TEACHER MANUAL FOR ACTIVITY 1

This manual provides guidelines to teachers on how to teach with G-v-G. It contains instructions on how to set up the Leap motion controller as also lesson plans for teaching with G-v-G. The content of this manual is arranged in the following sequence:

Q1) How do I set up Leap motion controller with G-v-G?

1. Peel off the sticker from the Leap motion controller
2. Connect the device to your computer with the USB cable provided with it
3. The shiny side of the controller faces up and the green light faces towards you
4. Download the leap motion driver for appropriate operating system from the links provided above.
5. Double click the downloaded folder and install the driver. You may have to click "next" button a number of times to get it installed.

Q2) How do I run G-v-G on my system?

1. Click on the "Download Zip folder" button on the home page to download the G-v-G folder.
2. Click on the downloaded folder to extract it on your system
3. Plug in the Leap motion device to your computer
4. Click on index.html from the Geometry via Gestures 2.0 folder
5. Get started with G-v-G

Or

1. Click on the "Run" button on the home page
2. This will direct you to the activities of G-v-G
3. Plug in the Leap motion device to your computer
4. Get started with G-v-G

Q3) How does the G-v-G code work?

When the sliding/upward gesture is sensed by the controller, it will be verified by the application code if the gesture has been associated with any action with the current model on-screen. If specific action is associated, as in this case, then the rectangles can be made to move like a 3D cycle wheel. This will enable the student to associate the 2D rectangle primitive with the 3D right circular cylinder (Figure 2).

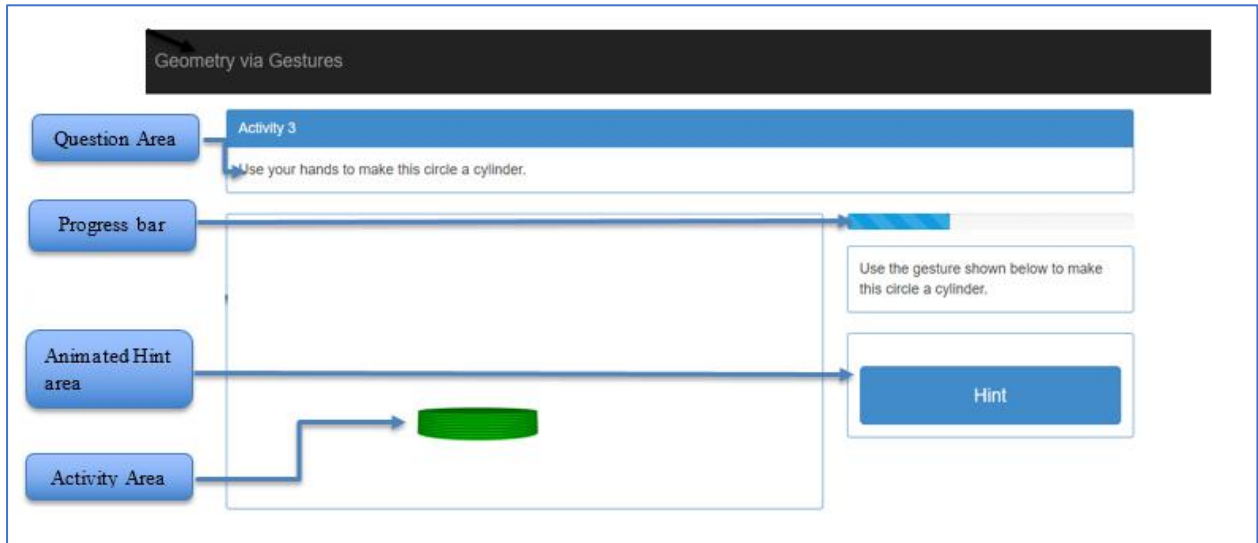**Q4) What are the Screen Components of G-v-G?**

Figure 1. Screen components of G-v-G application

The activity screen of G-v-G application, is divided into the following areas as can be seen in Figure. 1. A brief description of the same is provided in the table below.

Screen components	Description
Question Area	The space on the screen where the activity question is provided to the learner.
Progress bar	Indicates the progress of the activity
Animated Hint Area	The space on the screen where hints are given on the type of gestures to be used to do the activity. The hint can be used at any time during of the activity.
Activity Area	The space on the screen where the learner initially sees a 2D shape. Based on the learner's gestures, transformation occur in this area and finally a 3D structure is formed

Resources required: Leap motion controller

G-v-G requires the Leap Motion Device to recognize gestures. You can purchase it here: https://www.amazon.in/Leap-Motion-Gesture-Controller-MAC/dp/B00E3CP9UM/ref=sr_1_2?ie=UTF8&qid=1522055470&sr=8-2&keywords=leap+motion&dpID=310zzpBz0eL&preST=_SY300_QL70_&dpSrc=srch

Here is a detailed design of the learning activities that teachers could do with G-v-G.

Activity 1

Title: Construct Activity (C1)
Educational level: High school students   **Topic:** Visualizing 3D shapes

Learning Objective: Student will be able to construct the formation of a 3D right circular cylinder by the rotation movement of a 2D rectangle.

Activity Context:
When learning about 3D geometrical figures, students are first introduced to the underlying 2D primitives and then the derivation of 3D object from accumulation of these 2D primitives is explained. Likewise, when explaining the right circular cylinder structure to the student, it is desirable to show them how the structure can be obtained by orienting a rectangle along different planes around a central axis akin a cycle wheel with spokes.

Lesson Plan:

S. no	Time duration (minutes)	What will teacher do?	What will students do?	G-v-G feature to be used
1.	10 mins	Pose recall questions/activity for the 2D structures previously dealt in class. Example question prompts you can ask students: • What is meant by 2D? • What are the 2D structures you learnt in class? • What are the 2D structures you see in real life?	Recalls & respond to question prompts on 2 D structure	-
2	5 mins	Ask the student to do the Construction Activity	Student will use the G-v-G application to do construct the 3D object	Construction Activity (C1) Refer Figure 2: 2D Rectangle Sheet to view the screen of the activity
3	5 mins	Ask the progress of the activity Example questions that you can ask*: • Do you see the Hint feature in the G-v-G application? • You might want to use the hint feature in the G-v-G application • What is the gesture that you did so that the progress bar moves?	Student will either respond that we are unable to do /unable to see the progress bar move/ see that the progress bar has moved	Progress bar and Hint feature in the G-v-G application
4	5 mins	Teacher will ask the students to continue so that the progress bar shows activity completion	Students will use the Hint feature to figure out gesture/ Their peers might point out the gesture	Construction Activity (C1)
5	5 mins	Ask the students their progress bar status By now, the students would have completed the task, if not the teacher could go the individual student to help. Or ask the peer who have completed to help	Students would report their progress status.	Construction Activity (C1)
6	15 mins	Once the task is complete, teacher can ask the following questions*: • What was there initially on the screen?	Students will reflect on the question/ Discuss with peer/ Answer the question in a notebook	Construction Activity (C1) Refer Figure 3: Right circular

		• What happened on the screen when you used the gesture? • After the activity completion how did the screen structure look like? • What do you infer from the activity? • Some of the 3D shapes that you previously mentioned how will you construct them?		<u>Cylinder</u> to view the screen of the activity

* The questions asked by the teacher during the activity are expected to make students reflect on action they did, why they did that particular action/gesture, what happened to the object on screen, what insight did the student gain from this activity and finally can the student conceptually describe the volume property of the 3D object in terms of the 2D objects.
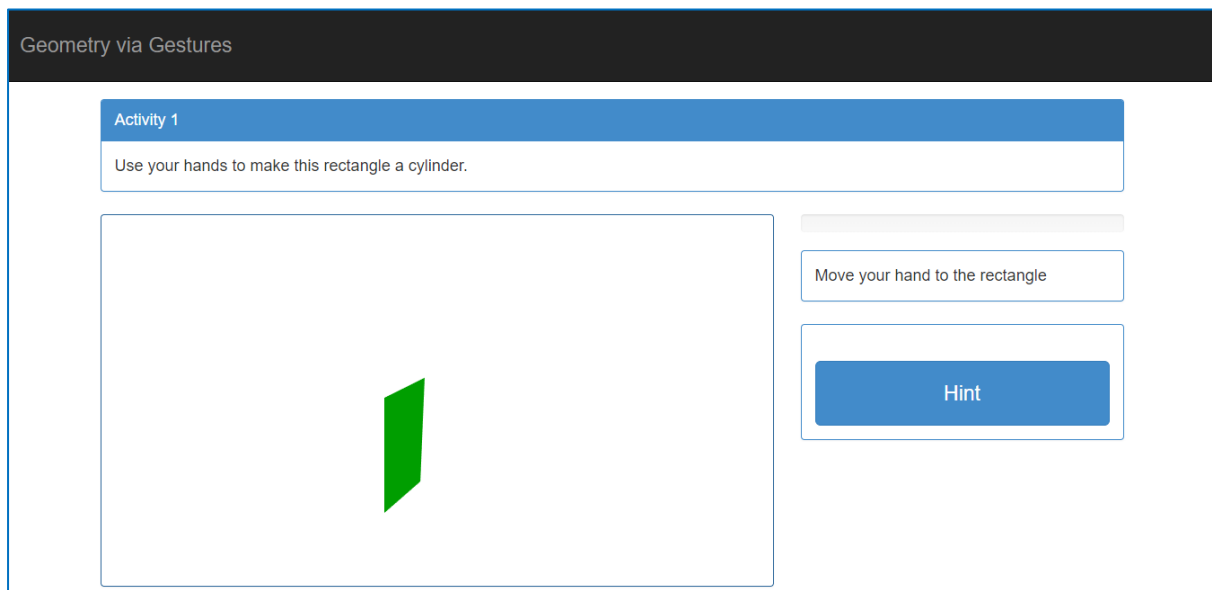

Figure 2: 2D rectangle sheet

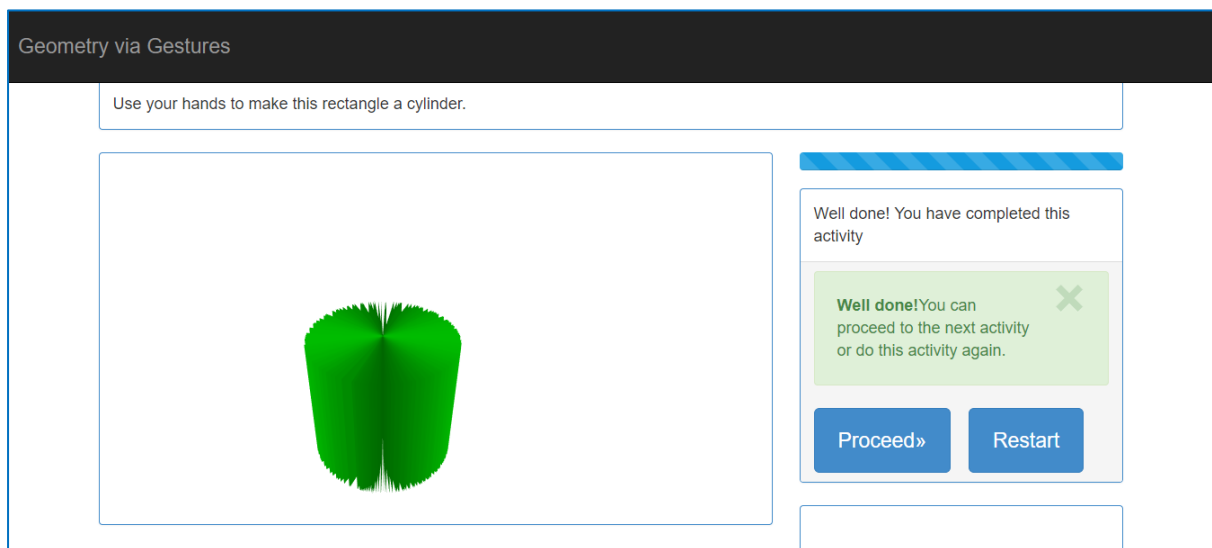The initial screen of activity 1 will appear as displayed in Figure 2.

Figure 3: Right circular cylinder

Q6) What are the precautions to be considered while using Leap Motion Controller?

Let the students and the instructors play around with leap motion controller for maybe a week before the activities.

- Leap Motion Controller sensors are very sensitive to direct light. When exposed to direct light the sensors will be unable to detect the hand gestures of the students. We advise the instructors the following:
    - Avoid using leap motion controller in direct sunlight
    - Avoid harsh lighting (powerful/photography lighting) directly on the leap motion controller

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