gstep
Ghana Science
& Tech Explorer Prize

Lesson 3:
Generating Ideas

DREAMOVAL FOUNDATION
Ministry of Education
REPUBLIC OF GHANA
Ghana Education Service (GES)
PARTNERSHIP BUREAU
SHULEM LAKE
Practical Education Network

Introduction

How to use the lesson plans

These lesson plans are for the use of teachers (or an adult representative), to help guide the students through the GSTEP Challenge. Lesson plans 1-6 should be completed in order.

Each lesson plan includes:

- A list of materials needed
- The learning objectives
- A lesson summary with teacher notes
- A worksheet for students to fill in (optional)

All lesson plans and supporting materials can be downloaded for free from the GSTEP Challenge website: www.gstep.org.gh.

The lesson is outlined over the next few pages. However, this is just an example schedule. You can choose the activities and lesson plans to meet the needs of your group and your timetable. You can also adapt the time spent on activities to make them shorter or longer.

Students will need paper and pens/pencils and should be guided by your instructions. Alternatively, there is a worksheet that can be printed out for students to fill in, if this is easier and you have access to a printer (no problem if not!).

Overview

Learning objectives:

- To introduce STEM
- To develop innovative and creative thinking skills

Time:

- 40-50 minutes

Materials needed:

- Large sheets of paper (preferably A3 and/or A2 paper)
- Pens/coloured pens/pencils/coloured pencils
- Lesson worksheet (optional)

Lesson Plan 3: Generating ideas

Introducing today's lesson (5 min)

Start with a brief recap of the the previous session.

Notes for teachers:
In the previous lesson, students wrote a problem statement in groups.

Ask them if they remember the key components of a problem statement.

Answer:

a. *The group of people affected by the problem*
b. *A description of the problem they aim to solve*
c. *An explanation of why this is a problem*
d. *The intended outcome, or how their idea will help to solve this problem*

Ask them if they remember why a problem statement is important.

Answer:
A problem statement helps you to focus on the needs of the people affected by the problem, before jumping straight to the solution.

Next, introduce the aims of this session.

Notes for teachers:
The aims of this session are:

- To introduce the concept of STEM; and
- To generate creative ideas and solutions to their clearly-defined problem.

Lesson Plan 3: Generating ideas

Activity 1 (15 min): Generating ideas

Ask students to come up with as many ideas as possible to solve the problem they have identified.

Notes for teachers:
For the first 5 minutes, students should individually list down their ideas.
For the next 10 minutes, they should share these with the group and build on each other's ideas.

To complete this activity, the students should follow some guiding principles:

- *No idea is a bad idea:* At this stage we don't want to be critical of any ideas. This is a chance for the students to think creatively, so please encourage positive and encouraging comments only.
- *The more the better:* This session is about generating lots of ideas, rather than fully developed ones. So, please encourage students to write down as many ideas as possible.
- *Work together:* All students should be encouraged to input ideas in their groups, especially quieter members. They should also be encouraged to build on other people's ideas. This is a group activity, so collaboration is really encouraged.
- *Think big:* Students do not need to think about the practicalities of their ideas at this stage. They should be encouraged to be ambitious and think creatively.

Activity 2 (10 min): Choosing the best idea

Ask students to identify their favourite idea, that they would like to develop further (as a group) in the next lesson. They should draw an annotated picture of this.

Notes for teachers:
You should explain that, in the next session, they will start to think about the steps needed to bring their ideas to life!

To do this, they will need to have chosen at least **one** idea that they want to work on further. The more exciting, innovative, and imaginative, the better!

They should select their favourite idea and draw this on a piece of paper, annotated with some of the key features.

Lesson Plan 3: Generating ideas

Activity 3 (10 min): Introducing STEM

Ask the class what the acronym STEM stands for.

Notes for teachers:
Answer:

- ***S**cience*
- ***T**echnology*
- ***E**ngineering*
- ***M**athematics*

Before the students start to think about creative ideas, please remind them that their ideas must link to Science or Technology.

Next, ask the class to think about some key scientific and technological methods and features that they have learnt about in their Science and Mathematics lessons.

We want to hear from as many students as possible and to hear a wide range of ideas. Just a few examples include:

- Buzzers
- Magnetic forces
- Electricity
- Computer coding

There are *many* more, though! Please don't be limited to these examples.

Tell students to keep in mind that their inventions should use Science or Technology in some way. This will be relevant in the next activity.

Lesson Plan 3: Generating ideas

Activity 4 (15 min): Identifying Prototype Materials

Prototype materials: This is a model of the product or solution that they would eventually build. If they reach the finalist stage of the GSTEP Challenge, they will have the opportunity to build these prototypes with the support of expert mentors and coaches.

Ask the students:
What materials do you need to build your prototype? Think about all the possible items, tools, and resources that could help you bring your idea to life.

Notes for teachers:

- For the first **5 minutes**, students should individually brainstorm and write down a list of materials they think might be useful.
- For the next **10 minutes**, students should share their lists within the group, compare, and combine them into a **master list** of materials needed.

Guiding principles for students:

- **No limits at this stage:** Don't worry yet about cost, availability, or practicality. Capture all possible material ideas.
- **Be specific where possible:** Instead of just saying "plastic," consider if it's a *bottle*, *PVC pipe*, or *plastic sheet*.
- **Encourage collaboration:** Everyone should contribute ideas, and groups should help quieter members share.
- **Think in categories:** Consider materials in terms of *structure* (e.g., cardboard, wood, metal), *connectors* (glue, tape, screws), and *extras* (paint, labels, electronics).
- **Build on ideas:** If someone suggests "wheels," another person might add "recycled bottle caps as wheels."

Lesson Plan 3: Generating ideas

Activity 5 (15 min): Steps to Build your Prototype

Instructions:

- **First 5 minutes (individual work):** Each student should think about the idea their group has chosen and write down the practical steps they would follow to build it. Don't worry about order at this stage, just list as many steps as possible.
- **Next 15 minutes (group work):** Students share their individual steps within their group. Together, they should:
    - Combine their ideas into one group list.
    - Arrange the steps into a logical sequence (what comes first, next, last).
    - Make sure the list is clear enough that someone else could follow it.

Guiding Principles:

- **Be specific:** Instead of writing "build the structure," write "cut cardboard into panels" or "glue pieces together."
- **Think in order:** Try to place steps in the sequence they would actually happen.
- **Collaborate:** Encourage everyone to contribute ideas.
- **Stay practical:** Focus on steps that are realistic and achievable.
- **Prepare for challenges:** If a step might be difficult, note down possible alternatives (e.g., "if wood isn't available, use cardboard").

Student Worksheet 3: Generating ideas

Activity 1 (15 min): Generating ideas

For the first 5 minutes, individually come up with as many ideas as possible to solve the problem you identified in the last lesson. No idea is off limits… the more creative, the better!

For the next 10 minutes, please share these ideas and build on them as a group.

Note:
Some guiding principles to help you with this exercise:

- *No idea is a bad idea:* At this stage we don't want to be critical of any ideas. This is a chance for you all to think creatively, so please avoid negative comments about people's ideas.
- *The more the better:* This session is about generating lots of ideas, rather than fully developed ones. So, please write down as many ideas as possible.
- *Work together:* Make sure every member of the group has the opportunity to input, especially quieter members. We encourage you to build on each other's ideas. This is a group activity, so collaboration is really encouraged.
- *Think big:* You do not need to think about the practicalities of your ideas at this stage. Be ambitious and think creatively!

Student Worksheet 3: Generating ideas

Activity 2 (10 min): Choosing the best idea

As a group, decide which is your favourite idea. You will have the opportunity to develop this further in the next lesson. You should draw an annotated picture of this below.

Note: The more exciting, innovative and imaginative, the better!

Your drawing should be annotated with some of the key features. Remember, though: this should just be an idea at the moment. You will have the opportunity to develop this further and think about the practicalities in the next lesson.

Student Worksheet 3: Generating ideas

Activity 3 (10 min): Introducing STEM

What does the term STEM stand for?

S……

T……

E……

M……

Please list some examples of scientific and technological methods and features that you have learnt about in your Science and Mathematics lessons.

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Note: Keep some of these scientific and technological methods and features in mind when thinking about your inventions in the next activity!

Student Worksheet 3: Generating ideas

Activity 4 (10 min): Identifying Prototype Materials

Prototype materials
What materials do you need to build your prototype?

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What will each of these materials/components do?

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Student Worksheet 3:Generating ideas

Activity 5 (10 min): Steps to Build your Prototype

What are some of the practical steps you would take to build or create your idea?

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What makes your idea different from what is already available?

How is yours different from existing inventions, products and/or services?

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