PREFACE

"Study the science of art. Study the art of science."
Leonardo Da Vinci

STEAM is an educational discipline that aims to spark an interest and lifelong love of the arts and sciences in children from an early age. Science, Technology, Engineering, the Arts and Math are similar fields of study in that they all involve creative processes and none uses just one method for inquiry and investigation. Teaching relevant, in-demand skills that will prepare students to become innovators in an ever-evolving world is paramount, not only for the future of the students themselves but for the future of the world.

STEAM empowers teachers to employ project-based learning that crosses each of the five disciplines and fosters an inclusive learning environment in which all students are able to engage and contribute. As opposed to traditional models of teaching, educators using the STEAM framework bring the disciplines together, leveraging the synergy between the modeling process and math and science content, for example, in order to blur the boundaries between modeling techniques and scientific/mathematical thinking. Through this holistic approach, students are able to exercise both sides of their brain at once.

An important part of this educational approach is that students who are taught under a STEAM framework are not just taught the subject matter but they are taught how to learn, how to ask questions, how to experiment and how to create.

The goal of this guide is to provide instructional tools in line with the National Curriculum of Pakistan, and it will be useful for teachers of students in all grades. It presents a teaching approach that encourages the active participation and involvement of students in the learning process, with an appropriate balance between thinking and hands-on activities. Sometimes students will be engaged in discussion, and if teachers use questioning effectively, it can improve their students' thinking and communication skills.

To make the guide user-friendly, simple step by step instructions are provided.

A total number of periods is also suggested for each unit, but the amount of time needed to complete each unit or activity may vary according to its degree of difficulty and the abilities and skills of the students. Teachers can adjust the times to suit their particular needs and context. Advanced preparation and clear instructions by teachers will help to minimize classroom management problems.

All materials suggested for the activities should be easily available at low/no cost: alternative materials can be substituted if necessary.

HOW TO USE THIS GUIDE

Following the simple guidelines can help you get most out of these lesson plans. However, as all teachers know, in order to deliver the best lessons, you should be thoroughly familiar with the subject matter before you plan your lessons.

1. Always read the lesson plans thoroughly before the class to maximize confidence and command over your teaching. It will also enable you to modify in advance the plans to suit the needs of your particular students.
2. Collect and test all the materials listed in the plan before the lesson in order to obtain the required results. This will also minimize classroom management problems.
3. Instead of giving your input directly, introduce the key vocabulary using the glossary or dictionary. Involve the students in exploring the meanings of the key vocabulary using the glossary and if any meaning is not there, ask them to look up the meanings in a dictionary. You can also prepare flash cards for the new terms and display them on the walls. Before starting your lesson, ask the students to read these words aloud and share their meanings. This will help your students improve the pronunciation of the new scientific terms and their fluency in using these terms in discussion of the topics.
4. Before any activity, give clear instructions about what, how, and why they are going to do it.
5. Each additional worksheet has been coded according to the following criteria.

STE. 6. 1. 4

0. The concept of STEAM education is new for everyone. If a child takes longer than you had anticipated, adjust accordingly. Always be appreciative of the work done in class.

We hope that this guide will prove useful in making the learning and teaching something to be looked forward to and enjoyed by teachers and students alike.

IQRA ZAHID
DEPARTMENT OF ACADEMICS
THE NEXT SCHOOL

THE NEXT SCHOOL

DAILY LESSON PLAN

Class: 6 Term 2 Lesson 1 and 2

Project: Introduce the App Lab programming environment as a powerful tool for building and sharing apps: **Intro to app lab**	Duration 40 min

Learning Objectives: At the end of the lesson, students will be able to

- Build and share their own apps in App Lab using features like buttons, text, images, sound, and screens.
- Helps children to develop their mathematical skills and spatial awareness and encourages them in developing how to problem solve and come up with new ideas.

Teaching Objectives: Teacher will

- Help them to break the barriers by actively pairing students if they seem like they need help.
- Before completing a level for a student ensure they've actually looked closely at the target image and read all the text there.

Skills involved:

Thinking skills · Problem Solving · Observation skills · Self-management

Resources required:

Computer/Laptop
https://youtu.be/wAuYr1IntQs

Instructions:

Warm up: Motivate: Explain to students the goals of today's activity. They are going to start using a new tool that will let them quickly make apps they can instantly send to themselves or friends to use.

Video: The first level of this activity is a video that should both motivate students to complete the activity and explain how it will work. Consider watching it as a class and quickly debriefing afterwards to answer questions.

Activity: Introduction to Application Lab!

https://studio.code.org/s/applab-intro/lessons/1/levels/1

Step 1: Setting Properties - Levels 1-4

- Help students to learn about the use of `setProperty()` block. The dropdowns in this block make it easy to know exactly what it is capable of changing. That said, there's a couple tips that can help
- When to use Double Quotes: The `setProperty()` block automatically changes the final dropdown when you select what properties you want to change, including whether they use double quotes. When in doubt, students should first change the first two dropdowns, then use the last one as a model for what values work there. The most common error is failing to use double quotes around a color name.
- Hover to Read IDs: By hovering over an element in your app you can read its ID. This will help students when they're trying to change multiple elements on their screen.

Step 2: Make It Interactive - Levels 5-7

- This sequence introduces the `onEvent ()` block. Here's some helpful tips if students are getting stuck.
- on Events Don't Go Inside One Another: Students just starting out may try to put one block inside of the others. This is never the intended behavior for this tutorial. Even though this is mentioned in the videos, a quick reminder might help get kids unstuck.
- Check Your IDs: You need to change the `"id"` property in `onEvent ()` so that it detects events with the correct element.

- You Can Use Multiple Blocks in an `onEvent():` If you want multiple things to happen when you click the same button, just add more blocks to the same `onEvent()`. You should never have a program that has two onEvent () blocks for the combination of element (e.g. "button1") and event type (e.g. "click")

Step 3: Images and Sounds - Levels 8-9

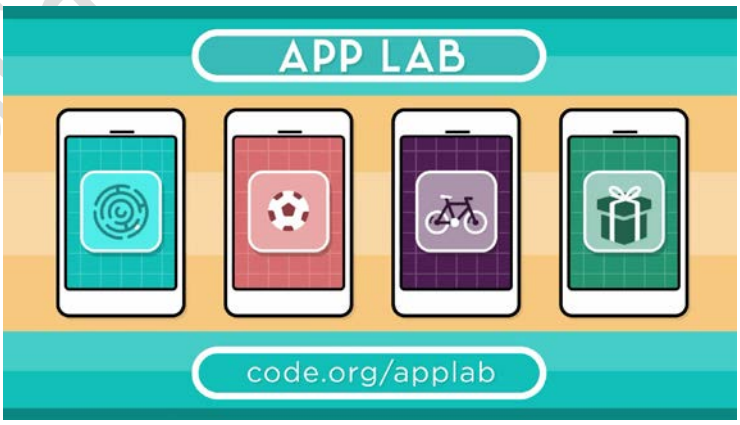
- This section has a single level that has students add an animal to a soundboard. This level is a little more involved than the previous ones, so expect that students may need to either rewatch the video beforehand or read instructions carefully to complete all the steps.
- Images Use `setProprety():` To add an image to a screen element students can use the `"image"` property. There is no new block.
- Link to Images: Students can copy the URL of images they find directly into the `setProperty()` block in order to add them to their apps. There's no need to download them to their computers and upload them to App Lab if they don't wish to.

Step 4: Design Mode - Levels 10-13

- In the last sequence students are working on the same project for three bubbles in a row. They are now learning to add screen elements themselves which means that the total number of things they can do in App Lab has grown a lot. Assume that some students will spend some time exploring at this point as they try out all the new tools.
- Using Good IDs: An important part of programming in App Lab is giving your elements good IDs. Up to this section students have had their IDs created for them, so they haven't had a chance to practice this skill. This is a useful reminder for the teacher to reinforce during this **section.**

Step 5: Share Your App - Levels 14-15

- This section is very open-ended. The tutorial itself is designed to give students ample time to keep working on this project, either making Choose Your Own Adventure, or one of their own creations.
- Try the Samples: Students are provided 3 sample apps that should help them brainstorm their own ideas.
- Encourage Creativity: Compared to other activities in this lesson, this section asks students to be much more creative. Ask students to think "what will your story be about?" or do a quick group brainstorm so that classmates can hear ideas from one another.



Print Certificates: Print certificates for students to celebrate their achievement.
Click on the link below for the notes: **Teacher only!**
https://studio.code.org/s/applab-intro/lessons/1/levels/1

Evaluation/Reflection:

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Signature of the teacher Signature of the Head/Coordinator

THE NEXT SCHOOL

DAILY LESSON PLAN

Class: 6 **Term 2** **Lesson 3 and 4**

Project: Introduction to machines Learning by using gears: **A paper Crimper Machine**	Duration
	40 min

Learning Objectives: At the end of the lesson, students will be able to

- Identify how gears and different gear train arrangements are used to change the speed, torque and direction of a power source.

Work collaboratively in a small group to create something together.

Teaching Objectives: Teacher will

- Explain the role of gears in mechanical devices.
- Check the degree to which the students are meeting the learning objectives

Skills involved:
Thinking skills · Problem Solving · Communication · Self-management

Resources required:
Powered simple machines

Instructions:

Warm up: Challenge the students and ask them to imagine if you are an engineer and I ask you to build a machine that can do something with paper? Maybe a folding machine? What is the thing you are trying to build?
Take different answers from students if they have solid plans, ask them to sketch the plan on a piece of paper and try to build it and if they don't have any plan yet start your class and ask them to build a paper crimper machine by using beams, axles and gears.

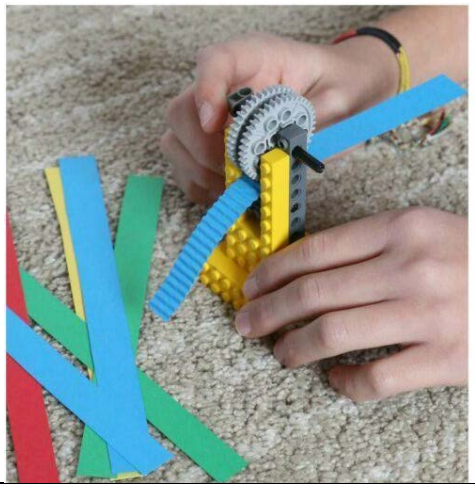
Challenge: Build the paper crimper or invent new machines on their own.

Step 1: Started with two 2 x 6 bricks, two 1 x 12 Technic bricks, and a 2 x 2 brick.

Step 2: Slide two small gears onto a Technic axle. It doesn't matter how long the axle is, as long as it's long enough to go through both Technic bricks.

Step 3: Then stick it into the holes in the Technic bricks. (You'll have to take the Technic bricks off again to do this.) Use larger gears for the second set, but the size is not important.

Step 4: Attach both sets of gears to the frame. For the handle, you just need something that has an x-shaped hole so that it fits snugly on the longer axle.



Step 5: Add more bricks to the frame. We used two 2 x 6 bricks, two 2 x 4 bricks, and two 1 x 6 bricks.

Step 6: Then you're ready to go! Cut some paper strips to use with your crimping machine! Try to use construction paper and copy paper as well as card stock. The card stock looks the best, but you'll need to turn the gears themselves instead of the handle because of the stiffness of the paper.

Evaluation/Reflection:

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Signature of the teacher Signature of the Head/Coordinator

THE NEXT SCHOOL

DAILY LESSON PLAN

Class: 6 Term 2 Lesson 5 and 6

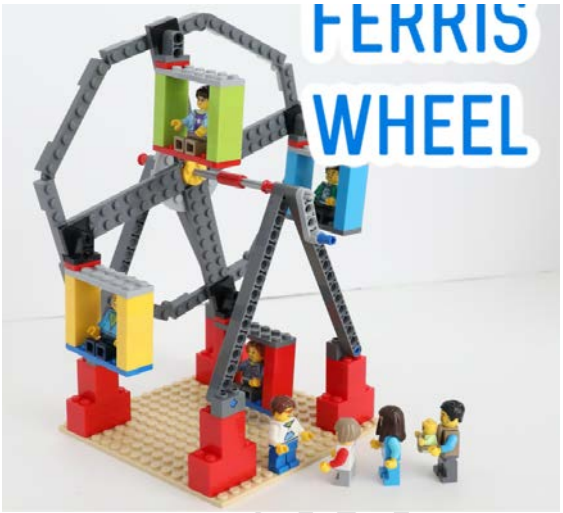
Project: Implementation of basic engineering concept: **Build your own Lego Ferris wheel**	Duration 80 min
Learning Objectives: At the end of the lesson, students will be able to ● Learn some engineering issues that are valuable for students to figure out. ● Understand how engineering concepts is implemented in practical life	
Teaching Objectives: Teacher will ● Help students to show how to build it out of some fairly basic pieces. ● Help them to figure out how to make the wheel turn freely within the frame.	
Skills involved: Thinking skills · Problem Solving · Communication · Self-management	
Resources required: **Powered simple machine kit** **https://www.youtube.com/watch?v=pml-1RZOBjA**	
Instructions: **Warm up:** Gather the students and ask them if they have ever sat in the Ferris wheel. Ask the students what they think about how engineers build this long wheel and how people sit on it. **Say:** Today we are going to construct the Ferris wheel. What do you think about how we can build it? **Note:** Always give the students this challenge and see if they can figure it out without first seeing ours. **Activity: Build** a Lego Ferris Wheel which turns the handle on LEGO Ferris wheel, and the cars go for a spin. **Step 1:** First, **construct** the frame. Grab four 1 x 15 Technic lift arms. They can be any color. Insert a blue axle pin with friction ridges into the bottom of each lift arm. Then slide a 1 x 2 Technic brick with an axle hole onto each axle pin. **Step 2:** Attach the axle at the top of the frame is one light gray axle 9 studs long and one light gray axle 7 studs long, connected with a Technic axle connector 2L (2 studs long). **Step 3:** The wheel is made from one 6 x 6 light gray round plate. Then attach a 2 x 2 round plate on each side of it, top and bottom. The 2 x 2 round plates have axle holes, while the light gray plate has a round hole. We needed the size of the 6 x 6 round plate, but needed the axle holes so that the wheel would connect with the axle and rotate WITH it. **Step 4:** Grab the bricks shown for building the rods that support the passenger cars. Need four sets of these.	

Step 5: Attach a 1 x 2 pin connector plate to a 2 x 2 tile modified with a pin. Add these to the end of a 2 x 10 dark gray plate. Then add a 1 x 2 red plate (or any color you want) to the underside of the pin connector plate.

Step 6: Build a passenger car. Use two 2 x 6 plates. Then there are four 1 x 2 bricks on each side.

Step 7: Make three more of these. Then attach the passenger cars to the wheel on the Ferris wheel frame.

Step 8: Now your wheel is ready. Try to improve your project by using outer bricks.



Evaluation/Reflection:

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Signature of the teacher Signature of the Head/Coordinator

THE NEXT SCHOOL

DAILY LESSON PLAN

Class: 6 Term 2 Lesson 7 and 8

Project: Science behind the concept of sinking and floating: **Building of an Elastic Boat**	Duration 40 min
Learning Objectives: At the end of the lesson, students will be able to ● Design and build their own rubber band paddle boat. ● By building the boat students can learn different concepts of floating and sink.	
Teaching Objectives: Teacher will ● Help students in building ● Help them to participate in collaborative conversations about the topic	
Skills involved: Thinking skills · Problem Solving · Communication · Self-management	
Resources required: Popsicles sticks, Rubber band, hot glue gun, paper cutter, nail https://www.youtube.com/watch?v=JU0zEznezZ4	
Instructions: **Warm up: Before starting, ask them what is meant by sinking and floating? Show them a video of objects which objects are able to sink and which can float and why?** After the video **Say:** What have you learnt from the video? **Activity: Build a paddle boat!**	

Step 1: Put the glue gun on the sticks and attached 5 to 8 sticks together. Try to attached two popsicles sticks in the lower side to make it strong.

Step 2: Now ask the students to take a pencil and draw a shape of boat with proper corners and cut it with help of cutter for making it into a proper shape.

Step 3: Now cut other popsicles in a proper shape to make a boundary of the boat.

Step 4: Put a hole through these points shown in picture, and match up with the other ones.

Step 5: Now it's time to make paddles of the boat on both sides take two bottle caps and make a small hole into it.

Step 6: Cut the cabs into 5 equal parts so we can but a popsicle sticks into it to make a paddle as shown in the video.

Step 7: Put the longer sticks into the paddles and attached it with the boat.

Step 8: Now take two wooden blocks and put glue gun into it and attached it inside the boat on both ends.

Step 9: Now take a small nail and glue it on wood.

Step 10: Now put the rubber band on side of the wood and test your boat in water.

Evaluation/Reflection:

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THE NEXT SCHOOL

DAILY LESSON PLAN

Class: 6 Term 2 Lesson 9 and 10

Project: Controlling variables, taking accurate measurements, and analyzing data: **Make Your Own Seismograph**	Duration 40 min

Learning Objectives: At the end of the lesson, students will be able to

- Model and describe the effect of earthquakes on buildings.
- Learn about the cause of earthquakes,
- Learn about how scientists measure earthquake intensity

Teaching Objectives: Teacher will

- Explain how a simple seismograph is able to record ground motion that can be seen on seismograms.
- Discuss methods to improve and re-engineer the model seismograph.
- Describe how a seismogram can help a community.

Skills involved:

Thinking skills · Problem Solving · Communication · Self-management

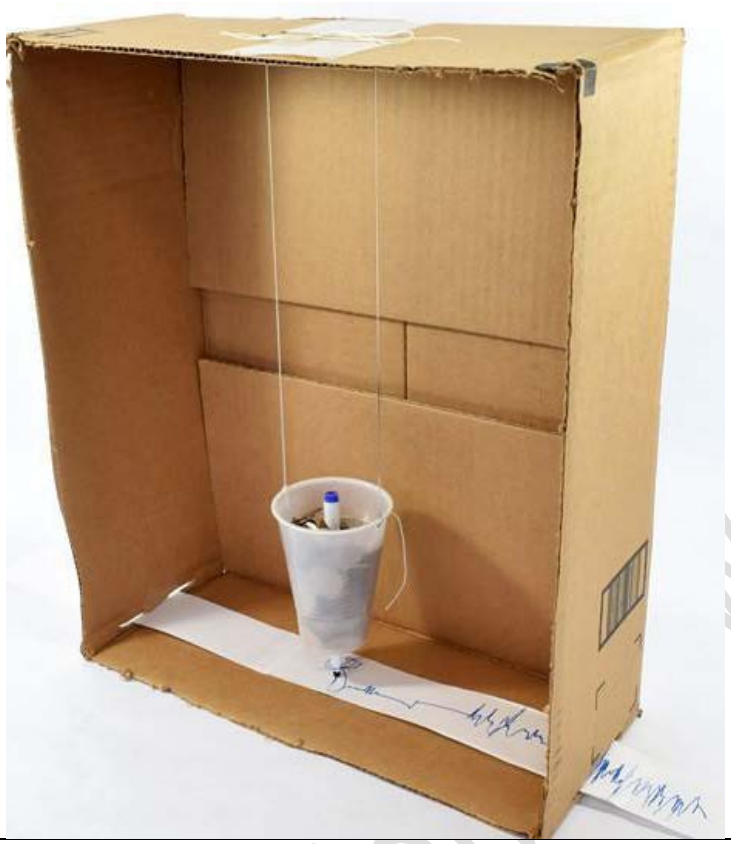
Resources required:
Medium-sized cardboard box, Paper or plastic cup, String, Marker, Scissors, Paper, Tape, Coins, marbles, small rocks, or other small, heavy objects to use as weights
https://www.youtube.com/watch?v=ClCaM6WFCoo

Instructions:

Warm up: Start by thinking about these questions: who has felt an earthquake? What do we know about earthquakes? What famous earthquakes have happened in our history? How do scientists measure the magnitude of an earthquake?
Say: A seismograph is a tool scientists use to record earthquakes and measure their strength. In this activity you will build your own seismograph using simple materials.

Activity: Make your own Seismograph

Step 1: Cut the lid or flaps off the cardboard box. Stand the box up on one of the smaller sides.
Step 2: Poke two holes opposite each other near the rim of the cup.
Step 3: Tie a piece of string, slightly longer than the length of the box, to each hole.
Step 4: Poke two holes in the top of the box, making sure they are the same distance apart as the holes in the cup.
Step 5: Push the two pieces of string through the holes and tie them together on the top of the box, so the cup hangs down inside the box. The bottom of the cup should be about an inch above the bottom of the box.
Step 6: Poke a hole in the center of the bottom of the cup. Remove the cap from the marker, and push the marker through the hole, so its tip just barely touches the bottom of the box.
Step 7: Fill the cup with coins or other small weights, making sure the marker stays vertical.
Step 8: Fold a piece of paper in half lengthwise, then fold it in half lengthwise again. Unfold the paper and cut along the folds to form four equal-sized strips. Tape the strips of paper together end to end, to form one long strip. If you have a long-printed receipt, you can skip this step.
Step 9: Cut two slits on opposite sides of the cardboard box, as close as possible to the bottom edge. The slits should be wide enough to pass the paper strip through one side, across the middle of the box, and out the other side.
Step 10: Make sure the marker is centered on the paper strip. You might need to poke different holes in the top of the box and re-hang the cup if necessary.
Step 11: Now you are finally ready to use your seismograph! Stabilize the box with your hands as your helper slowly starts to pull the paper strip through the box from one side to the other side.
Step 12: Now, shake the box back and forth (perpendicular to the paper strip, keeping the bottom of the box in contact with the table) as your helper continues to pull the paper strip through, doing their best to pull at a constant speed. How does the line on the paper strip change?
Step 13: Pause your shaking for a few seconds (as your helper continues to pull the paper), then try shaking the box harder.
Step 14: Pause for a few more seconds, then shake the box very gently.
Step 15: Pull the paper strip all the way out of the box and look at the line.



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