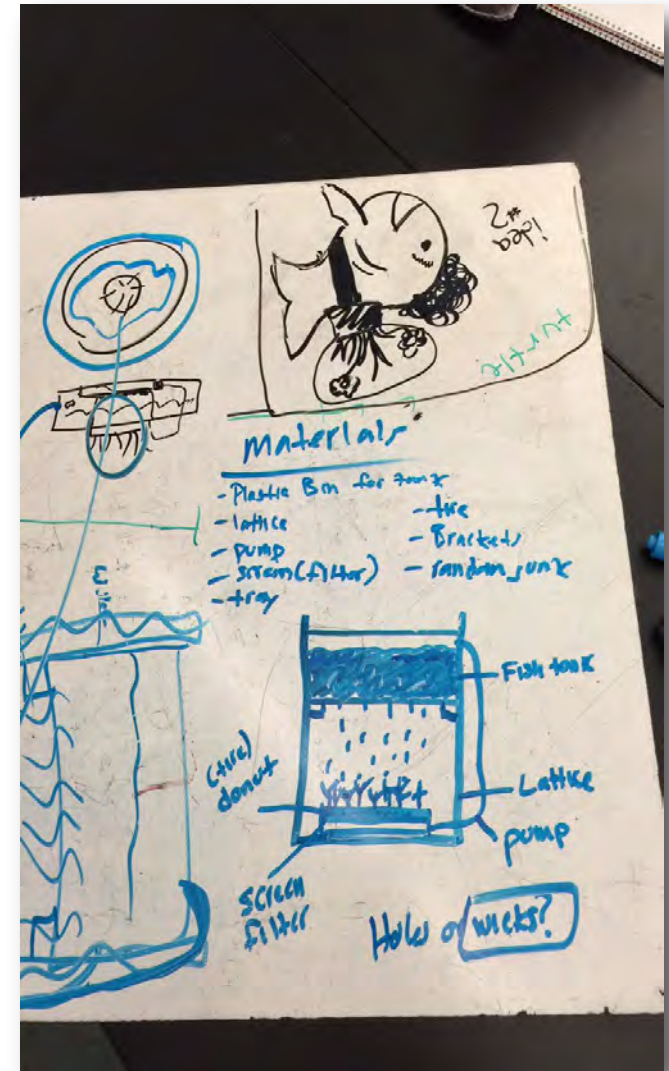
Design module ONE was an exploration into creative thinking and design, re-enforced by the 'design thinking process'. It was meant to serve as a stepping stone into the world of creative thinking, and the processes required to get from an idea floating around their heads, to a real feasible and working product. While doing so, we hoped to not only introduce the kids to the 'design thinking process' but also get them to critically and creatively think about natural systems, and their components. Further, we hoped to give importance to the issues of sustainability, and the notions of using recycled materials to support their desired outcomes. By doing all of the above, it remained a persistent goal throughout to support and encourage teamwork, collaboration, leadership, and creativity amongst the students in a non-traditional classroom setting.

### DESIGN GOALS

The above objectives were set out to be achieved by creating an 'aquaponic' system made out of recycled materials found at a local scrapyard, ReSource, in Boulder, Colorado. The students, in fact began the design process by sitting down and listing out a set of goals they had hoped to achieve during the project. First, and foremost, they wanted to create the 'best' design not only in the entire class, but in the entire 'world'. The students wanted to have the most creative and functional aquaponic system in the end. Further, the students made it a goal to have a system that supported life and had the ability to effectively pump water through the system. Although at times rather ambitious in nature, the students ability to set their goals out was particularly admirable.

As the process moved along, and the project goals were put forth, the students began brainstorming their ideas. Dylan was a man on a mission as we began the first stages of the 'design thinking process'. As we plugged away and ideas flourished, given his artistic ability, Cole was tasked with drawing the ideas in his notebook and white board. As issues came about, and the group began to struggle with the unforeseen issues, Walker began acting as a negotiator often coming up solutions to the problems.

As the first day came to an end, the group settled on an idea, and was now time to make a list of materials they would need to construct their aquaponic system. These materials to be collected at ReSource included: plastic bin to hold water; lattice; pump; screen acting as a filter; tire; brackets; random junk.



The groups brainstorming and ideation process

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### PROJECT OUTCOMES

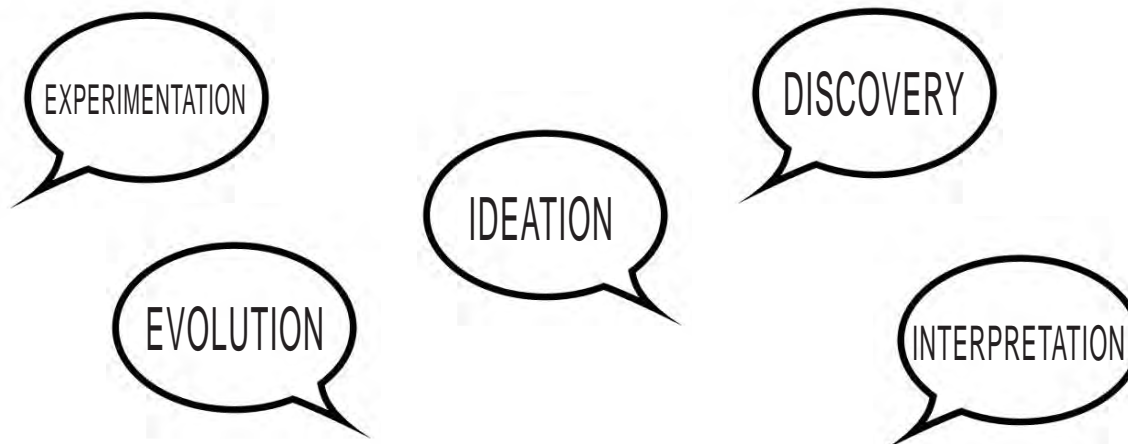
After hard work, dedication, enthusiasm, and plenty of laughs throughout, the group was able to finish their aquaponic design. During the course of the project, the group faced many obstacles, but was able to overcome them and create a truly outstanding and creative system. The first major obstacle came after collecting the materials necessary at ReSource. As the group met a week after collecting our materials, we came to the realization that the design would have to be adapted, according to the materials collected. This came as a valuable lesson for the students as it allowed us to go back, examine and re-enforce the design thinking process. This was a turning point for the group, as we sat down, and essentially started the whole process over with more brainstorming, ideation, and drawing. Dylan found this to be a bit of an annoyance, while Walker and Cole caught on and became exceptionally engaged with the process. As a byproduct, the group became fundamentally more literate, and were shown the importance and relevance of the design thinking process first hand.

As the group once again came to a final design, the construction phase began. Although difficult at times to keep focus given the plethora of power tools and strange objects littered through out the classroom, the group displayed, yet again, profound ability to problem solve, work as a team and collaborate.

The final design took shape in a peculiar way. The group used and cut a sheet of plastic lattice to vertically re-enforce the system while using a round tin container, screen mesh and wicks from a mop head to feed water to the plants and soil above from a container of water and rocks below. A garlic clove and strawberries were planted. Although the project may not win any ASLA awards, the group did set out to achieve many of the goals they had hope to, while also achieving many of the goals that we, the CU students, had also hope to achieve such as encouraging teamwork, collaboration, leadership and the design thinking process.



The group working together to solve a design issue



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### CHALLENGES

- Keeping the students focused during the construction of the project given the amount of distraction in the classroom and during times in which standardized testing was occurring at Casey.
- Encouraging teamwork during times of struggle and problem solving.
- Allowing the students to work through unforeseen issues when possible solutions were rather apparent to us, the CU students.
- During the early stages of the project, clearly communicating the design thinking process, and the reasons for for which we use it.

### ACCOMPLISHMENTS

- During the early stages, the group displayed admirable ability to put forth goals and see them carried out.
- Identify and designate roles for each group member.
- Returning to and better communicating the design thinking process and encouraging the use of it after collecting materials at ReSource.
- Solving the unforeseen issues that commonly came up during the construction phase.
- Think creatively and outside the box while also reiterating the ideas of sustainability, and the use of recycled materials.
- The ability to adapt.
- Laughed, bonded and had a fun time!

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## PART THREE: PROJECT DELIVERABLES AND KEY TAKE AWAYS

### PROJECT DELIVERABLES

Working with the students at Casey should be seen as an opportunity to engage students in a non-traditional classroom setting, where students are free to roam, collaborate and essentially use any materials found in the classroom they desire. This method of education provided the class with the rare opportunity get away from their desk chairs and work with the CU students in a much more informative, creative and engaging way. The following is a documentation of the happenings and experiences while designing and constructing aquaponic systems with the students at Casey Middle School:



Sarah and Chris listening to Cole and his idea about the lattice frame



Walker cutting the lattice with a saw



Dylan and Cole constructing an Archimedes screw

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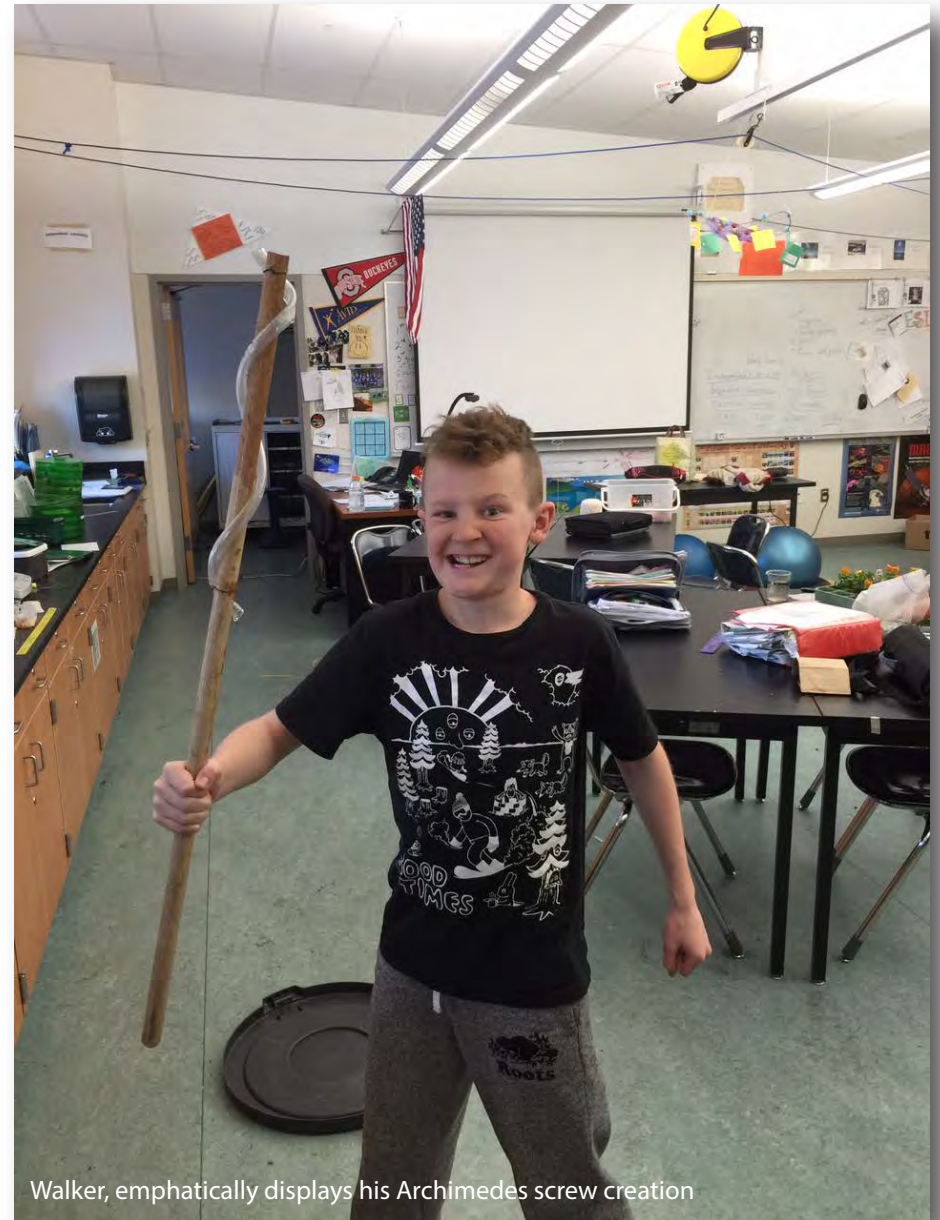
## PART THREE: PROJECT DELIVERABLES AND KEY TAKE AWAYS



Cole doing research about pumps



Walker and his group members presenting their final design



Walker, emphatically displays his Archimedes screw creation

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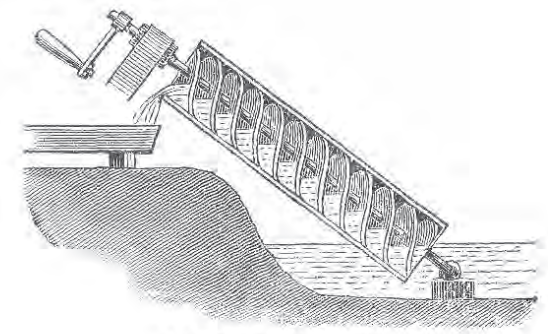
### PROJECT DELIVERABLES AND KEY TAKE AWAYS

Overall, the project should be seen as an extreme success. Everyone had fun, shared laughs and managed to finish the project on time, and without injury-- a success in of itself. Dylan was truly the mastermind behind the project. He was consistently coming up with great ideas and displayed extreme devotion to coming up with the most creative solutions. By the end of the Module, Dylan had decided that he wants to become an architect one day, just as his grandfather, and fellow CU students.

Walker was difficult to reach in the beginning stages of the design module. It took him some time to become fully engaged, but once he did, he never looked back and became a key member and contributor the success of our group. Anytime there was an issue being debated over amongst the group, Walker found a way to suggest a feasible compromise. The turning point for Walker should be seen at the point in which we decided to return the re-evaluate the five steps of the design thinking process. He grasped this idea and held onto and became very outspoken about it.

Cole, at times a little more reserved and quiet, displayed tremendous artistic ability. He was the groups communicator and took on the role of extracting Dylan and Walker's ideas and placing them on paper. Without Cole's ability to draw and communicate, the group would have had a much more difficult time getting through the design thinking process. Further, Cole has quite the imagination. His first ides for the project was to find a dead fish, and grow plants out of it. For this idea, Cole has been awarded the 'best brainstormer' out of the entire class. In addition, Cole came up with a creative solution to pump water from the bottom of the system to the top that he had learned about in another science class-- an Archimedes Screw. Cole and his fellow group members were very proud of this particular achievement.

For Chris and Sarah, many lessons were learned throughout. First and foremost, the realization we first came to was just how exhausting spending time in a classroom can truly be. Second, working with Dylan, Walker and Cole showed us just how creative 6th graders really can be. Time after time they were coming up with ideas that simply left us in awe--such as Cole's Archimedes screw solution. We learned that while working in a classroom setting, just how important adaptability is. We needed to not only adapt the design several times, but also the format in which the group was working. During the beginning stages of the project, the three boys had a difficult time working together, until we began to notice their strengths and weaknesses. At this time, we adapted and designated each student with different roles. It was at this point that the group began to flourish and become much more engaged and focused.



Archimedeian Screw.

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We now realize how important effective communication is while working with students. During early stages of the project, 'grand picture' communication was greatly lacking and the kids took notice. To combat this, we often times found ourselves talking to the group asking them questions and reminding them why it is what we are doing. This always seemed to benefit the team in many ways and bring focus back to the group when it seemed to be disappearing.

Near the end stages of the project, the group became, at times, a little more difficult to work with. As previously mentioned, this may be a cause of standardized testing happening at the school, and with spring break around the corner. But this could also be the byproduct of the students getting bored with the project and wanting to move on to something new. The time frame for which middle school students are willing to stay focused and engaged in a project doesn't appear to be so long.

Design Module ONE was an excellent opportunity to work with three excellent young men in a non-traditional classroom setting. We feel as if we were able to effectively work with and teach Dylan, Cole and Walker something about design, and the processes behind it, but perhaps even more so, Dylan, Cole and Walker taught the two of us a lot about themselves and what it means to work with and engage our youth.



Dylan, Cole and Walker with their final creation.