Ed Marrs Educational Technologies Final Project

1. In the world of computer science, there are a number of different technologies that are being used to help teach students in many different ways. Therefore, I plan to research the following three educational technologies:
   1. VR in Education: VR is a new emerging technology, and I would like to research and potentially develop tools that are used by educators in the classroom.
   2. 3D Modeling & Printing: For Engineering and Robotics, 3D Printing is used in order to quickly prototype and make scale models. I would like to see how this is done and used in a classroom setting.
   3. Education and Games: How can games and game platforms be used in order to teach students concepts?
2. Curriculum:

4/7-4/14-Research VR in Education. Find example tools that utilize VR and can be used with low-end headsets for the purposes of educating students, as well as tools to create VR Apps. Develop a lesson for an introduction to developing VR.

4/14-4/21-Research 3D Modeling & Printing, see how students use it in order to learn design concepts and how the models can be used when printed. Develop a lesson for an introduction to working with 3D Modeling and Printing

4/21-4/28-Research Education in Games-See how games can be utilized in schools in order to teach students. Look into various games that have educational backgrounds and find lessons that have been used to teach these students. Develop a lesson for using one of these games for educating students.

1. Resources:
   1. VR:
      1. <https://xd.adobe.com/ideas/principles/emerging-technology/virtual-reality-will-change-learn-teach/>
      2. <https://www.classvr.com/virtual-reality-in-education/\>
      3. <https://learn.unity.com/course/zoe-xr-for-education>
   2. 3D Modeling/Printing:
      1. <https://blogs.oregonstate.edu/inspire/2018/08/15/5-ways-3d-models-can-help-in-education/>
      2. <https://www.iste.org/explore/Computer-Science/Harness-the-power-of-3D-models-in-the-classroom>
      3. <https://www.educause.edu/ecar/research-publications/learning-in-three-dimensions-report-on-the-educause-hp-campus-of-the-future-project/pedagogical-uses-of-3d-tech>
      4. Makerspaces
   3. Education and Games:
      1. <https://www.minecraft.net/en-us/edition/pi>
      2. <https://education.minecraft.net/en-us>
      3. <https://www.edutopia.org/article/how-use-gameplay-enhance-classroom-learning#:~:text=According%20to%20research%2C%20using%20games,and%20boosted%20their%20academic%20scores>

**Week 1- VR in Education**

Resources:

Standalone Systems:

ZSpace-A laptop glasses system used for a variety of different educational tools such as Engineering and Biology. Units include a laptop and cost $1300 per laptop/pen/glasses setup.

Oculus quest- Standalone VR Headset with hand controllers. Does not require a computer to utilize it. App Store is available which contains various educational apps. $300 per setup.

Mobile Device Powered

Google Cardboard-Low end VR headset that allows users to use their phone as a VR device. Various app store apps are available for education. $15 + phone per unit (schools would likely need to have one or two extra phones on hand for use in VR for those that do not have smart phones, or have students pair up).

Computer Powered

HTC Vive/Valve Index-Require a pc to use, but offer full room scale technology for use in software. Various educational softwares exist that can utilize the technology. Typically has a similar library to the oculus. $600 + cost of PC (Schools would likely use this option as a “VR Lab” having one or two setups available in room-scale)

VR Lesson Plan:

Objective: To Learn the basics of developing a VR app and uploading it to our phones:

Required Tools:

Google Cardboard + Android Phone

Unity

Google VR SDK for Unity

Do Now: Have Students pick up a Google Cardboard from the Front Desk and use the attached instructions to build it

1. Introduce the Technologies we will be using today. Go over the basics of Unity. Show Students the application we will be using today (Unity VR Demo Application)
2. Show students what application to open to get to Unity on the computers and give them a brief overview of the basic features and how to navigate.
   1. Allow them to explore and play with the settings available in Unity for 5 minutes.
3. Have students upload the Unity VR Demo Application to their device.
   1. Have Students Press “Build & Run” on the application, and upload it to the device. The application should launch on the android phone. Allow Students to Play with the demo app and troubleshoot any potential issues going on.
4. Show students how to change & modify the app, do this for the rest of class
   1. Create a new Project in Unity and have students import the Android VR SDK + the demo application.
   2. Show students how to place objects within the Unity Scene. Have Students use one of the default unity assets and place it in the scene view. Allow them to rebuild the application and see how it has changed.
   3. Show students how they can modify the asset by changing the texture, size, lighting and physics. Allow them to experiment with changing and adding assets for the remainder of class, and help students who are having difficulty troubleshoot.

Closing: Go over the technologies we used today. Review the basic features of unity and how to open/run projects. Review how we made changes to our VR application.

For Next Class: Introduce programming within Unity and how it can be used for interactable VR spaces.

Resources:

<https://developers.google.com/cardboard/develop/unity/quickstart>

<https://developers.google.com/vr/develop/unity/get-started-android>

<https://learn.unity.com/search?k=%5B%22tag%3A5900b95a090915001e654b47%22%5D>-More Lesson Ideas for later classes

**Week 2-3D Modeling & 3D Printing**

Resources:

Software:

Tinkercad-very simple to use 3D Modeling software that allows students to very quickly develop 3D Models. Has built-in class features. Free to use!

Blender-Free Advanced 3D Modeling software that allows fine control of the creation of 3D Models, recommended for more advanced students.

Creality Slicer: Allows slicing of 3D STL files into gcode files for use in 3D printer. Offers a variety of options for choosing how users would like to print their model.

Hardware:

<https://all3dp.com/1/best-3d-printer-for-school-education/>

Lesson Plan:

Objective: To learn how to use basic 3D Modeling software, and how we can print those models, and the limitations of doing so.

Required Tools:

TinkerCad

Do Now: Have students come up with ideas of things they may want to try to 3d Model. Have them sketch out these ideas on paper

1. Introduce Tinkercad to the students and present that we will be using it for modeling. Have students join the tinkercad classroom. For 10 minutes, go over the basics of 3d modeling, how to change the camera angle & how to place & modify objects within the Tinkercad space.
2. For 10 Minutes, allow students to begin experimenting with Tinkercad and allow them to build models to become accustomed to the software.
3. Introduce the Students to the 3D printer, in operation. Explain to them the challenges that arise when bringing a 3D model into the physical world via a printer. Explain some of the physical rules that models need to adhere to in order to have them print properly (Size, Supports, Rafts, Ect.) (10 Minutes)
4. Allow Students to return to their desks, and modify or start a new model that adheres to these rules. Help Troubleshoot any issues (10 Minutes).

Closing: Review the basic controls of TinkerCad, and some of the rules our models need to adhere to in order to print out properly.

For Next Class: Allow students to work on their models more, and introduce slicer programs as a way to convert our 3D models into printing instructions.

Resources

<https://www.tinkercad.com/learn>

<https://www.tinkercad.com/teach>

<https://www.tinkercad.com/lessonplans>

<https://3dprintingindustry.com/3d-printing-basics-free-beginners-guide/>

**Week 3-Games in education**

Game Software:

Minecraft Education Edition: Used for a variety of subjects for teaching students’ various concepts

Minecraft Pi edition: Used for Teaching Students about Python code, interact with Minecraft in real time with code changes to make projects. Requires the use of a Raspberry Pi.

Roblox: Game creation tool that is focused on user generated content. Students can design and code levels using the software with Lua.

Game Development Tools:

Unity: Free game engine for developing games, used very widely in the industry

GameMaker Studio 2: Game engine that offers both block-based coding and written code for developing games. Student licenses offered.

Unreal Engine 5: High End engine for developing 3D games. Used widely in the industry.

Lesson Plan:

Objective: To Teach students about Python Code by use of Minecraft Pi Edition.

Required Tools:

Raspberry Pi + Keyboard/Mouse/Power

Minecraft Pi Edition (Free)

Do Now: Have students come up with ideas of modifications they might want to try to make in Minecraft.

1. Introduce the Raspberry Pi to students. Have them turn it on, and figure out how to navigate Rasbian (Raspberry Pi’s Linux-Based OS). Allow them to play around with it for 5-10 minutes.
2. Introduce the students to Minecraft Pi Edition. Stress to them that they need to stay on task while working with it, as its easy to get distracted when working with a game. Let them explore the differences & changes of Minecraft Pi from the Retail Edition for 5 minutes.
3. Introduce students to the first Minecraft Python program. Show students how to use python to place a block at the players’ position. Allow them to experiment with the function’s parameters to see how altering it can change the position of the block, and the type of block. (5 Minutes)
4. Challenge students to try and make a 5x5 smiley face or similar drawing using the SetBlock function. Challenge students who finish early to make a more complex image at 10x10 or 15x15. (10 Minutes)
5. Introduce looping to students. Show them how to set 3 blocks next to each other by incrementing the blocks. Challenge students to draw the smiley face again but by using a loop instead. (10 minutes)

Closing: Review the basics of the raspberry pi and the Python Code we learned. Review the key terms learned.

For Next Class: Allow students to experiment with loops more, and have them use it to create an “Infinitely Spawning Pathway” under their feet.

Resources

<https://www.raspberry-pi-geek.com/Archive/2014/03/Learning-to-program-with-Minecraft>

<https://pimylifeup.com/minecraft-pi-edition-api-reference/>

<https://www.reddit.com/r/gamemaker/comments/ng7sao/what_is_the_best_way_for_learning_gamemaker/>

<https://education.minecraft.net/en-us/resources/explore-lessons>