

PARTNERS IN EDUCATION

AUGMENTED REALITY SANDBOX

USER GUIDE

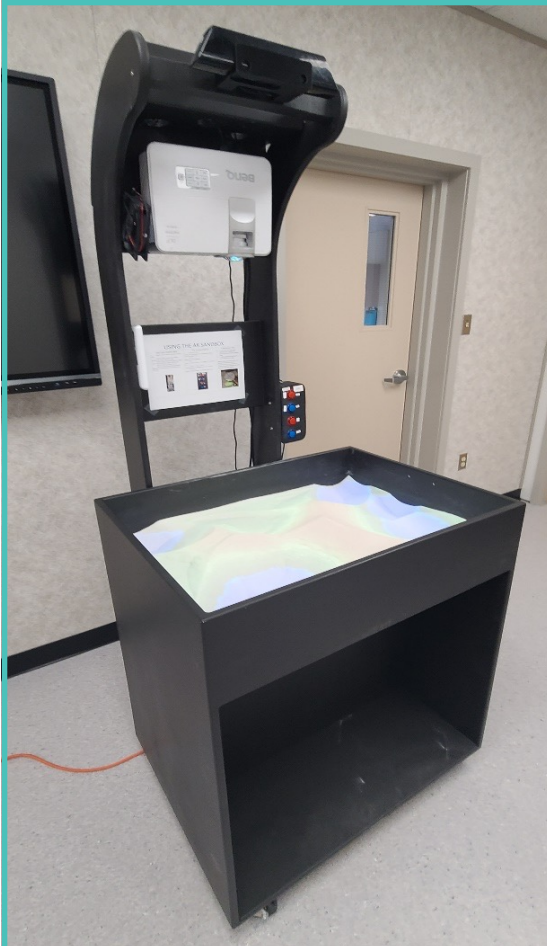
2ND EDITION WITH ARSANDBOX V2.8

SCHOOL
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Interactive geology tool for younger students. A mobile unit that has cutting edge technology to allow students to manipulate their landscape and see the impacts of change in terms of weather, season, geography and geology.

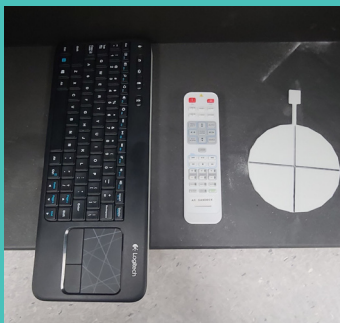
MOVING THE AR SANDBOX

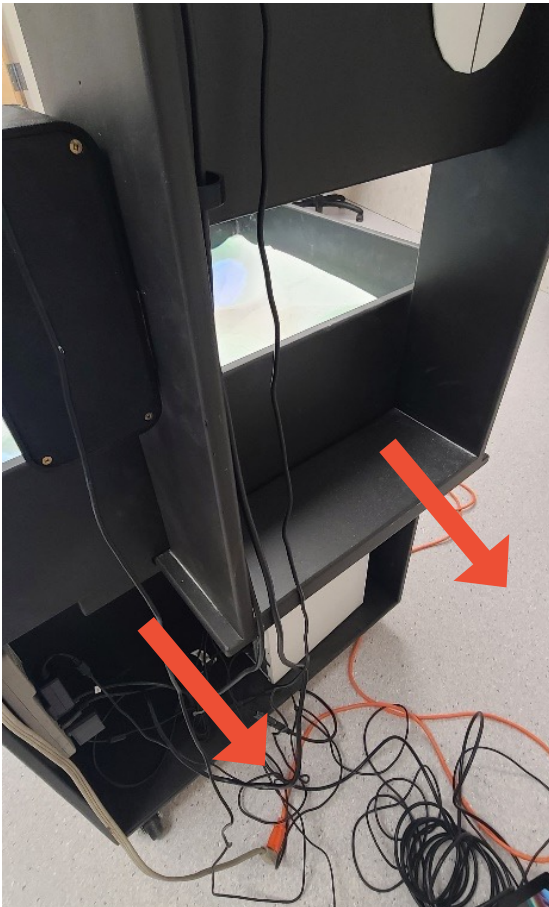
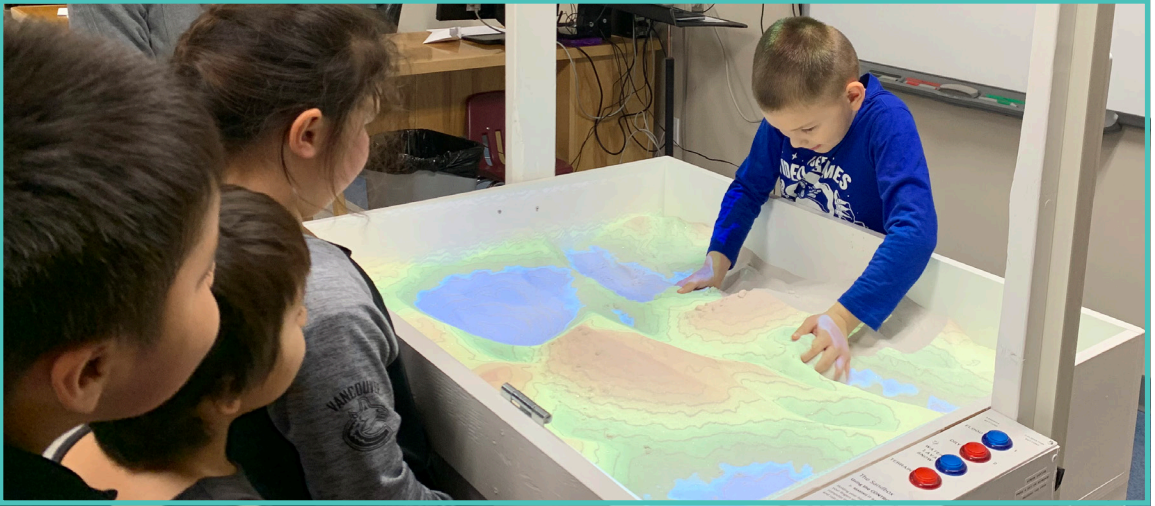
Before the AR Sandbox can be moved, the upper section of the AR Sandbox apparatus needs to be **separated from the base unit**.

1. Cables need to be unplugged from the computer in the back of the AR Sandbox. The cables going to the Kinect camera, button box and projector need to be gathered at the base of the upper apparatus.
2. The upper apparatus simply slides out from the sandbox. It may require some coaxing if sticky, try pulling evenly on both sides so it doesn't bind in the slot. It is important to support the weight of the upper apparatus so the base of the upper section that slots in doesn't break. The upper apparatus can be loaded upright in a tall vehicle like a van, or across a back seat on the side without the button box.
3. It would be a good idea to load the computer separate from the sandbox so it doesn't suffer damage in transport.
4. The Sandbox can be loaded into a vehicle by two people with some effort, 4 people would be ideal.

ITEMS INCLUDED WITH THE SANDBOX

1. Calibration tool (disc on stick with crosshairs)
2. Projector remote
3. Wireless keyboard w/ trackpad





SEPARATING THE BASE UNIT

SETTING UP AFTER A MOVE

The process above is reversed, but there are a few points that will help in setup, and get you up and running. **Do not connect power to the AR Sandbox until the following steps are completed.**

1. Once on site at the new location, slide the upper apparatus back into the back of the sandbox base.
2. Put the computer back into the lower back of the base unit.
3. Plug all cables back into the computer, power cable being last.
4. Inspect the Kinect Camera, button box, and projector are still seated as they were before the move.
5. The AR Sandbox computer should now auto start after power is restored, and it will auto launch the AR Sandbox software. You should only need to turn on the projector.

AR SANDBOX CALIBRATION TOOL

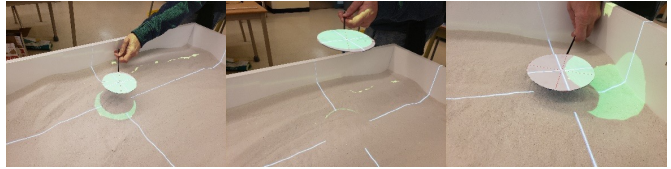
Occasionally, the projected image is not quite aligned with the contours in the sand and the AR Sandbox will need to be recalibrated. The process uses a series of 9 calibration points to correct the position of the projected image to match the contours detected by the XBOX Kinect camera. We'll walk you through those steps here:

1. Press ESC to exit the AR Sandbox application
2. Double click the Calibration Tool icon on the desktop
3. Using the supplied calibration tool (circle with crosshairs attached to stick), to line up the crosshairs in the circle tool with the white crosshairs being projected.

4. Then press the number One button on the control panel to set that calibration point. It is important to hold the circle tool reasonably still while the software sets the calibration point. The projected circle will be green when it is measuring the location, even if it is fluttering between green and yellow it will measure enough green to eventually save and move onto the next calibration point. It is ok if the projected circle isn't anywhere close to the calibration tool itself.



5. Repeat this process for each of the 9 calibration points, it is helpful that you use a different height for each calibration point. Keeping in mind that you will want to keep the heights roughly within the heights of the sand when it is in use.



6. If you wish to dig down into the sand for one of the calibration points to be lower than the sand, **you must then press the number 2 button on the control panel** to set the background depth. The calibration tool starts by doing this before presenting the first calibration point, you'll note this step by the entire sandbox being projected **RED**.

7. After all 9 calibration points have been set, you can see if the calibration has been successful by moving the Calibration Tool around the sandbox, as you move up and down, back and forth, a set of red lines should fairly closely line up with the crosshairs of the Calibration Tool. If the intersect of the 2 red lines does not follow your Calibration Tool movements very closely (approx. 1/4 inch) you may want to run the Calibration Application once again, close the app and go back to step 1.

8. Once you have completed these steps, you can exit the Calibration Tool app, and then double click the AR Sandbox application to relaunch the AR Sandbox app and once again start using the sandbox.

TROUBLESHOOTING

The process above should get you up and running with the AR Sandbox, but even in a perfect world, things don't always go according to plan. Here's some things we know may come up and we've included some solutions for you:

THE COMPUTER IS RUNNING BUT THE AR SANDBOX SOFTWARE ISN'T

The process to manually launch the AR Sandbox software is simple, using the provided wireless keyboard w/trackpad, double click the ARSandbox icon on the desktop.

THE PROJECTED IMAGE DOESN'T MATCH THE CONTOURS OF THE SAND

The process to calibrate the AR Sandbox is relatively simple, see AR Sandbox Calibration section of this User Guide.

THE COMPUTER IS RUNNING AND THE AR SANDBOX SOFTWARE IS RUNNING, BUT THE MOUSE ISN'T RESPONDING

Change the batteries in the keyboard w/trackpad. If it still doesn't respond, check the keyboards USB dongle in the back of the computer, move to another USB port and try again. If it still isn't responding, check if any of the control panel buttons have any effect, if the control panel buttons have no effect the AR Sandbox software has locked up, you must then press the small reset button on the front of the computer to force the computer to reboot. The system should auto launch the AR Sandbox software after restart.

Note, computers don't like being restarted in this way and should be used only as a last resort.

USING THE SANDBOX

The goal when building the AR Sandbox, was not only to make it the same as others we had seen documented online. We also wanted to make it reasonably transportable, which was no small task. We did this, as well as adding the control panel buttons to make the AR Sandbox as user friendly as possible yet allow the more advanced features of changing landscapes and change rain to lava or snow to be easily accessible and enrich the use of the AR Sandbox for everyone. We think we've done that, so here's some basic nuts and bolts instructions on using the AR Sandbox:



THE CONTROL PANEL.

MAKING IT RAIN

Holding your hand above the sand with your fingers spread will make the computer treat your hand like a cloud and rain under your hand. Note, if you have just changed the shape of the sand, pull your hand away to allow the computer to redraw the landscape before trying to make it rain.

MAKING IT FLOOD

If you'd like to make the entire landscape flood with rain, press the Flood button on the control panel. The length of time you hold the button increases the amount of virtual water till it reaches its maximum amount. Note, this does tax the system and momentary pauses in animation may occur.

“DRYING” OUT THE VIRTUAL WATER

If you'd like to reduce or remove the amount of animated “virtual” water, press the Dry button on the control panel. Holding the button down slowly reduces the animated water until it is eventually removed. Note, this is easier and faster than restarting the software.

SWITCHING BETWEEN RAIN-LAVA-SNOW

The AR Sandbox software has a reasonable facsimile of water, lava and snow animations. Simply switch between these with the Water Lava Snow button on the control panel, in that order. Pro tip, a great way to show early spring melting in the mountains is to make it snow on the mountains and then switch it back to water, immediately the water rushes down the contours of the mountain.

CHANGING TERRAIN

You can switch between the default landscape, mixed with ocean depth and land colors in the contour map, to two additional landscapes, all ocean, all land by pressing the Terrain button on the control panel. This way you can do instructed play entirely within ocean depths only (you can build high enough to form islands). Or the land only, which removes the blue ocean layer found in the default terrain, which allows you to use the rain/lava/snow without the blue ocean layer of the map.

3D MODEL ON 2ND SCREEN

If you have a LOFT/Viewboard touch screen in your classroom, you can connect the included Display Port Adapter + HDMI cable, as well as the USB device cable to connect from the Display Port on the computer to the HDMI 3 port on the right side of your LOFT/Viewboard. Additionally you can connect the USB A-B cable from the computer to the USB 3 port on the LOFT/Viewboard. Now with the LOFT/Viewboard turned on and set the HDMI 3 input, when you launch the AR Sandbox application a 3D model of the sandbox is presented on the LOFT/Viewboard. You can spin the model by touching the screen, using the trackpad of the keyboard you can zoom in or out by holding the left trackpad button and moving your finger on the trackpad. The 3D model is a realtime representation of what is being done to the AR Sandbox. So two ways to use the AR Sandbox!

A WORD ON SAND MAINTENANCE

Obviously, it is important to continually instruct students to keep the sand in the sandbox. It can make a mess, and it is expensive so if more sand is needed to keep the sandbox working well, it would be a considerable expense.

It is also important to be aware as with all sandboxes, traditional and augmented that they can be a point of transmission for colds, flu, and other illnesses, so use of hand sanitizer or at least washing hands with soap is recommended before and after use of the sandbox.

When the sand is dry, there is quite a bit of dust which can get into the projector, also the sand sluffs to a 40-45 degree slope when dry. So we have done some testing with moistening the sand. Very little water is needed to keep the dust down, only 100ml from completely dry was enough to reduce dust to nothing. First time adding water (real water not virtual water) 300ml was more than enough to allow the sand to be packable and better shaped so you should never need to add more than 300ml. In fact 2 days after the first time adding water, only 150ml was needed to bring the sand to the same consistency as when we first applied the 300ml so use that as a bit of a guide. Too much water would have the potential of becoming a fungus or mold problem so it is good to allow the sand to dry completely when not in heavy use. Using a standard water bottle or plastic soda bottle, roughly one third is pretty close to 300ml. **Note, using your hands, mix the moist sand with the dry sand thoroughly to ensure the sand is moist but consistent.**

More information on the specific sand used in the AR Sandbox can be found here <https://www.sandtastik.com/100-sand/101-white-play-sand>

We contacted Sandastik about the AR Sandbox and asked about cleaning the sand, here's what they got back to us with, so simple:



How to clean Sandtastik™

The following procedure done periodically will ensure SANDTASTIK™ as a clean and safe sand along with extending its usefulness as an ideal play medium:

- 1) In any container; i.e. plastic pail, fill 1/2 full with SANDTASTIK™.
- 2) Place container in sink and let running tap water pour gently over SANDTASTIK™, allowing water to flow over sides of the container and down the drain, while agitating sand with hand to free any foreign particles in SANDTASTIK™.
- 3) Once the sand in the pail has been thoroughly rinsed, pour off excess water and return wet sand to play box. Let dry with cover off.
- 4) Repeat this procedure whenever you are aware foreign particles have been introduced to SANDTASTIK™ or if an odor exists.

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