**Audios & Videos from classroom**

**Week 1: Session 1&2-Exploring biomimicry concept**

Voice recorder 12 min

**Week 2: Session 3&4-Exploring biomimicry examples & deciding on inspiration from nature&idea brainstorm**

Voice recorder table 1&2 34 min

Voice recorder table 3 35 min

Voice recorder table 2 52 min

**Week 3: Session 5&6-Sketching and iterating on design**

Camera following teacher 10 min

Camera following teacher 25 min

Camera following teacher 8 min

Voice recorder table 1 53 min

Voice recorder table 2 53 min

Voice recorder table 3 53 min

**Week 4&5: Session 7&8 Self-assessment and taking design on TinkerCAD, improving on TinkerCAD, final presentation**

Camera 1 Formative assessment and interview on experience 16 min

Camera 2 Presentation on final designs

Camera 3 TinkerCAD specific 44 min

**A total of 6 hours 51 minutes of recording about the design and learning process, transcribed by the software, Descript.**

**S1-16=Pupils**

**T=Teacher**

**C=Researcher**

**First week, Session 1&2**

S12: okay, simple words, imitation of the living

S8: imitation of us

S12: well not just us, because there’s loads of other things living

S8: well we are living, so painting portraits is biomimicry?

S12: no but there’s other things not just humans

S8: yea but painting portraits is copying living things

S12: no but it’s imitation, imitation is based on the ideas of living stuff, and we create stuff, painting is jut not it

…

T: okay, guys, what’s your own definition for biomimicry

S8: biomimicry is mimicking characteristics of nature to make human design more efficient

T: characteristics, who wants to share,

S4: I don’t understand…

T: Okay who else want to share

S9: umm, design strategy, functions, biological strategies, organisms, and traits?

T: yea, those are key terms related to biomimicry

T: Now, an example of biomimicry, who would like to share an example

S6: Well the ducks, they have like the web things here, and the webs help them to swim faster and against current

T: okay what kind of thing, or human design, that is being inspired by this

S6: like paddles, like on the feet they have these fin things

T: yes well done, another example?

S12: the flying squerrals, they inspire the suits that you glide with, i love those

T: Okay who can give me a non-example of biomimicry

S9: a whale water fountain

S8: flamingo floatie

T: oh yea, because it looks like a flamingo but it’s not necessarily a design that’s inspired by the function that this animal has. Okay guys, we will come back to these concepts, but we have to move on.

T: okay, put your hands up if you have learned about analogy? (very few hands) well okay guys, we have learned about it and we have actually done it since primary, if some of you remember. Can somebody help me read the definition of it, loud and clear?

Students: reading definition and examples from the slide

T: yea so that’s analogy, so biomimicry is an analogy of the function of the natural things and then humans think how to link to functional things for human needs

T: so basically biomimicry is design by analogy, something inspired by nature, what we want to share with you, which is super super interesting, is that many human things, are actually inspired by nature (reading example of rabbits’ ears from slide), and humans have used this ideas for the design of cooling system

**Second week, Session 3&4**

**Voice recorder 1&2 learning about biomimicry examples**

T: we have five minutes, to look at the nature things you choose, we really have five minutes, concentrate, and learn a little more about the things you chose

T: did you check the videos

S14: Ms I already know why they shake off, so they don’t stay wet, cuz they need to dry themselves

T: So what is the biological strategy then

S14: Im still confused by that

S15: Ms, are towels inspired by fur?

T: what do you think?

S15: no

T: why not? Did you watch the video? Did you watch the resources?

…

T: did you check the website?

S5: we checked the website but

T: open it! The function, cuz it’s like the Eiffel tower didn’t use like the bone, they used the structure of the bone. So once again, the function of these structures, so in this case, it was the function of the pine cone. Have a look at those things, think about the structure of the pine cone…

…

T: It’s like super interesting, I have a friend who collects pine cones from around the world, and she gets really excited to identify the differences between pine cones, so what you are saying is true, the short answer is yes, the pine cone changes

S5: according to the weather

T: yes, now go and look at the resources more

S5: the colder it is the stronger they are

S6: so the function, the function would be that it open and closes in reaction to weather

S5: okay so the organism is pine cone

T: okay here you have a couple of resources

S1: oh I thought we are going to write what we want

T: yea yea, you can use these resources as inspiration

S1: okay what does it mean by function again? You know we have two put it on Jamboard, like a trait is what is special of but what is a function…

T: okay, now that you have a bit of research on the traits of the nature things you choose, please try to sketch four things, four solutions, that you can… I will pull up the design challenge again, you have ten minutes to do it, so you have like 2 minutes per idea, I will start the clock now

S1: well okay we have two and a half minutes per idea

S7: Ms, which is the one we are doing? This one? Or this one no?

T: Guys, don’t just sketch it, if you have a bit of time, then explain what it is, you have one minute left

S5: look it cannot be an umbrella, because when it’s cold and wet it’s gonna close (referring to pine cone)

S6: a house, oh okay never mind, Oh a car, like a folding car, it opens when it’s warm and closes when it’s cold and rainy… wait like a convertible car…

M to whole class: it’s for camping, once again go back to the design question, how can you help a group of campers to make gears that are weather resistant, gears for campers. How is it related to pine cones? Maybe it has different layers

S6: oh yea it has to link to the pine cone

T: guys it needs to be related to the nature thing that you chose

S1: … the second idea was inspired by the spiral tree, it has these spiral and when there is wind it starts rotating, rotating gots energy, so when you go camping you can have like a grill and you can power it, it’s just supposed to create energy. the wind makes it spin, and when it spins we have energy

…

T: idea 3, go!

S6: do you think pine cones can burn? Because they are woods, you could use it as a campfire…

S5: Pine cones are water resistant? S6: yea pine cone are water resistant, but okay, let’s do wind, because well they are heavy, not that heavy as in like…

S5: oh they are heavy for the tree to hold, because when there is strong wind, or like where there is a strong storm, you can see when they fall off

S6: I was gonna say like since they are so small on the ground, they are hard to blow away, because the wind takes like the air up… okay maybe like a tent

S5: okay but like what we saw in the document, when it’s open, when the water goes in, it gets into a specific form, it goes into like the leaves part, and you can use that, tho i don’t know how you can use that

S6: well we can use it like a tent, like a hut, cuz it’s like flat at the bottom and then it gets pointy at the top.

S5: yea but that’s really hard to make…

…

T: Guys, you should be on idea 4

S5: yes we are trying to think of an idea but it’s very hard, there’s not much

S6: yea

T: don’t focus on the thing focus on its function

S5: but we can’t find a function on them, it’s hard, we got the hardest one!

T: no, pine cone has like these layers, and it opens and closes when weather change

S5: yea it opens and closes but we can’t use it as an umbrella because when its’ wet it closes, what am I supposed to do with that? (here we see that they are trying to visualize how such biologicla strategy can be applied as a design strategy)

T: I don’t know, have a think!

S5: okay what can we do when it’s wet… we got the hardest one!

…

T: I need your full attention, it’s decision-making time my friend, we are gonna give you this sheet…

S1: I think that here, our first one, uses the spiral tree thing, so when the wind comes in, it makes it rotate and create energy, so I think the first one, I don’t think it fits the design challenge but I think it’s biomimicry

T: good then put it there

S1: okay, this is spin sun tree, okay so the wind hits and the spin sun tree generates energy, it does it 24/7 so if no one is there the energy goes to the power box there. Spin sun tree, ten out of ten name

T: what’s your number three then

S1: it’s a tent, and it draws the wind and redistribute the wind energy, it’s for campers to sleep in and so while they are sleeping, the wind won’t go crazy

T: okay so is it wind resistant, and water resistant?

S1: it’s not water resistant, but it’s wind resistant

**Voice recorder 3 35 min- deciding on inspiration from nature and idea brainstorm**

T: okay, now that you have a bit of research on the traits of the nature things you choose, please try to sketch four things, four solutions, that you can… I will pull up the design challenge again, you have ten minutes to do it, so you have like 2 minutes per idea, I will start the clock now

S14: okay lets first do the one we just came up with

S15: water proof fur…

S14: water proof fur? Fur is not water proof…

S15: well we can make one

S1: well but then that’s not using the idea

S15: no but we are using it with another idea

S1: you can have water proof skin but

S14: Ms, can we use fur, so basically, is it possible to get water proof fur and to put it on like the out layer of the tent

T: how

S14: if there is a way, we just like we stick it on, and we put some fabric under…

…

T: time for the second idea, try to think of something opposite… 2 minutes

…

S15: and then we need some sticks to make it stand up… and that would be pretty comfortable

S14: how about we make one with like connect to the water

S15 how

S14: like you can have a tent inside a tent, nevermind

S14: so the tent will be made fully out of fur, and with those stands just to make it stand

S14: shall we think of a soaking thing, just to expand our idea…

…

T: idea 3, go! try to think of something completely different, as crazy as possible

S14: okay more tents?

S15: no it’s like a soaking thing

T: This one needs to be as crazy as possible, what is it

S14: a ball of fur to soak up the water

T: that’s crazy and i like it

T: don’t make the same example, try to at least add a gadget to it, change something

T: okay the last idea, it would be something people would like to buy

S14: okay can we do just anything

S15: well just make something, and remember it doesn’t have to go inside the tent

S14: Im bad at this

T: what are you talking about you are super bright

S14: what about like a this covered by this, and you cover it and dig a little opening into like a stream, and it filters out any like dirt

T: love it

…

T: okay, I have to say that I’m super proud of you, you have come up with four different ideas in a very short amount of time. Now, it is decision time. Before the decision time i want you to stand up and stretch, and go around the table…

T: I need your full attention, it’s decision-making time my friend, we are gonna give you this sheet, (the choice box) it has four squares… who can tell me the design question in your own words, yes, so something for camping and inspired by nature. If you think that from your four designs, it doesn’t really fit the design question, and it’s not really original, then you put the number of your design here. If you check your pages, you have four designs, 1, 2, 3, 4, and you can check your design, and you can give it a name also, if you think that umm it doesn’t really answer the design question, but it reflects biomimicry, then you put it here, because you are somehow inspired by nature inspired by the function of nature, and if you say, umm, it doesn’t really reflect biomimicry, but it does do something for the campers, then you put the number or the name here, and if you think, oh, it’s related to biomimicry and it helps to answer the design question, then it goes here. And this one here is going to be the winner. So i want you to be super critical now, these four ideas, give it a name, and decide one this page where it needs to go. Put your hand up if you understand what you need to do….. S11 could you share what we have to do?

S11: so you have numbered your four designs, and with your partner you pick like a design, and you put it in a box that you think it fits in, for example, fitting the design challenge but it does not reflect biomimicry yet, you could put it in that box there

T: yea okay, based on whether it’s related to biomimicry and whether it answers the design question, you are going to put it in this grid, and the one in this one is gonna be the winning design. So we are gonna pass it on, and you have ten minutes to do that

S2:okay one and two keep the wind out and keep heat and sunlight in, well not the sun light in but it keeps the sun radiation inside, it brings the rain to one collection point and has ridges, so they are basically the same

S2: one is like somewhere here…

S14: Okay lets’ choose, which one do you think

S15: this one should go over there

S14: which one?

S15: nevermind I don’t know

S2: okay this one reflects biomimicry, because it has these ridges when it’s trying to get like, sunlight, but when it gets a bit over windy, it deflects some wind and, so it’s like one out of those two aspects, so i think i will put it higher up, so somewhere here

S4: so that one is better than this one?

S2: in my opinion yes

S4: this one i think i will put it somewhere here because there’s already folding cups, it only reflects biomimicry because it’s foldable and sturdy, but like campers already have it, so I will put it here

S15: okay this one, not that fitting and it’s not biomimicry…

S2: yea okay it’s not very sturdy unless you pin it down, so i’m gonna say not the best

S15: what are we gonna call this…

S14: furry ball… water soaker

S2: what is that

S15: oh that one is like waterproof tent layer

S2: so I guess tactical turf…

S14: So basically we have four ideas, for camping, and they are all used fur in them, so number one, it’s basically a layer of the tent, that is water proof, because some tents are not water proof, basically it’s for the non-waterproof tents, so it will soak the water and dry itself

S15: the second one is about the outer layer of the tent, which is basically about the fur, and the stand, and here is a zip lock so if you want to enter the tent, you can open the zipper

S14: okay the third one, is like a big ball, fur ball that can soak up water in tent, so basically if you have leftover water in tent, you can use this to soak it up, and then you can squeeze it somewhere else

S15: so this one is like completely different, it’s basically a glove that is water proof, and it’s made of fur, so it absorbs the water, these are called the water-proof fur gloves. Inside them you have cotton, which keeps you warm. So that’s it

T: We are so proud of you, there’s a lot that happened today, super proud….

**Voice recorder 2 exploring biomimicry examples and deciding on inspiration from nature and idea brainstorm**

T: okay, now that you have a bit of research on the traits of the nature things you choose, please try to sketch four things, four solutions, that you can… I will pull up the design challenge again, you have ten minutes to do it, so you have like 2 minutes per idea, I will start the clock now

S10: okay, like furry waterproof jacket that you can shake

S11: maybe we need something to quickly shed the water

S10: which is a dryer

…

S13: like this thing that goes around the tree around the leaves

S12: yea we should do that on tent

S8: it can filter wind… so here we draw a tree

T: okay guys you have 20 seconds to finish up the first idea and we are gonna try to come up with another idea…

S8: maybe something like a sink…

…

S10: like this chair…

…

S10: a crazy one would be something like car

S8: oh like a furry car …

…

Decision-making time:

S12 to the camera: so we decided on our wind-resistant tent because there are ridges on the tent that the wind can channel through, we also thought of anti-slip shoes, but it does not fit the design challenge because it’s not wind or water resistant. And we also have a water collecting camping bag, which we have made a picture here, but we don’t really know how it was inspired by the tree, because the tree doesn’t collect water with it, and we also have a chair, but yea

…

S10: okay this is the best drawing we have so far

S13: so number one will be here…

S10: it’s like good, but not good enough, so im gonna put it here

S11: oh hold on, it doesn’t fit the design challenge

S12: this one doesn’t really reflect biomimicry, and it’s not wind or water-resistant

S10: okay the coat, the coat was a failure…

S10: well this reflects biomimicry, but this is not like our winning design, should we put it here?

T: can you elaborate on this

S10: okay so basically, there is this furry lining, and if it gets wet, you can shake it and it will dry

T: okay, tell me about your design

S8: we have four designs, SS, channel 1, dry chair and dry tent

T: so from here you still need to choose

S8: yea we did choose

T: oh so the dry tent, but why

S8: because…(noise)

…

**Third week, session 5&6-Sketching and iterating on design**

**Transcription from camera following teacher**

T: Good morning everyone, so this is the fifth lesson, who can tell me do you remember what was the design challenge?

S8: To use biomimicry to make gears for campers that are wind or water resistant

T: okay, do you remember, how we came up with things on that walls (the specimens from nature wall), you want to tell me how did we find it？

S2: We went on a walk to find something that inspire designs

T: and you spotted interesting things to inspire human design, everyday designs. So what we are going to do today is we are gloing to revisit your design ideas, from the first session, because you already have very nice ideas, and based on your choice box, because you also briantormed at least four ideas that you chose one. And today, we are going to conceptualize our design. So we are going to think about it, elaborate it, describe it, and give feedback to each other. What I want you to do is to have a think at the characteristics, you remember we used these worksheets, once you decide on ah this is the design I want to work on, you are going to fill out these exact same worksheet that you have. So step one have a look at what you have, step two, get these paper, identify once again, which organism you are focusing, some of you choose maybe the pine cone, tree, and the leaves.. Have a think of what nature thing you were using as analogy, remember we were also talking about analogy to design something for the campers. And we also have sketching papers. We are going to ask you to sketch your final design. Here we have the characteristics, like this one here, like the rabbit one here, like the function is cooling, like I remember someone telling me how the leaves was so soft that it reminds you of a teddy bear. So, even though you already have two ideas, choose the one that you like best, and develop on that idea, does that make sense? So once you discuss with your team, take these papers to identify and describe how you want to come up with your design, and Im gonna ask you to sketch it on these papers. (showing papers with small squares) You know how we have used isometric paper before, just to give you an idea, if you want to do the 2D or 3D version, you can use these papers, we thought that these squares might help you to make it a bit more, ugh

S8: but can we use isometric papers?

T: yea, i also have isometric papers, so you can use this or this. Okay everyone knows what to do? You have one minute to tell your shoulder buddy what we are going to do.

**Camera following teacher**

T: which organism did you choose

S12: spiral tree and it’s swirling trunk

T: okay, what’s the strategy from it

S12: making swirl

T: okay what’s your design, oh okay you choose the swiriling tent, so you are going to use the swirly… so what is the biological strategy? Here you need to name it, and what makes this idea stand out

S12: i don’t know

T: okay (walks away)

T: okay show me, what’s your chosen idea

S14 : it’s like a ball of fur that can like soak up water

T: it can soak water, okay

S14: we are using the dog fur and some extra material together

T: so for example, if we have a look at the bunny, their ears help them to cool the blood, and that’s their biological strategy. So here maybe the biological strategy is the waterproof of the fur? And then are you using the isometric paper to draw?

S14: we are

T: okay, good (walks away)

S14: what do you mean like what makes this idea stand out from others

T: you drew four ideas, and somehow you end up with this one, so what makes this special. Are you in charge of the sketching?

S15: yea, I still don’t know how

T: this is your chosen design right? This one here? I think you are doing a great job, why are you erasing it?

S15: it’s like not connecting to each other (gesturing a triangular tent top shape and erasing the previous sketching, and setting to sketch again)

T: you could also using the white side (i.e. the blank paper, with no grids or no isometric planning) whatever works best for you

T: do you have another idea?... i still don’t… is the idea like having a furry ball that helps you to dry out your tent?

S14: yea, like if you have a puddle in your tent

T: okay, so the water soaker

S14: its like the size of this, (gesturing), and they can like squeeze out like outside

T: it’s like a big sponge

S14: yes

T: a furry big sponge to keep you dry

S14: that is special for camping

T: so maybe you can add something to this, because this is too general. Do you have some idea?

S15: no

T to S14&15: so you are focusing on the tent but actually this is not your design, guys, your design is the fur ball, does that make sense? So I suggest that you actually make a drawing of your fur ball because that’s what you are making. And we know that it helps to bring up the tent, but the tent is not your design. She’s giving you feedback to make it compact, but yea, just draw your ball here

**Voice recorder 1**

T: show me what you have

S1:We have to draw down our designs and make it better right?

S1:I don’t know how to…we did this online already right

T:Here, this is your chance to really really nail your design idea with what you chose, even though you already brainstormed, but you know what, my first design idea, like the one we had on our first day on the walk that we took, is already interesting so I will be using that. This is your chance to choose

S1: okay, but i don’t know what the name should be

T: You can come back to that later, do you remember which nature thing you were inspired by?

S1: ehh, spiral tree

T: S1 and S2, i can see you are sketching but you actually need to conceptually elaborate on your chosen design, so which one did you choose again?

S2: I forgot what kind of leaves but it was a type of leaf

T: okay leaves…

S2: oh hornbeam leaves, yea, hornbeam

S1: eh, function, what does it mean by function, okay, what is the function again?.... (students chit chatting about class-unrelated topics) Guys, I have a question, what is its function again?

S3: I don’t know, ask X

S1: (to X) what is the function again

S2: i didn’t work with this

S1: yea i know but I mean what does it mean by function

S2: like, what does it do

S1: distribute the wind, the same as its trait

S2: it’s actually, so the trait is something like, like a trait is like you have glasses, why you have glasses? To help with your vison. So the function is to help your vision, a trait is just something it has, basically

S4: What is a biological strategy… (in distant) what do i write about biological strategy

S2: eh, like, what is the strategy to get foldable leaves

S1: biological strategy, what does it mean by the biological strategy, it’s the strategy that it distribute the wind but it sounds basically the same, i don’t like it, im just gonna write distribute energy

S2: what’s the design strategy, i don’t know, i’m gonna go sketching

….

T: listen, we have three minutes, you need to wrap your ideas, and we still need to give each other feedback

T: Okay guys, two minutes, you need to finish your sketch and document it, what make these special, and you, I don’t see these being finished, you need to finish it, i know it’s there but you need to document it

S1: it first says sketch your design

T: yea i know but, oh, okay right

S2: can i just market this as foldable solar panels

T: okay guys write your name, and what would be a name for your design then? I like your sketch, and i like that he is making a bigger version, what’s the name of your design then?

S2: i don’t know, umm i have an idea but it’s on the tip of my tongue

T: well, share it with X and you two can come up with an idea, (and to the class: Guys, one minute)

S2: Ecosturdy? Umm i think i like ecosturdy

S2: smooth against the wild? Standing in the wild?... what should we call it? What should the slogan be?

Teacher to the whole class: Okay, i can see that most of you have developed your design idea into really great product, i’m super super proud of you, you are about to finish the sketches, once you are finalizing your design, it’s super important to ask a buddy for some feedback before putting the final touches, so that’s what’s gonna happen for the next ten minutes. Okay, guys listen, we have these feedback forms, we have used it before as well, when we give feedback, it’s important to recognize something good that they did, but it’s also important to be critical, as for the “how can” questions, so that can be to getting them to think how can they improve the design, maybe just focusing on one feature of the design, especially linking it to the nature features that you are using as an analogy. Does that make sense? Okay good. So what I’m gonna ask you to do, is that you have five minutes to present your design to your friends sitting next to you, yea, and this sheet is meant for you to give it to the other team. Is it clear? Five minutes to present and get feedback.

S2: Okay, this is so far what we have of the ecosturdy, it is a tent with a solar deck to supply solar power, based off of photosynthesis, it’s also foldable for transport with the water collection, so when it rain, you can collect the water and dump the water to nearby sewer and the EcoXX convert the smoke, so everytime you cook in the tent, they convert the smoke into the white smoke instead of the dark smoke, so far this is what we have

S1: okay our term, so basically we are inspired by the spiral tree, with the spiral tree (noise)

S2: is this like something you can hide in so people can’t catch you

S1: no

S2: oh so it’s is like a wind turbine

S1: no no, just wait, so like instead of distributing energy, it catches it to make it spin, and as it spins it transmit energy to the energy box

S2: is the energy box has battery or capacity

S1: i don’t know, but it spins, and the energy goes to here

S2: oh but you forgot to label the generator

Teacher to the whole class: okay, did you finish? Class listen, stop right now, i think you have heard enough, please start writing about the team that was presenting, write some feedback, a complement, something to improve, and a question, go

S1: what’s your title

S2: Okay the whole thing is called eco sturdy

S1: okay we are gonna call ours spin spin spin, okay that was a joke, eco energy

S2: okay you can just say, tree bines, like a tree turbine, because it’s like a tree, and it’s a wind turbine

S1: okay yea

S1: okay what do you mean by “how can you” (the feedback report)

**Voice recorder 2**

T: okay, which one did you choose for your design idea

S5: we chose this one

S6: we chose the shoe

S5: yea when its muddy outside

S7: and after, are we gonna do these in real life,

T: Oh these, we are, i’m going to talk about this later

S7: are we gonna like, do it, in real life

T: well we are going to design it now, and design it online, and if we have time later, we will 3D print it, but we will need a special software for that, but first finish elaborating your idea, so you chose… which one did you chose

S7: the one that no one wants to choose, the red, like the umbrella

T: what does it do

S7: it protects you from rain

T: and is this for the campers

S7: yea

T: so from which nature thing were you inspired from

S7: uh leaf

T: leaf, okay, so here, what are the characteristics, because remember, we have to design with something inspired from nature, and it has to be weather resistant, so which characteristics are you using from the leaf

S7: ….

S5: uh, what type of lace should we have, should we have a velcro…

S6: yea but we can do one lace like this, and one like this

S5: okay well I have a different idea, like this

S6: oh a zip

S5: yea and lots of straps that tighten it more, well hold up, im just gonna draw, okay how does a lace look like, oh okay just like X

S6: oh okay look we have the laces, we have the zip, and we will have velcro on the top part

S5: No just look look look, so we have this, and this and this to the half way

S6: yea and do a velcro here, look you have two laces down here, they just randomly stop and you have a velcro instead

S5: No no no, im doing this right now

S6: no I know, just put a velcro here instead

S5: well if you look at the shoes, you need to turn it around and tighten it, nah im just gonna put a lace, and a velcro here, so the lace don’t like, loose, so im just gonna draw the laces, like the lace X

S5: im not good at sketching… okay the velcro here, i wish i was good at sketching

…

S5: biological strateg… what does it mean by biological strategy

S6: it just mean your strategy

S5: okay, pine cone could be a…

T: Show me what you have, everything

S5: okay this is everything, and our sketch, not too neat yet, but we don’t know what this part means

T: so the biological strategy… so you remember what we have the ears and the bunny, what is it that makes it special about the pinecone, you mentioned it

S5: so when it’s warm it opens and when it’s cold it closes

T: great, that’s that

S6: and also like when it’s cold it closes and gets hard, and when it’s warm it opens and easily break

S5: easily breakable and fragile

S7: I don’t understand this, i have this umbrella

T: so the leaves, what makes the leaves special in terms of its function

S7: like, water resistant

T: yesss, so that’s the strategy you are using to inspire your design, but it could be better if you think of something more special, more focused for campers, could you add another picture to your umbrella that is more like camper related

T: okay maybe at the handle of this umbrella so you know when you go to camping and you have this umbrella, you also need like a mini hammer to like dududu (hammer it in the ground)

S7: ohhhh

T: so maybe if you add that, then it is more like camper-oriented, you know what I mean?

S7: yeaa

T: so at this end, it’s a hammer, and (the otherside) it opens

S7: ohh, yes, how do you do that

T: well go get a hammer in the room

T: listen, you have three minutes to wrap up your idea, and we still need to give each other feedback…

S6: can we make them already? I want to make them

…..

S5: hold on im just gonna make a bird’s eye view

S6: do it top

S5: that’s what im doing

S5: Ms. this is the plan, this is the bottom, this is the scale, this is the top, and these are the shoe laces, and here, so we have these because most of them just go around these so we put some velcro things around so they don’t move and don’t go away

T: that’s clever

S5: and also here on the side you can see it’s like, it’s easier so we can just put like a zipper, so you can open it and it’s easier to put on

S6: so you can slide in

T: so how is that related to the pine cone

S5: no that’s the bottom thing, we are just putting on some securities

T: oh, oh you are thinking in so many directions, well done, guys I think you are ready

…

S7: so Im gonna present mine, okay, this is a hammer, and like a pickaxe, and this also, and this is an umbrella, it’s triple use

S5: yes but I already know how to improve it, so if you are gonna use it as a pickaxe..

S7: no this is the pickaxe

S5: okay but why did you point here

S7: i don’t know

S5: well is it gonna be made out of metal, or what is it gonna be made out of

S7: i don’t know, that I will know after

S5: well you have to think of it now because let’s say it’s gonna be made out of metal it’s gonna be heavy and how are you gonna bring it around everywhere you go

S7: well maybe wood

S5: if it’s gonna be made out of wood then it’s not that good of a hammer because

S7: yea this part make of wood, and this is rock or metal

S5: yes but what type of metal, if it’s too heavy metal then it’s just gonna, you can’t hold it, maybe you can use carbon something, i forgot how it’s called, it’s something that lambogini are made out of that’s how they go super fast

S6: umm carbon fiber?

S5: yea it needs be strong and light

S6: aluminium…

S5: yea but that’s weak

S6: but it’s light

S6: hopefully you are not using your umbrella to break something

S7: no Im using this part to…

S5: but i also have another thing that you can make it better, lets say its a heavy storm…

T: okay everyone, stop stop stop, you have heard something from your buddy, now please start writing something on the feedback

S7: Im gonna use this wood, and thats a very strong wood, and im gonna put the axe…

S5: (presenting) what X and me have designed is a non-slip grip shoe, where its’ made out of pinecone, let’s say it’s stormy and there’s a lot of mud around, when a pine cone is wet and damp, it makes it stronger and has more grip to it, so if we put the grip on the pine cone on the bottom of the shoe, we can make it a very grippy shoe so we don’t slip and fall,

S6: and another idea we have, well an improvement that we did, is that any normal boots have like, velcro, or strap, but we have added all three types of it, a zipper, so you can put the boot on, laces so like, like most shoes, So this part of the shoe doesn’t go like unfold, and doesn’t make you slip; we put velcro on them middle side so it doesn’t move around

S5: may i? So we put velcro over here so then these things don’t move around

S6: so it stays like this

T: oh so you are also using the inspiration from the velcro

S5&6: yes

T: good so you are actually using two different things from nature

S7: but maybe like, if the pine cone open, you will slip

S5: yea but like we designed these specially for when it’s raining, because here on the design sheet, we just said only use when it’s wet outside

S6: if it’s slippery then use it, the whole concept is to make you not slip cuz the pine cone at the bottom, they have these little things that poke out

S5: scales?

S6: yea its’ like snake skin, if you feel it it’s like bumpy

S7: and how are you gonna put the pine cone on the shoe, are you gonna glue it?

T: that’s a good question, how can you

S5: so for the pinecone, we just cut the top of it off so we have two halves of the pine cone, because we still need the mechanism that use it to make it like more grippy, because when it’s warm it just opens, when the pine cone got wet it just closes,

T: so how can you make a mechanism

S5: there already is a mechanism, we have a like pine cone that is fully scaled, we try to just cut, as much as we can, so it’s flat without hurting the system, and we put it on the shoe, and then we with that, we still have the mechanism to open and close, without damaging the system

T to S7: okay, so what’s something good that you like

S7: thats like creative

T: and something they can improve

S7: ugh

T: well it would also be nice for you guys to elaborate on what is creative about S7’s design

S5: well so it’s not just like any umbrella, you have the hammers on

S7: wait a second, but maybe like you can hurt yourself

T: from the scales?

S5: no but its on the outside

T: so it’s like those soccer shoes

S6: basically yes, cuz they have the spikes down

S7: okay

S5: wait, i just figured out, maybe pine cone inspired the shoe for football

T: so how does the zipper

S6: so you take out the velcro, take out the shoe laces, unzip the zipper and you slide it on, look the zipper would be right here, you zip the zipper, put the lace on, and the lace would be like this, and the velcro would how this

T: yea but Im talking about the spikes for the shoes, the question is that are they like the soccer shoes, are they always there?

S6: yea they are always there

T: so you are only using the velcro function for the shoe laces

S5: yea but the bottom part is the pine cone

S7: but how can you put the pine cone on the shoe

S5: it’s already there! I already explained, okay I’m gonna explain, we cut the pinecone in halve and we tried to get as much of the skin as possible, and then we put it on the shoes

…

S6: we were just trying to tell him that if it’s an umbrella how are you gonna close it, and with the hammer how are you gonna carry it, and if it’s a hammer it’s gonna weigh a lot

T: well you close it like an umbrella,

S6: but how, it’s leaves on a hammer

T: well usually at the end of the umbrella, you have these hook to hold it, so instead of the hook this is just a hammer

S6: yes but how do you slide the umbrella close

T: just like how you close a normal umbrella

S6: well but you need something that goes on the leaves, his trying to use leaves, not the normal umbrella things

T: he is using, as an analogy, the characteristics of the leave to be water proof, to repel water, he is not using like the leaves leaves, he is using the biologcial strategy of leaves

S6: yea but I know what he is doing

S7: yea but this is not gonna be this material, it’s gonna be wood

S6: yea but the hammer itself is heavy

T: it’s okay, but first, you need to use a kind volume, now it sounds like you are arguing, when you give feedback, and this is a life skill, you need to use a nice voice, people will listen to you, but if you shout at them they won’t

S6: but he doesn’t understand…

T: okay here’s the thing, you gave him feedback, he also gave you feedback, if you are not satisfied with your feedback, and you think, listen, thank you for your feedback but I think im just gonna stick to my idea, and that’s okay

S6: Im not saying that, im saying how are you gonna close the umbrella

T: just like a normal umbrella buddy, I know you are now fixed on that idea, but it’s just a normal umbrella, but instead of having a hook or a string, it just has a hammer at the end, that’s it, don’t worry, it’s just a normal umbrella

S6: yes but that was not the options, the options were like the plant, the pine cone, and two others, but none of them were a hammer

T: you know what, I actually get your feedback, he used the umbrella for water resistance, and he added a gadget for campers, and he is trying to implement it

S6: so that means we can just use a football shoes, like a water proof football shoes

T: if that works for you…but look, you two also added the velcro for the shoe laces, look I like that both of you are pushing the boundary of thinking, and really sticking to the biomimicry concept, and I appreciate that, but guys we need to wrap up form now…

T: okay, put your hands up if you were able to present to your peers? Okay put your hands up if you were able to give feedback to your peers? Okay if you have finished giving feedback, please consider the feedback from your peers, and adapt your design based on their feedback, guys if you have time, adapt your design to your peers’ feedback, see if there’s something you want to change. We are about to move on to making the design.

**Voice recorder 3**

S8: Okay spiral trees..well it has spirals, and…the function is provide wind resistance and spread the water, distributing water

S9: yea

S8: biological strategies…

S9: it spirals the wind around and away, and the water also goes

S8: i think that’s clever because with the branches the water will all gets spiral down, okay what makes this idea special, it collects water and, so for example if it’s raining and you are under the tent, and it’s raining really really hard, at least the water doesn’t just all flow over the edges because of the barriers, and the things that collects water, so water is controlled

S9: i actually think it’s something like this we are going to create, they flow down the stream

S8: a bit like the drain pipe i guess?

S9: yea I think so

S8: yea I think it’s clever, and even a drain pipe will take up way more space than this, and because they are made of metal they will be very heavy and expensive,

S9: yea

S8: so this is better, we can make this out of plastic, which is bad for the environment, but we can make it out of very strong plastic that will last through a very long time, or lightweight metal, that you can like take it off and crack it down or hold it up or something, so it’s not like a big heavy drain pipe that you carry around

S9: yea that can work, we don’t have to keep it on (and gave some short comment which cannot be heard cleary due to small voice)

S8: the design strategy is the water flows down the edges from the top… and it flows to the bucket, my god we were so creative, and now we need to think of a slogan

S9: I don’t know how to make a slogan

S8: spiral your water away with drytent, it’s a slogan, it will do

S10: it’s actually pretty good

S10: okay function…(to their design) to make homesick kid feel some kind of company so they don’t have to pay the 5000 therapy

S10: homesick to home, that can be a slogan

T: ladies, how is it going

S11: very good, because we are having smart ideas

S10: we have these leaves and the teddy bear

T: You are coming back to the teddy bear, you know what, I love it, you should come back to your first idea, yea

S10: and we mixed these other ideas together because it has a dog’s shape, and it has the silver carpet leaves, and it’s kind of like water proof, you can mix it together

T: so it’s like a special type of fabric

S10: yes

T: ladies, im proud of you, well done, and you?

S8: so we ended up choosing our drytent

T: i love your drytent

S8: our slogan is spiral your water away, and so now we are drawing the sketch of it, so how it works is like it’s a tent, basically when you are camping, where you eat, but on top, there’s like a barrier area that collects all the water that gets on the tent, and by four holes at the edges, the water is led to the spirals, that gets the water down, and we attached the bucket to the pole so you can collect water for washing, and it’s different from having normal drain pipes, because drain pipes are expensive and heavy and are unpractical to carry around, and these are durable plastic so you can keep them on or fold together so that you can bring it around with you

T: you know how we have these games that we play, that we have these spirals thingy that can go down the stairs, I don’t even know how it’s called, but it imagine having it to be something as flexible and as compact as that. So when you are packing it, but yea, and yea also make sure that it has a nice strong structure, but yea, collecting water I love this feature, but you also need something to actually hold the tent

S8: well yea there’s like poles, and you know how like those things that you push into the ground, so we have those, and these go around the poles, and you can take them apart, you can take them away. And another benefit of this thing is that if you just have a normal tent, yes it will shelter you from the tent, but if there’s a lot of rain, it will just go down the sides and flow everywhere, and you wouldn’t want that because then everything gets wet and that’s not nice, and in this case, because there is, box on top, like you can say it that way, the water is collected and there are only four holes, which leads to the spirals, so no water can flow off the edges and it won’t flow everywhere, so that’s another function

T: well done, I love it, ladies well done

…

S10: what makes this idea stand out from others…well it’s smart

S11: year it’s like the future, we mixed animals and plants, we didn’t just use the plant, omg yes we are getting big brains (both of them excited and proud expressions)

S11: we used both plant and animal to create an item that provides therapy and is useful for the surroundings…

…

S8: now we are gonna make the edges, but im not sure how we are going to make it

…

S11: design strategy… what’s our design strategy

S10: we need your wisdom

S8: what do you need to do… the design strategy, so for us the dry tent, the water is collected on top and it flows into the bucket, so basically how it works

S10: ohhh, so the aquadog get wet, it soak the water, and we shake it, and then the water goes

S8: but where does the water goes

S10: to the ground

S8: imagine your at home and the water just go to the ground and the carpet and your mom gets mad…laugh

S10: well it will not be at home

…

S11: well the water couldn’t go anywhere

S10: it’s up to them (users) to use their brain

S8: you can shake it on top of our drytent and the water will be collected

S11: what if we include a towel…

S8: should we add some chairs and tables to… explain, i guess? (add to the sketching)

S10: does dogs only have two genders, male female? We should just say all genders…

…

S8: we shall present. so basically our design is the drytent, as shown in the picture below, so our drytent basically is a tent, like the one you would put over your table and chairs when you go camping, it is water proof and it helps you collect water

S9: so the water goes up here, and because of these holes it goes down here

S8: so all of the water goes to the corner and it goes down and you can collect it

S8: so one of the benefit is that it stays dry

S9: wait a second, and the wind goes like around and away

S11: okay I gotta ask, what if the bucket gets full

S8: well you just take it out and you put it somewhere

S10: well what if it’s raining really hard

S8: then I would have ran…

S10: so can we not use it, we are interrogating haha

S8: it is your choice, you don’t just heat it, you can wash your clothes,

S10: well the rain water can actually have acid

S8: well wait guys we haven’t finished, another benefit of the drytent, is that on a normal tents, they wouldn’t have this box thing

S10: can i ask a question… (didn’t really ask)

T: guys, start writing some feedback

S8: look, with the box, the water don’t just flow off the roof and just like onto the ground

S9: and also for the wind, it spirals the wind around

S11: what if it is raining really hard, and the buckets are completely full, and the water just splash everywhere…

T: ladies, get to the feedback

S10: well the design is smart, they have the water and the wind thing, i will put smart, we think this can be better, if the bucket gets too full, it’s gonna overflow….

S8: if it overfills then swap the bucket

S11: but Improve the bucket, make them bigger, make them barrel

S8: do you think those are portable?

S10: well you can fold them

S8: okay foldable bucket, write it down

S9: oh you know those foldable bucketsfor dog food, like the dog food bucket, they are foldable!

…

S10: okay we are gonna be presenting. so basically this is aquadog, and it is a water proof, it includes a towel, and you can have female or male, so the function is when the aquadog gets wet, and since it has the leaves from silver carpet leaves, which we found it, um biological strategy is that the dog and the leaves have the same need to get rid of water and being fluffy, and the dog has a physical appearance to make it cute for like kids, and the leaves provide the function of being waterproof

S9: what if you want to sleep with it but its wet

S8: and why do you want it to be wet

S10: homesick to home goes from anywhere and everywhere, the point is you can go outside with it and not worrying about it getting wet, because sure it’s gonna get wet, mother nature will do that

S11: or what if the grass is wet, ah-oh you dropped it, and then you shake it, you get the wet out of it

S10: you know the dog shakes to gets off the wet, this is basically how it works

S11: we mixed the silver carpet and the dog like shaking

S9: how big is it gonna be

S10: who gives a damn! (jokingly)

T: did you adapt your design based on the feedback?

…

S8: how do you save the water? Like you use the towel, but then the towel gets wet, and you get a wet towel

S10: the towel dries in the sun

S8: and how long is it gonna take

S10: an hour or so

S8: well with all that water it won’t just dry with the sun!

S10: no you squeeze the towel…

**Fourth-Fifth weeks, session 7&8, Camera, self-assessment and taking design on TinkerCAD**

S2: I guess I would most like to improve on the second one (I can connect the characteristics of organism in nature with their functions in my design)

C: why is that?

S2: I think that using nature to help you is a very important thing, they have many more years to think of a strategy than humans, I think we should use them as a role model for our design

C: Do you think this project is a good start for you to start looking for inspiration from nature?

S2: I think so

C: have you ever designed something inspired by nature before this project?

S2: umm I can’t recall but I do not think so

C: so it’s a new topic for you

S2: yea I believe so

C: Can you name like one thing that makes this project different from the previous design projects?

S2: umm I think it has a more clear goal to what you are trying to do, so that makes it a bit easier

C: and what is the clear goal for you here

S2: helping campers to stay like warm and dry

C: do you think the goal to use nature as an inspiration is clear enough for you

S2: yes

C: what is the biggest challenge you encountered when using TinkerCAD

S2: if i have to scale things that were at angles, if I want to make things shorter, it would change the angle of it. Instead of being, let's say ten degrees if I made it smaller, it would then become more to umm one degree or so.

C: so it’s difficult to control the small changes? S2: yes, but i think it’s a good start to CAD

C: and what do you think is the biggest challenge of turning the sketches onto TinkerCAD?

S2: umm, i think it’s getting like some of the edges round, because some of the shapes you have to manually produce, you couldn't round off the size

C: did you use the cutting or combining or scribble to form the shapes?

S2: I used the cutting, just the cutting

C: so, which one do you think you would like to improve on the most?

S15: I could have understand the design challenge better

C: so like do you feel like you could have had more time, or more explanation on it?

S15: both

C: okay, and have you heard of using nature as inspiration for design before this project? S15: umm yea I heard of it

C: and how is this design project different from the previous ones you have?

S15: well for this one, we can work with partners, we can come up with stuff together, and we can make our own designs, actually that is also in previous design projects

C: yea yea

S15: and this time we get better feedback

C: like from each other? S15: yes, and this time we also have a sheet like where you can see which level you are on (referring to the formative assessment sheet), last unit we didn’t have that

C: do you like the idea of using inspiration from nature?

S4: yes i think so, because a lot of the design we use in life are inspirated by nature, and it’s kind of nice to get ideas and make some stuff that are useful

C: okay, i see here you put like you were just starting at coming up with ideas (item 4 on the formative assessment), do you feel like you had some difficulties or you could have have some more time to…

S4: yes it was a little bit hard for me to get ideas

C: do you think there could be some ways to help you come up with ideas?

S4: umm

C: or something to help you better understand and create

S4: umm maybe I could have looked more at the material i got, look at the nature material a bit more carefully

C: how is this project different from previous design projects?

S9: I feel that this one is leaned more towards nature

S8: and here is more getting inpsired from things, while the other ones is just think of a thing and then improve on it and reflect

S9: so it's more structured, I think

S9: I think this one is different because it helps more people, and the previous one is focused more on individual person, or specific environment

S8: well the other ones are more like you just think out of your mind, you look at the needs, you look at what is it that they want and you just make it. This one is a lot more like led by inspiring instead of inventing if that make sense

S9: here we have to like create the problem ourselves but in the previous ones we have to ask questions and try to figure out what the problem was

C: So do you like the idea of using nature as a source of inspiration

S8: yes I think it’s very clever because often nature adapts really well to like things that challenge their life like we are, for example, rain, we can just walk into a house

C: do you think there were enough time to explore the biomimicry examples, and enough examples on how other people have done the biomimicry? S8: it’s enough, yea we could use a little more, but yea it’s enough

…

C: okay, so you marked here you most want to improve on “how to apply biological strategies to your design”

S12: because yea first we had a design, that wasn’t wind or water resistant

C: what was the first design again?

S12: the design we were gonna choose originally was a pair of boots, with ridges on the bottom, for grip, however we realized that wasn’t wind or water-resistant

C: well but it’s also working against slippery ground, but yea the you have now is more in line with the design question

S12: yes then we decided to do the tent, even though we didn’t know how hard it was gonna be making it on TinkerCAD

C: so you think the most challenging part was transferring your sketches onto TinkerCAD

S12: yea, it’s way easier drawing

C: okay, how do you feel about this project compared to other design projects you did

S12: well, i like that there is a reason behind it and that we can make it on 3D printers

C: would you like to do more design that are inspired by nature

S12: maybe, im not sure, i really enjoyed this one though

C: do you feel like there was enough examples given for you to come up with your design ideas, like enough biomimicry examples?

S12: well i could use a little more exploration

…

C: so how do you think this project is different from previous projects?

S5: This one is more useful to society, because we find new ideas that can actually help the world

C: have you done something that is also like taking inspiration from nature

S5: no not yet

C: and do you like this idea

S5: yea i think it’s a great idea

C: okay well here I see that for these two, you didn’t give yourself a super high rating

S5: yea for those two, i don’t really do that

C: do you feel like in this project there could be more chances for you to explore? And more examples, like the biomimicry examples?

S5: yea

C: so do you feel like, for you to come up with a really good idea inspired from nature, what would have helped you to come up with those ideas easier?

S5: well if you have the thing that inspire you, let’s say if you have the pinecone, then you can see it, feel it, and see what it does, then it’s easier to make something out of it

C: so is it like the more time you explore or the more details you know about that thing…

S5: I think the more details, the more information you have, with more information you can make new things,

C: if you are to choose one item to improve on, which one would you choose

S5: i don’t know, maybe this one

C: sketches? Okay, so for sketches, i see here that you have the design for the side, bottom and top, how do you think it could have been better

S5: it could be bigger, and here I could have labeled what it is, and this part is a velcro to hold down the laces, so the shoe doesn’t get off

**Presentation on final designs**

S5: so this is our design, the nonslip grip shoes

S6: what this design prevents is slipping on the floor, so basically you can go in the woods when it’s raining and you can’t slip (general gesture for communication)

S5: our slogan is saving humanities from slipping

S6: what we use is we use pinecone to put it at the bottom, cuz they have like little…(gesturing to represent at the bottom and gesturing to represent the small scales on pine cones) I don’t know how to say this but they have little things that like, poke out, on the bottom of the shoes

S5: what inspired us to make the nonslip grip shoes were the grip of pine cones, they have extremely strong grip when they are wet and when it’s wet, you probably slip a lot, so that’s what we are inspired from

S6: one function is not to slip

S5: well this is how our design look like, we try to make it look like a shoe, but i don’t know if this looks like an actual shoe

S6: we’ve got a zipper with a velcro thing there and laces, so we have extra security that you don’t slip off (pointing to their design on the screen display, gesturing to show where the velcro are)

S5: and for the bottom we have the grip of the pine cones

S6: we have like three spikes at the front, also from the pine cone, so when climbing uphill you can put it into the ground (moving his feet to represent hiking uphill)

S5: we tried our best to hollow up the inside (pointing on screen the inside of the shoe), so it looks like an actual shoe, and this is the laces

S6: it helps to not slip, it uses the feature of pine cone, and it’s easy to make, because all you need is the pine cone, and then, the shoe, (lifting his feet to show and point to his own shoe), the velcro, the laces, and that’s it!

S15: this design we call it the water soaker

S14: with this design we solve the challenge of protecting the tent from wind and water

S15: our slogan is don’t think hard, think smart

S14: when we look at nature we looked at the dog, the dog fur

S15: we are inspired by its characteristics, it’s fur and how it shakes

S14: we think this characteristic serve the function of it shakes water off

S15: this function can help solve the problem of wet puddles in the tent

S14: we discovered that the dog can be a biological model for the design of the water soaker

S15: our design has a battery inside and outside there’s a ball of fur

S14: among all of our other ideas, this design is the most special, it burrows idea from nature and solves the design challenge because it’s water proof and useful to soak up water and shakes water out

T: so the tent is helping to shake or…?

S14: no we don’t have the design, it’s in the other slide… (during the presentation, they only showed TinkerCAD design of the tent from different perspective, but not the fur ball, and the tent looks like a normal tent with no label or special feature, teacher was pointing out that the shown design does not match their description and they pulled out the wrong slide)

…they pulled out the correct slide

T: can you explain what it is?

S14: so basically it’s a ball of fur with a battery inside, motor inside, so like when you soak it in, the motor goes like, makes it shake off (general gesture for communication)… we are still not fully done with it

T: okay but we can actually see the engine there, and it runs with batteries, and it’s a furry thing that like shakes itself

S14: yea

T: and that’s the tent?

S14: yea

T: and that’s (referring to the fur ball) is like ten times bigger than the tent? (on the TinkerCAD design they showed, the fur ball was about ten times bigger then the tent, potential mis-sizing or they didn’t really consider the size)

S14: well (laugh) we couldn’t figure the size out

T: well, it’s okay, you are getting there, thank you guys

S1: with this design we solve the challenge of having no energy in the forest, and our slogan is capture the energy. When we look at nature, our organism was spiral tree, we were inspired by its spiral design. Our design has an, indented spiral design inside it, to capture the energy, make it rotate, and store energy in a nearby electricity storage box, Our design is basically a small cylinder that has indented lines in it, and the special thing about it is that it’s really sturdy, creates energy, and it’s cheap.

S9: so the name of our design is the drytent, with this design we solve the challenge of keeping your camp dry, and our slogan is keep dry with the sky dry tent

S8: when we look at nature we noticed the spiral tree, we were inspired by the spirals on this tree, and we think this characteristic serves the function of channeling water, nutrients, and wind resistancy

S9: we think this function can help solve the problem of getting soaked and water loss, we discovered that the spiral tree can be a biological model for the dry tent

S8: our design looks like a tent that you would normally put on top of your tables and chairs if you are going camping (gesturing to show the idea of a shading area/tent over tables), and it has poles with spirals (pointing at their design on the screen display and using small gesture to represent swirling spirals at the poles), and um buckets (gesturing a shape of bucket and a rough size of it) and buckets at the end, and there’s also a box on the roof, with a pyramid shape (using one hand to quickly gesture a pointed triangular shape). So if it rains the water gets caught on the top of the roof, which is to be like a box, (gesturing to represent pouring rain, and the box shape), and because of the pyramid shape (using two hand to represent a pyramid top), all of the water goes to either one of the four holes (pointing at the four holes on the screen display, gesturing to represent that the water goes only to the four holes), and then it goes down the spirals to the buckets (small swirling hand movement to represent the water came down from the spiraling shape). And among all our other ideas, this design was the most special, it burrows idea from nature and solves the design challenge because it is water resistant, it doesn’t let the water fall off the edges when if there is a lot of rain (general communication gesture, and gesturing pouring rain fall down), it saves water since the water is collected in the buckets, and it turns away the wind.

S16: So the name of our design is the red tree

S7: with this idea we solve the design challenge of having an umbrella so we don’t get wet, and a hammer. Our slogan is don’t get wet, stay dry.

S16: so our design is inpsired by the leaves in the forest and uh things like that. Because some types of leaves are impermeable and they don’t let the water pass through them

S7: we are inpsried by the characteristic of that organism that inspired our design is impermeable, because you can’t get wet

S16: so we think this characteristic serves the function of not getting wet when you walk in the street and stuff like that

S7: okay, this function can help you solve like getting dry, so you don’t need like to changing yourself and clothes

S16: our design looks like an umbrella, but it has cones in the top, so if the water falls it falls down to the ground, and that’s it

S4: The name of our design is eco sturdy

S2: with this design we solve the challenge of wind and water resistance

S4: and our slogan is standing strong with nature

S2: when we look at nature, we notice the hornbeam leave

S4: and we are inspired by its ability to be stiff during… (can’t read the word)

S2: photosynthesis

S4: photosynthesis, and flexible in wind

S2: we think it’s characteristic serves the function of withstanding very high winds and not snapping

S4: and this function can help solve the problem of damage caused by wind

S2: we discovered that the hornbeam leave can be a biological model for our design, ecosturdy

S4: and our design looks like, there’s this foldable roof, and there is this solar panel (pointing to the screen display at where the solar panel is on their design, but was not very accurate with where he was pointing, and it seems like he doesn’t really know where the solar panel is)

S2: among our other ideas, this design is the most special because it burrows the idea from nature, because it deflects wind, collect rain water and solar energy, and it’s very compact, and portable.

S13: the name of our design is stand strong tent, with this design we solve the challenge of not having water-proof tent and having enough water. Our slogan is stand strong tent for campers everywhere. When we looked at nature, we noticed the spiral tree, we were inspired by its spiral trunk (small gesture for communication purpose)

S12: the function of the spiral trunk is to collect water and distribute it across, (general gesture for communication) and wind resistancy, which you can see in our design, it collects water with buckets (general gesture for communication). The function can help solve the problem of water loss and strong wind by collecting water and not being a big box. The tent has ridges along the side to gather the water to the buckets (pointing on screen at the ridges and gesturing to show the water fall down the ridges), and it’s water resistant, and it can collect water.

S11: Our design is called aquadog

S10: with this design we solve the problem of homesickness, and it’s water resistant

S11: when we look at nature we noticed this leave called silver carpet, which is like a furry type of thing that is water resistant

S10: and we are inspired by it’s water proof ability, it has tiny hair that protects it from the rain