STEM Project 1E - Design Harvester

International Space Farm

Challenge

To address food security issues by designing an International Space Farm (ISF)!

Write your name on the astronaut's uniform

Ways to Meet the Challenge

This project has many different parts to it and you will be looking at one area in particular.

Design and build a model of a harvester to use on the International Space Farm

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A harvester will pick or cut the crop grown to allow it to be packaged and transported back to Earth from the International Space Farm. Here are some traditional harvester designs that are used on Earth currently to give you some ideas.

Harvesting rice

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Harvesting potatoes

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Picking grapes

https://www.maxpixels.net/static/photo/640/Grape-Harvesting-Machine-Agricultural-Machine-Harvest-1682559.jpg

Here are some points you might like to consider in your design process:

1. Will the harvester be operated:
    - by people?
    - by robots?
    - by remote control?
    - fully autonomously? That is, the harvester would not require anyone or anything to operate it, it would act alone using something like artificial intelligence (AI).

2. How would the crop be harvested? E.g. by cutting it off at ground level, by pulling it out by the roots, by picking each fruit.

3. What sort of container would the harvester have to collect the harvested crop?

4. Will the harvested crop need to be repacked to send to Earth or would there be collection containers that could be removed from the harvester for shipping?

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5. What sort of materials would the harvester be made from? Your model does not need to be made from these materials but they should be labelled in your design diagrams as the final design material.

6. Will the harvester use wheels, continuous tracks (like a tank) or some other way to move around? Would it be on the ground at all or could it be like a drone?

7. Consider whether the harvester is going to have a fixed route, perhaps on a track or rail or whether it will be able to roam freely.

8. How will the harvester 'see' the crop? Will it use a video camera or some other kind of technology to be able to sense what to harvest?

9. Would your design be able to operate at different heights if the farm were growing crops on multiple levels?

In the space on the next page, brainstorm all the ideas you have about how you could investigate the project area.

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Brainstorm – International Space Farm harvester design

When you were brainstorming, were there some things that you found you need to know more about? Write those down here. You may like to use the separate PALMS 6 STEM - Research Guide - Digital to find out more about these things.

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Scientists all over the world organise the way they think about and carry out their work in the same way – we call this the *scientific method*. They also write quite formally in the 'third-person' style (not using phrases such as 'you', 'we' or 'I)'.

To try and solve your part of the STEM problem and meet the challenge, you will need to design and build a model. The STEM Project Design Process Worksheet on the following pages will help you with this process.

It is important that you include as much detail as possible so your design could be built by anyone who reads it. If you have trouble attaching pictures or need to submit your work in a different format, contact your teacher.

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STEM Project Design Process Worksheet

Do I have a clear understanding of the problem I need to solve? Write the problem in one or two sentences.
How will I test my solution? Remember that you may only be able to build a smaller model of your real-life design.
What materials will I need to work towards a solution and test it?
List any special tools you may need to use. e.g Scissors, hammer, clamp

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What do I need to do or use to make sure I work safely?

Draw a first draft of a diagram to show your planned design and take a picture. Upload the picture by clicking on the icon here:

If that doesn't work, send the picture separately but write here what the name of the file is:

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How much will your planned model cost and are all the materials and tools available to you? Where will you get them from? You may need to check with adults at home.

Review your design and make any changes needed. Make sure it is well labelled! Take a picture. Upload the picture by clicking on the icon here:

If that doesn't work, send the picture separately but write here what the name of the file is (it should be different to your draft):

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How will you record your progress? (choose an option) Other (Write in box ->)

Check your design with your teacher before starting to build it.
Once your design is approved by your teacher, go ahead and gather your equipment and build a prototype model!
Take pictures or a video if you can, to show your model.

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Could It Be Better?

Once you have built your model and tested your solution, you need to review your ideas and work. In this section, you can identify any problems or difficulties you encountered and suggest ways you could improve your project if you were to start again.

These questions will help with your review process. Write your ideas for improvement in the table below. If it's easier to draw a picture, make sure you take a photo of it and include the file name in the table below for your teacher to look at.

- Do you currently have access to enough of the materials you used to make a full-size model? Is there enough of it available in Australia? On Earth?
- Will current technology be useful, or do you need something more, something faster or better?
- Estimate how much it would cost to put your plan in place.
- Estimate how long it would take to put your plan in place.
- Can you do all of this yourself or do you need to bring in some experts? Who might these experts be?
- Did your design give you enough information to start an International Space Farm tomorrow? What further experiments or tests might you need to do?

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Problem encountered	Possible Solution
Any other ways to improve your solution if you have unlimited resources, time and access to the best people!	

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Report Back To Base

To finish off your STEM Project, you need to let everyone know what you found out and what solution you came up with for your problem.

There are many ways you could do this and your teacher may ask you to do it a particular way or have you come up with your own ideas. When writing or making your presentation, make sure you think carefully about who your audience is and how much detail you need to include. More visual presentations (colourful or with lots of pictures) are always more interesting.

Whatever kind of presentation you end up doing, you should cover the following things:

- What you found out or discovered that you didn't know before.
- What you designed, built, programmed, tested.
- What STEM skills you used (problem solving, creativity, critical analysis, teamwork, independent thinking, communication, digital literacy)
- How you could better investigate the challenge if you had no limit on resources or time.
- The most challenging aspect of the project.

Don't forget!

- Save this file as a PDF and submit it to your teacher. Don't forget to include your name!
- Check that any photos have uploaded or send them to your teacher separately (tell them the file name)
- Submit your Report Back To Base presentation to your teacher.