Teacher/Coach Online Challenge: Autodesk Fusion 360

Summary

- 1. Subject: Using Fusion 360 to manage robot design processes and virtues
- 2. Topic or Unit of Study: Learning the fundamental tools of Fusion 360 and the applications they bring into Vex Robotics team collaboration.
- 3. ESOL Strategies:
 - Demonstration
 - Illustrations & Diagrams
 - Rephrasing & Simplifying
 - Verbal Response
- 4. Learning objectives:
 - Students should be able to synthesize how fusion 360 will ameliorate their engineering process through further accessibility, tools, and synergy.
 - Students will gain principle knowledge on the utilities of Fusion 360, project manipulation, navigational tools, and standard modeling mechanisms.
 - Students will learn how to use simulation environments to assemble 3D robot designs, share projects with peers, and simultaneously validate ideas.

Tip: Think about how you will INSPIRE your students and consider what you want them to take away from today's lesson plan.

5. Time Allotment:

(3) 1-2 hour sessions

Implementation

Learning Context

Tip: Have your students learned everything they need to know in order to complete this lesson? This might be a good time to review some previous lessons so that they feel prepared to learn something exciting and new!

Procedure

a. Anticipatory Set

To grab their attention, introduce them to Fusion 360 by showing videos of model rendering used by professional engineers that are accessible online

ex, https://www.youtube.com/watch?v=dLlkW9gR4VU

b. Direct Instruction

Provide step-by-step instructions on the downloading process of Fusion 360, and how to access team files and projects.

c. Guided Practice

Demonstrate the content by showing a live exhibition of using the Fusion 360 environment and tools.

d. Check for Understanding

After Reviewing Content, test students' knowledge by giving them scenarios to which they may verbally respond. Repetition and feedback are essential for a successful grasp of the content.

Tip: Ask lots of questions throughout your lesson to make sure that your students are feeling comfortable with all of this exciting new information.

e. Practice

Pair up the students in groups and give them a small task to which they may work together in solving. Give them ample and flexible time constraints. Assist them in any areas they may inquire about, but attempt to allow them to problem solve amongst themselves first.

f. Closing

Allow students time at the end of the lesson to open up with feedback on what they did or didn't like about fusion 360. Be sure to answer any questions or topics they still feel stuck on or want to pursue further in the next lesson.

Tip: This is the perfect opportunity to open up the class for a group discussion. Ask your students questions that help them realize the importance of today's lesson with questions like, "how will you use this information in your team design process on a daily basis?"

Materials & Resources

a. Instructional Materials:

Powerpoint for the 1st lesson is attached at the bottom of this pdf

https://www.youtube.com/watch?v=dLlkW9gR4VU (fusion 360 promotional video)

https://create.kahoot.it/share/basic-fusion-360-terms-knowledge/e7635861-1b7e-401b-b7f e-2ccc0f2729d0 (Kahoot game for Fusion 360 terms & basic knowledge)

b. Resources:

https://www.youtube.com/watch?v=Hxs0q9UoMDQ (Vex Change Up game reveal) https://www.youtube.com/watch?v=rA5mKtSOTEo (additional help on fusion 360 for vex)

Assessment

To test the students' knowledge on lessons, we will have a term-based quiz where the students will use the educational platform *Kahoot!* and be tested on important terms they must know for basic Fusion 360 usages for robotics. Link for the *Kahoot!* The quiz is under the **instructional materials** section. For the second lesson, below the powerpoint is a worksheet that students can fill out to test their knowledge on the interface and tools of Fusion 360.

Student Reflections

Before the week of lessons our teacher Mr. Becerra showed us, most of us didn't even know what CAD stands for! So the transition to learn a whole software in a matter of a few sessions seems like an improbable thing to do. We felt the first lesson was fundamental as it led the way for a successful learning experience. As stated by one of our team members,

I felt that this would be a boring week for me as I have a hard time concentrating on finicky things like Fusion 360, but the way Mr. Becerra introduced the cool things we can do with it; my interest definitely piqued my interest (Andres C).

After showing what we can gain from learning Fusion 360, we were shown the vast tools and for starters it was definitely a mouthful. For robotics however, he told us there are a few tools that we can focus that will be sufficient when creating our projects or later robots for competition. He did a breakdown using a visual powerpoint to show each tool and its functions. After, he would show us his Workspace on Fusion 360 and give us a demonstration so we could follow along and use the tools hands on. After showing us what each thing did, he gave us time for discussions amongst each other and time to practice. In a fun and very engaging way, he gave us a Kahoot! game with questions that tested our knowledge specifically on the things he showed us. One of our members describes using the Kahoot! as an important part for him learning to use the software. He put is as simply,

When it comes to learning a lot of information that's new to me, I kind of get lost in all the words and terms I have never heard before. So when we were discussing it amongst ourselves, I was a bit frustrated when I couldn't remember as good as everyone else. Then when we played the Kahoot! It's like I forgot what we were doing and I was so engaged that it left me remembering nearly everything Mr.Becerra taught us. This would not have been the case for sure if not for this method of learning (Julian C).

What is the correct order of steps in order to "extrude" a component?



In a short amount of time, we learned the basic environment manipulations of Fusion 360, such as how to navigate with orbit, change environment background to photo booth, and hide certain elements to make it visually appealing to work with. We also learned how to use certain tools that we can implement in our robot designs for this year's competition *Change Up*. Learning to move the pieces, joint them together, cut them using extrudes, splitting bodies, and many more. We also learned how to create components, making all kinds of shapes and forming them how we want to. One of our team members lead designers stated how

Now that I know how to create and render objects on Fusion 360, I can use that to create a rounded rectangular shape to add in as plexiglass for an important element of our robot this year. This will also help us as we begin working on another vex online challenge, the "Make It Real" CAD challenge where we will make a piece from scratch (Stellan S).



All in all, we are definitely excited to use this new source of project based learning to the full extent in our competition robots from now on. We highly recommend other teachers to show their students this innovative and effective method of testing iterations of the students designs! We have seen a big improvement in each of our groups communication and design process because of Fusion 360, and below you can see just what we have been working on in our teacher's lessons:









Creating a Fusion 360 project and its implementations in the Vex Robotics Curriculum

Mater Academy Charter HS

2020-2021

Mr. Becerra

FUSION 360[™]



What is Fusion 360?







INNOVATIVE CAD TOOL FOR DESIGN, RENDERS, AND SIMULATIONS, CLOUD-BASED PLATFORM SOFTWARE PRECISE MODELING OF 2D AND 3D OBJECTS

Why should you use it?

By learning the interfaces and commands, you open a whole new world to the design process and are no longer limited by the physical world, just your imagination.

One of the core aspects of all engineers is the planning and simulations, which is why Fusion 360 is the perfect software to complement us in Robotics.



Applications in Robotics

Accessible anywhere

Faster building process

Unlimited resources and utilities

Easier to collaborate on

You can backtrack on your work



Getting STARTED!



Download Autodesk Fusion 360

https://www.autodesk.com/prod ucts/fusion-360/free-trial



Download Vex parts into library

https://drive.google.com/file/d/1 5TzytEyjS0G9ZbriMs1WPwuJPvWFS -8Z/view Go to your school emails and accept the join 11476A Fusion 360 team

Join a team

Fusion Team



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COMMENTS

parts already in our project

Creating a Project

Once you click the icon circled above, this page will appear. Before you save it, you must:

- Name the project

- Choose its location

Once you have done this, you may click on the bottom right where it says "Save".

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		Motion	9/16/2020, 3:14:15 PM		
		Motors & Electronics	9/16/2020, 3:15:13 PM		
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	New Project New Folder		Cancel		
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Which of the following arrows point to the "save" icon?

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Which of the following arrows point to the "files" icon?



Which of the following is a navigational tool in Fusion 360?





Constrained Orbit	♦ Swivel
Free Orbit	Pan

Which of the following arrows point to the "joint" icon?







In order to "joint" two bodies together, you must first break the link...







What is the correct order of steps in order to "extrude" a component?



Which of the following tabs are the workspace to manipulate your Designs?

	DE SIGN GENERATIV RENDER ANIMATION	VE DE SIGN sis.2 etting vs
▲ Design		♦ Generative Design
Render		Animation

creates a transitional shape between two or more sketches





New Component	Chamfer
O Loft	Fillet

A sweep extends a sketch along a specific non-perpendicular path



Fusion 360 Assignment #2: Creating a Box

- 1. Click the File menu.
- 2. Select New Design.
- 3. Click Create > Box.
- 4. Select the XZ Plane along the bottom of the canvas.
- 5. Pick two points to define the length and width of the box.
- 6. In the Box dialog, enter:
 - Length: 100 mm.
 - Width: 100 mm.
 - Height: 50 mm. Then click OK
- 7. Right-click in an empty area on the canvas.
- 8. Select Press Pull from the marking menu.
- 9. Hold left-click, and then drag the window to select the entire box.
- 10. For Radius, enter 8 mm.
- 11. From the Extents list, select All. Then click OK

If done correctly, your box should look something like this:

