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IO2-A2: DUAL EDUCATIONAL PACK

CROSS CURRICULAR SCENARIO 6

3D2ACT:

FOSTERING INDUSTRY 4.0 AND 3D TECHNOLOGIES THROUGH SOCIAL ENTREPRENEURSHIP: AN INNOVATIVE PROGRAMME FOR A SUSTAINABLE FUTURE

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PROJECT INFORMATION

PROJECT ACRONYM:

3D2ACT

PROJECT TITLE:

FOSTERING INDUSTRY 4.0 AND 3D TECHNOLOGIES THROUGH SOCIAL ENTREPRENEURSHIP: AN INNOVATIVE PROGRAMME FOR A SUSTAINABLE FUTURE

PROJECT NUMBER:

2020-1-EL01-KA202-078957

WEBSITE:

https://3d2act.eu/

CONSORTIUM:PARTNER LIST

- **NATIONAL CENTER FOR SCIENTIFIC RESEARCH "DEMOKRITOS" (GREECE)**
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Real Life Social Entrepreneurial Opportunities for Applying the 3D-P Education

Cross-Curricular Scenario 6

USEFUL GARDENING TOOLS FOR YOUR HOUSEHOLD GARDEN USING 3D PRINTING

Introduction

Household gardening is a small-scale production system supplying plant and vegetables for home consumption and use. These gardens are usually located inside or in the back yard of a house and provide edibles for consumption as well as ornamental plants to enhance home aesthetics. At the same time, gardening at home offers well-being, relaxation and creativity, elements important for releasing the stress of people's everyday lives.

This kind of activity usually requires a low production budget and combines simple technology for the purposes used. Home gardens often can be described as a mixed cropping system that encompasses vegetables, fruits, plantation crops, spices, herbs, ornamental and medicinal plants as well as livestock that can serve as a supplementary source of food and income.

Let's see how we can combine the modern technology of 3D printing with home gardening, utilizing the know-how of the previous courses and aiming at ecological awakening, flexibility and innovation.

The need

In the field of home gardening, many auxiliary tools and objects can be used for the production, growth and maintenance of plants and vegetables. In several cases, the resulting needs may require personalized solutions to be applied in limited or unsuitable (ex. low lighting source) plant storage areas.

In this scenario, ideas are given for creating various 3D printed useful tools that can make the process of engaging in home gardening more accessible, easy and creative.

More specific tools proposed for planning and implementation could be: **shovel & hand rake, plant labels, watering can, pots - wall pots - self-watering pots, seed starting cups, plant support system and a propagation station with light**. Students may choose from the proposed solutions according to their interests.

Image 1 - Watering can

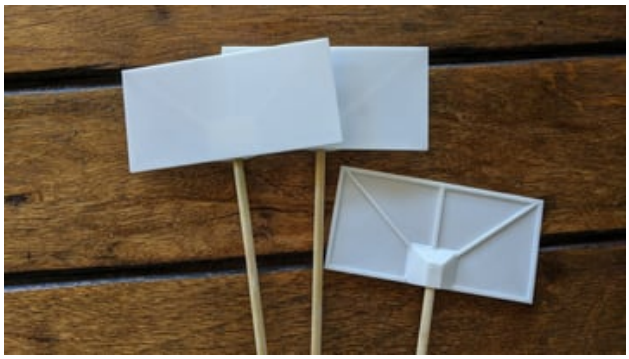

Image 2 - Plant labels

Image 3 - Shovel & Hand Rake

Image 4 - Pots - Wall pots

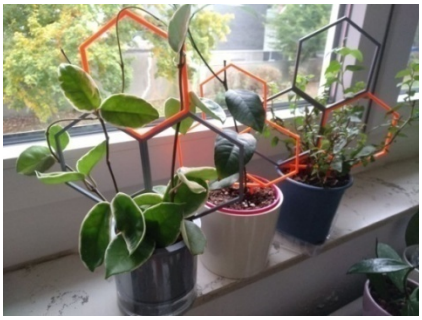

Image 5 - Climbing plant support

Image 6 - Propagation station/planter with light

Key terms

| 3D design/printing | Home gardening | ecological awakening | Gardening market |

Objectives and Learning outcomes

- *To stimulate the interest of students from different areas of vocational education.*
- *Students to gain interest for home gardening.*
- *Students to work as a team and promote a collaborative approach in finding acceptable solutions.*
- *Students to learn categorize and evaluate the above solutions.*
- *The collection of necessary data and the design of the solution/s (in 3D printing design).*
- *To identify opportunities that could be beneficial in the gardening market.*

Prerequisites

- *Basic knowledge of pre-mentioned guided lesson plans in 3D printing*
- *Basic IT knowledge*
- *Basic knowledge of gardening*
- *Basic knowledge of economics and analyzing business models*

Time distribution - Estimated Delivery

The duration of this open-ended challenge-based scenario can vary depending on the depth of approach by students and teachers. For example, in the case of implementation of a simple prototype, it can be about 4-6 weeks from 2-4 hours per week, or for something more complex it can take an entire semester. In any case, this could be best estimated during the *Milestone-3* phase.

Modes of Interaction

This is a challenge-based scenario which provides the opportunity for teachers and students from different areas of vocational education to get involved.

For example, areas such as the sector of Agriculture, Food and Environment have a direct connection, since the script negotiates issues related to their subject.

Also, Management/Economics is an area that can play an important role in the scenario, since the whole process will eventually have to evolve into a business model suitable for the needs of the gardening market.

The IT sector can also be involved in the script, helping with the whole process with the part that involves collecting useful information, designing software for a 3D printer, and completing and presenting the final project.

But also, this scenario can be a pole of attraction for teachers or students with an interest in Agriculture or Environment or simply in innovative ideas!

Guidelines - Milestones

In order to help you in this process, we provide you with some steps you can follow to carry out your project.

Milestone 1 - (est. 2 hours)

Get familiar with the area of home gardening and the tools that are available in the global market.

> *Hint: Use Google or any other official source to help your students identify tools and their use in home gardening.*

Milestone 2 - (est. 4 hours)

Consider the challenge in the home gardening area. Discuss the proposed solution of this scenario and provide new ideas and uses for these or other parts. Could these items be the core for an innovating business idea?

> *Hint: Students use brainstorming method to analyze the proposed ideas. All items are listed and categorized. Each solution is evaluated and clear arguments are produced in order to conclude to those that are more efficient and cost worthy to implement.*

Milestone 3 - (est. 4 hours)

Having concluded on the items more efficient to implement, students working in teams are preparing prototypes under these aspects:

- Sketch/drawing
- Description of operation
- Parts of the idea
- General dimensions

> *Hint: Students must verify each of the above steps taking into account the final produced items.*

Milestone 4 - (est. 2 hours)

Students under their teacher's guidelines proceed in the optimization of the prototypes by going through all steps one more time.

- Sketch/drawing
- Description of operation
- Parts of the idea
- General dimensions

Milestone 5 - (est. 8-10 hours)

Implementation of Prototypes' 3D design for 3D printer.

Milestone 6 - (est. 2 hours)

Correction of the final designs.

Milestone 7 - (est. 4 hours)

Technical documentation:

- List of materials
- List of parts / commercial items
- Assembly plans and exploded view
- Assembly Manual
- Manufacturing processes + process sheets + instruction.

Milestone 8 - (est. 2 hours)

Final products (Presentation of the final products).

Reflection & Feedback

To get valuable feedback on this scenario, we can implement a brief questionnaire, the answers to which will be a topic of discussion with students. The final evaluation must be correlated to the degree of students' satisfaction with the results of the project, in combination with their initial assessments.

Indicative Questionnaire

1. *In which team did you participate?*

   ○ *Team-1* ○ *Team-2* ○ *Team-3* ○ *Team-4*

2. *Do you think that this scenario enhanced your knowledge and skills?*

   ○ *Definitely* ○ *In most cases* ○ *Not sure* ○ *Not at all*

3. *Do you think that this scenario met your personal motivations/criteria?*

   ○ *Definitely* ○ *In most cases* ○ *Not sure* ○ *Not at all*

4. *Was there enough time to fulfill your goals?*

   ○ *Yes* ○ *No, I needed more time*

5. *What problems did you face and how did you overcome them?*

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6. *What did you like most?*

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7. *What did you like least?*

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8. *What would you suggest for the optimization of the scenario and the process of its implementation?*

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9. *What would you like to be your next goal?*

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Expansion

This educational scenario can easily be the basis for expanding the educational process, as it is oriented towards principles and techniques that promote the dynamic development of the student. In particular these techniques:

Allow choice: Students gain the flexibility to choose both the main topic to be dealt with and the approach they will seek to achieve this goal.

Promote research: Students rely on the know-understand-research model to build the knowledge base on which they will work.

Promote collaboration: Through the teams that are created, collaboration is promoted and bilateral channels of communication are created.

Use of technology: Through IT tools and 3D printers, students learn or even deepen their skills on new technologies.

Teach creativity: Students are asked to tackle key issues such as environmental protection and finding alternative forms of production.

Encourage self-assessment: Through feedback and assessment practices, students have the opportunity to assess what they have learned and what they have gained from the script implementation process.

Proposed items' images url:

- https://all3dp.com/2/3d-print-garden-tool-accessories/
- https://www.printables.com/model/62227-propagation-stationplanter-for-mini/files
- https://blog.prusa3d.com/3d-printing-and-gardening_45808/