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.

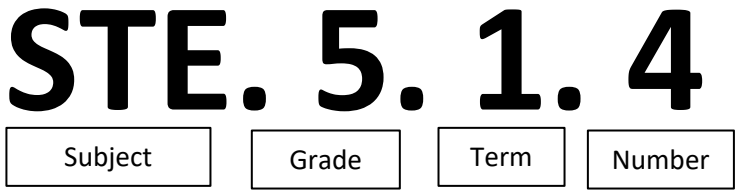
A total number of periods is also suggested for each unit, but the amount of time needed to complete each unit or activity may vary according to its degree of difficulty and the abilities and skills of the students. Teachers can adjust the times to suit their particular needs and context. Advanced preparation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



The concept of STEAM education is new for everyone. If a child takes longer time 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: 5 Term 2 Lesson 1 and 2

Project: Explaining the concept of gravitational potential energy and kinetic energy: **Make a marble roller coaster**	Duration 70 min

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

- Comprehend basic physics concepts that are applicable to roller coaster construction, including potential energy, kinetic energy, and momentum.
- Apply their understanding of those concepts as they construct and text their roller coaster.
- Describe how energy is changing throughout their marble's journey down the "coaster"

Teaching Objectives: Teacher will

- Help the children through a cycle of building, testing, observing and revision, so that students will gain an experiential understanding of fundamental physics concepts and the basics of successful roller coaster construction
- Ask them to watch the marble closely and observe its velocity. Where is the marble going the fastest? Where is it going the slowest?
- Add a straight piece of track to the end of your roller coaster at the bottom of the loop and ask them to observe how far the marble roll before friction brings it to a stop?

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

Resources required:
pool noodles, Duct, Scissors, Small marbles, Paper cup
https://www.youtube.com/watch?v=4lOFshwO0oA

Instructions:
Warm up: Before starting, ask the students, ``Has any of you ever sat in the roller coaster? How was your experience? Did you ever think about the science behind all this?
Say: Today we are going to build a roller coaster and also explore how it will work using different forces.

Activity: Create a roller coaster which will transport the marble from the top of the first hill, all the way through the track (need to start with a steep hill).

Step 1: Start by cutting one pool noodle in half lengthwise. This will give you two pieces of track. (If you are working with younger children, you may want to do this step ahead of time.)

Step 2: Use tape to secure one piece of track to the back of a table, or countertop so it forms a hill.
Step 3: Place the cup at the bottom of the track and test out the hill.

Step 4: When you place the marble at the top of the hill and let it go, the marble should end up in the cup. If it comes off the track, adjust your pool noodle and try again.

Step 5: Remove the cup and use other pool noodle half to continue your track. Use duct tape to attach it to the bottom of your hill. Make sure when connecting the pieces it must smooth the tape out. A bump in the tape will make your marble jump off the track.

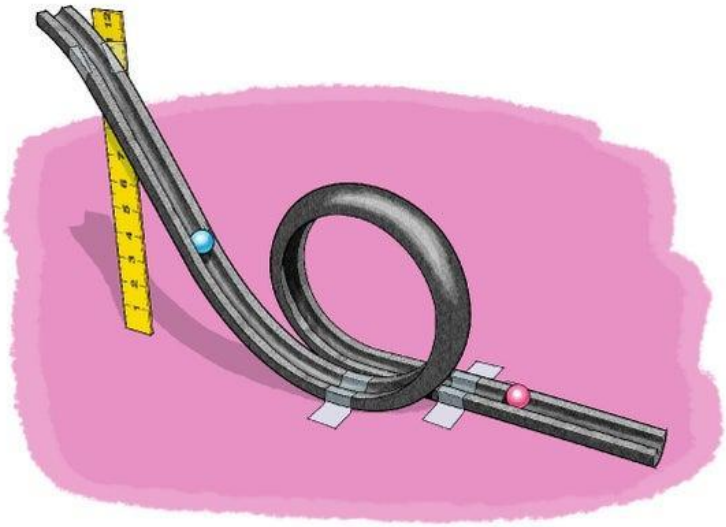
Step 6: Once the second piece of pool noodle is connected, use it to make a small hill or two by bending it into a hill and taping it in place to the floor. (Remember to keep your tape smooth.)

Step 7: Try to make a loop with the pool noodles by curving the free end up and over. Once done with forming the loop, use a piece of duct tape to secure the inner parts of the loop. Use more duct tape to hold it in place on the floor. (Sometimes it helps to have someone hold the track pieces while one student is taping.)

Step 8: Place the cup at the end of the track and test out the coaster again by sending the marble down the big hill.

Step 9: If the marble comes off the track, try again.

Step 10: Try making a tunnel or using the boxes to help make hills.



Evaluation/Reflection:

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Signature of the teacher Signature of the Head/Coordinator

THE NEXT SCHOOL

DAILY LESSON PLAN

Class: 5 Term 2 Lesson 3 and 4

Project: Identify a wheel and axle as a simple machine and where friction might be found**: Go-Cart**	Duration
	70 min

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

- Understand that wheels do not have to roll on the ground to be effective; roller conveyors use wheels to move objects easily.

Teaching Objectives: Teacher will

- Encourage students to identify parts while they are trying out the model.
- Draw different items where they find wheels and axles used in everyday machines and mechanisms.

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

Resources required: Powered and simple machines kits

Instructions:

Warm up: Gather the students and ask them about carts. Ask if they have tried steering a go-cart. What do they enjoy most about go-carts? Which simple machine is needed for a go-cart to move and turn?

Say: Let's build a go-cart!

Step 1: Make a base of the cart by using beams and attach them.

Step 2: Now put 2 axles on both ends of the beams and attach the wheels with the axles.

Step 3: Now put a Lego incurvature on the top of the cart and ask the students to try the cart.

Step 4: for testing the go-cart, use both hands to keep all four wheels on the track.

Step 5: Place one hand on the back of the cart and the other on the steering wheel.

Note: Encourage the students to build their own Go-Cart with the help of pictures. (Try not to share the building instructions with them to help them improve their creativity)

Encourage students to discuss the effects the different wheels and axles will have on the go-carts in their own words, prompting them with questions such as:

Describe what happened when you tried steering the go-cart.

- How easy/difficult was it to steer around the test track? Why do you think that was?
- Describe how the model works.
- What did you do to make sure your observations were correct?

Evaluation/Reflection:

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Signature of the teacher Signature of the Head/Coordinator

THE NEXT SCHOOL

DAILY LESSON PLAN

Class: 5 Term 2 Lesson 5 and 6

Project: Learn about levers and mechanisms: **Build Lego lock and key safer**	Duration 70 min

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

- Apply knowledge and skills related to levers, structures, hinges, and fair testing.
- Learn about all types of levers and its working in practical life.

Teaching Objectives: Teacher will

- Help them in making a sketch of the idea that they design and made.
- Continue suggesting them for improvements.

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

Resources required:
Powered and simple machines kit

Instructions:

Warm up: Ask the students if they have siblings that they want to protect their belongings from. If they want to keep their secret treasure locked away in a box from their siblings what will they do? Most students will give you different answers like my sister can undo almost any lock and she is always so curious and wants to know his secrets!

Say: For this I have a solution. What if we can design a secret way to 'lock' a box that uses a key?

Activity: Lego Lock and Key safer

Step 1: Starting with a 16 x 16 plate. It's a good size for building a drawer that isn't huge, but can hold plenty of coins or other objects.

Step 2: ask the students to decide what size you want the drawer to be. Cover an area that size with tiles so that the drawer will be able to slide easily. The tiles shown make a 12 x 12 square.

Step 3: Try to build a wall in front of the drawer and in back of the drawer. Leave one side completely open. On the other side, build a channel for the key.

Step 4: The idea is that the key slides into the channel. When you turn the key, the teeth fit through openings in the wall and push the drawer open.

Step 5: To use the key, slide it into the channel. Slide it all the way in until it hits the back of the safe.

Step 6: Build a 12 x 12 drawer. Try to use two 6 x 12 plates and attach them with a 4 x 8 plate. The drawer is 4 bricks high. Then there is a row of tiles around the top.

Step 7: Then turn the key to the left. The teeth on the key should push the drawer out.

Step 8: The drawer does not come out far on its own. Then use your fingers to pull it out the rest of the way.

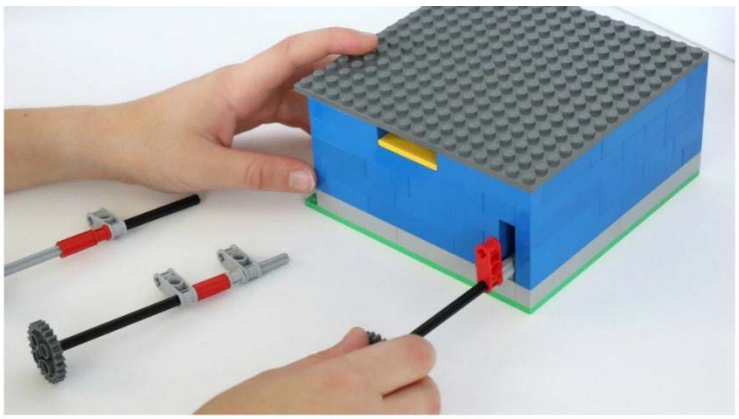
Step 9: Use a pin to keep the drawer from sliding out when you don't want it to. Slide a pin into a Technic brick and build it into your safe. Then add a Technic brick on the drawer.
Make sure that the height of the pin lines up with the height of the hole on the drawer!

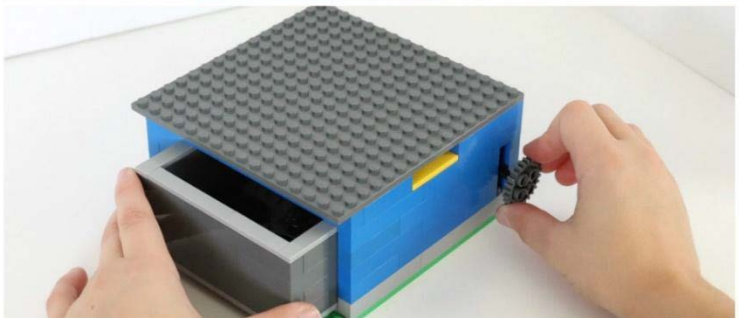
Step 10: Once you get the mechanism working, place the drawer in the safe. Then build up the sides so that their height comes exactly to the top of the drawer.

Step 11: If you want a coin slot, add a 1 x 4 tile to the top of the frame. Then add another row of bricks.
Step 12: Finish up the machine by placing a 16 x 16 plate on top.

Ask the students to build some decoy keys, The one which has two pins will work is the one that works.

Note: Instruction guide is also attached with the resource.





Note: Advised not to share image with students. (Only help them with their creative skills)

Evaluation/Reflection:

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Signature of the teacher Signature of the Head/Coordinator

THE NEXT SCHOOL

DAILY LESSON PLAN

Class: 5 Term 2 Lesson 7 and 8

Project: Concept of pulleys: **Make a Cable Car**	Duration
	70 min

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

- Will help in learning the concept of making a structure which will help them in future.

Teaching Objectives: Teacher will

- Determine that the student has met the objective of the lesson
- Help the children participate in collaborative conversations about the topic

Skills involved:

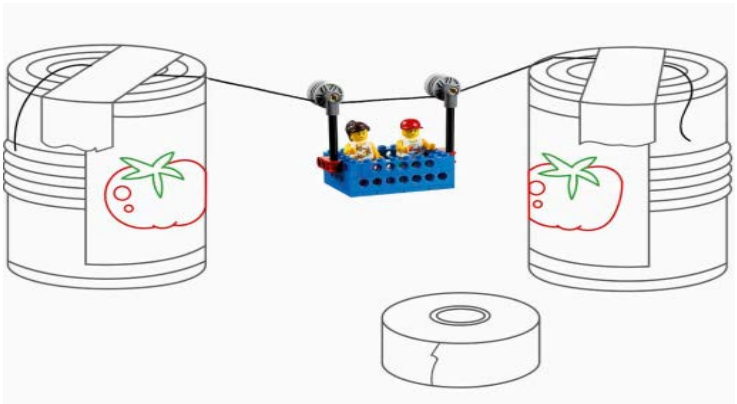
Thinking skills · Problem Solving · Communication · Self-management

Resources required:

2 tins, Paper tape, and a long thread for connected the pulley
Powered simple machine kit

Instructions:

Warm up: Can you think of some different types of cable cars? How do they move? Where do they travel? What do they carry? How do they balance? Which type of cable car would you most like to make? Would it travel by gravity or use a motor?



Activity: Make a cable car that can transport people from one place to another.

Step 1: Provide them axles, beams,2 pulleys and screws from a powered simple machine.

Step 2: Now show them different images of pulleys and ask them to build the pulley system,

Step 3: encourage maximum creativity, you may choose not to share the provided image with students.

Step 4: Now ask them to build on their own.

Evaluation/Reflection:

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Signature of the teacher Signature of the Head/Coordinator