

More Than a Helping Hand: Scene 1

Clara, Aria, and Kent are standing by their lockers when Mark runs up to them excitedly.

Mark: I have some exciting news!!

Clara: Ooooooaaaaay!!! And good morning to you too!

Mark: Oh. Good morning! Sorry, I'm just really energized and pumped about this idea I have!

Aria: Well spit it out, Mark!

Mark: Whooo, well I can show you better than I can tell you.

Mark pulls out his cell phone to show video ["How 3D printing is changing kids' lives"](#)

Aria: That was really cool Mark.

Mark: But that's not even the best part. This is something that **WE** really can do! We have a 3D printer right here at school.

Clara: Yeah, we do have one, but Ms. Gillespie does **NOT** know how to really use it. For Open House she made a stupid airplane... because that's what we need to make with a 3D printer, a two-inch plastic airplane...

Kent: Wait!!! She printed an airplane, out of plastic... how does that work? *mumbling under his breath* I thought printers printed on paper.

Clara: Kent, did you take a nap during the video?

Mark: Kent, just wait, you'll see, I still haven't even gotten to the best part, I know someone who needs a prosthetic hand. My little cousin Alex is four years old and her fingers didn't form correctly so she can't grip anything with her right hand.

Aria: Oh- I know who you're talking about, she is always with your mom at the baseball games.

Mark: Yeah, that's her. Because she always comes to watch me play baseball, she wants to play t-ball. She can catch with just her left hand, but I think having another hand would be awesome.

Kent: This is going to be soooooo cool!

Clara: We got it Kent, you love the word cool, but I agree, this is going to be awesome.

Aria: Aren't we forgetting something..

Clara: Like what?

Aria: Like, we watched the video, but how are we going to do this? We need to know how the hand works, come up with a design, create a prototype, test it, revise it, test it again, AND we **have** to make sure that it will specifically work for Alex.

Mark: You are right Aria, we are going to have to take it step by step to really do it right.

Kent: *(while looking at his hand and wiggling his fingers)* Hmmm, how does the hand work? Do the muscles work with the help of the bones, or do the bones work with the help of the muscles?

Example of Upper Level Variation

Kent: Ooh, ooh, ooh, remember in Anatomy class Mr. Horseshack was just talking about how our skeletal muscles move... flexing, fluxing,

Clara: I think you mean, flexion and opposition, extension, supination, pronation, stuff like that...

Mark: Yeah, the thumb makes opposing motions in conjunction with the fingers. The hand that we make will need to mimic those muscle movements in order for her hand to grip anything.

BOX CHART - Scene 1

<u>Facts</u>	<u>Questions</u>
<u>Hypotheses</u>	<u>Learning Issues</u>

More Than a Helping Hand Scene 2

Clara: Okay now we know how a hand works, so let's make a prototype of a hand.

Kent: I heard you use prototype before, why can't we just go straight to the lab and print one?

Clara: Duh, haven't you been paying attention in Intro to Engineering, materials ain't cheap and we need to see if our idea works before we make Alex a crappy hand.

Mark: Yeah because her hand is unique, the prosthetic hand that we create needs to be tailor made for her. She has Amniotic band syndrome, which caused the fingers on her right hand to not develop.

Aria: Soooooo, we need to figure out how to create a hand that she will be able to open and close to catch and release a ball?

Kent: You all are real advanced. Let's take this one step at a time. Can we make a prototype to mimic how a hand works?

BOX CHART - Scene 2	
<u>Facts</u>	<u>Questions</u>
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More than a Helping Hand Engineering Project

Using what you know about the skeletal and muscular systems, design a robotic hand. It must be able to pick up a ping pong ball demonstrating a grasping and releasing mechanism. You must demonstrate that your hand can complete this task no less than 5 times. When constructing your design, be mindful that the user/manipulator of the robotic hand may not touch any part of the grasping mechanism (phalanges and metacarpals). Beyond that, be creative. Also think about ways that your design could be used in addition to picking up the ping pong ball. Complete engineering process and reflection documents.

Musculoskeletal Abnormality Research Assignment

Select a musculoskeletal disorder and discuss:

- the abnormality and its description
- symptoms
- diagnosis
- treatment

Include at least 4 high quality references using the appropriate APA style referencing. Use <https://www.scribbr.com/apa-citation-generator/> as a template for the reference.

Case Resources

Link	Resources
https://www.youtube.com/watch?v=_N5A965XOOI	Video of making a hand with straws
http://enablingthefuture.org/upper-limb-prosthetics/	Website with instructions on how to make a robotic hand using a 3D printer
https://phys.org/news/2016-12-student-d-functional-prosthetic.html https://phys.org/news/2014-04-students-robotic-boy.html https://www.cnn.com/2017/11/14/health/ambionics-prosthetic-arm/index.html	Articles discussing 3D printed hands
https://www.scientificamerican.com/article/build-an-artificial-hand/ https://www.instructables.com/id/Robotic-Arm-From-Car-dboard/ https://www.k-12robotics.org/uploads/5/6/3/3/5633548/pdf_introduction_to_robotics.pdf	Step-by-step instructions for making a simple hand
<p>Making of my Special Hand, Madison's Story https://www.amazon.com/Making-Special-Hand-Rehabilitation-Institute/dp/156145186X/ref=sr_1_1?ie=UTF8&qid=1548374960&sr=8-1&keywords=the+making+of+my+special+hand</p> <p>Uniquely Me https://www.amazon.com/Uniquely-Me-Trace-Wilson/dp/1631773739/ref=pd_bxgy_14_img_2?encoding=UTF8&pd_rd_i=1631773739&pd_rd_r=78d71dfb-2035-11e9-8739-9941e184f583&pd_rd_w=yHpJd&pd_rd_wg=AwhlE&pf_rd_p=6725dbd6-9917-451d-beba-16af7874e407&pf_rd_r=BB0Q2PF192WB186CPA2R&psc=1&refRID=BB0Q2PF192WB186CPA2R</p>	Books of Interest (Elementary)