Agile2Learn Scenario

A STE(A)M project for

"A STUDENTS' CLIMATE CHANGE CAMPAIGN"

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2   Purpose of the project

The purpose of this project is to develop a STE(A)M didactic proposal on climate change that integrates also an agile methodology approach. This project aims to provide students with a hands-on, experiential learning opportunity that emphasizes collaboration, innovation, and real world problem-solving. By leveraging an agile methodology, the project will encourage students to work in a dynamic, iterative, and flexible way, allowing them to respond to feedback and adapt to changing circumstances.

The project will include lessons on STEM and non STEM Disciplines:
- **Science** (Climate change - greenhouse effect),
- **Technology** (Renewable energy),
- **Engineering** (Solution Brainstorming),
- **Arts** (Language Arts/ media literacy & creative writing process, Environmental Arts/ Land Art & Eco Art or fine Arts/Artful thinking Routines), and
- **Mathematics** (Water Conservation measures & calculations).

The ultimate goal of the project is to foster students' deeper knowledge and understanding as well as their active citizenship and ability to take action on climate change issues in their local and "broader" community. Finally, students will empower their own and public participation and/or exercise of active citizenship and social change towards the needed adaptation and environmental protection.

Real life Questions:

- What is the climate change phenomenon and the greenhouse effect?

- What action can we take to combat the climate change?

- How the Arts may contribute to raise awareness and active citizenship to climate change?

Grade level: Middle or High School
Estimated Project Duration: 8-10 weeks (it can be adjusted accordingly to any class and duration)

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3 Learning Objectives

In this document, a practical project scenario is provided for those who want to practically apply agile learning at school. The learning objectives are:

• Development of the project vision and project strategy
• Development of the initial set project requirements using user stories
• Development of the core agile values and identification of agile methods and their usability and practicability
• Learning about available tools, ways and complex solutions for digital collaboration.
• Producing a solution how to organize team collaboration based on the needs, resources available and desired outcomes.
• Learning communication mechanisms in classroom.
• Understanding the meaning of agility within the context of teamwork.
• Highlighting the distinct roles within agile teams.
• Development of effective decision-making practices that combine as many as possible viewpoints of team members.
• Development of the ability to critical thinking and creative audiovisual writing.

4 Related Learning Outcomes

a. <u>On STEM Disciplines</u>

Upon completion of this module, students will be able to:

(Science)

• Understand the basic science of climate change, including the causes, impacts, and potential solutions.
• Analyze and interpret data and evidence related to climate change from multiple sources (scientific articles, reports, observations).
• Communicate scientific concepts and findings effectively to different audiences (teachers, parents, policymakers, community members).

(Technology 1)

• Understand the principles and applications of renewable energy technologies (solar, wind, hydro power or other).
• Analyze the environmental, economic and social impacts of renewable energy systems/ compare them to conventional energy sources.
• Brainstorm ways to incorporate renewable energy into their Climate Change Campaign.

(Technology 2)

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- Develop a website to communicate effectively the goals, information, messages and activities of the climate change campaign.
- Use appropriate web development tools (Wordpress, Joomla, HTML, CSS, JavaScript, etc.) to create a user-friendly and interactive website.
- Evaluate the website's usability and accessibility based on the users' feedback.

(Mathematics)
- Collect and analyze climate change data from various sources (temperature records, sea level rise, carbon dioxide concentrations).
- Use statistical and mathematical models to analyze the trends and correlations of climate change data /make predictions about future climate change scenarios.
- Communicate the results of climate change data analysis using graphs and reports.

(Engineering)
- Apply design thinking process (problem solving, programming, etc.) to design and develop solutions to climate change challenges.
- Use various engineering tools and technologies, such as sensors, controllers, actuators, and simulations, to implement and test their solutions in real-world scenarios.
- Evaluate the effectiveness and efficiency of their solutions based on performance metrics and user feedback and iterate the design process accordingly.

b. On "Arts" or "non STEM Disciplines"
Upon completion of this module, students will be able to:

(Environmental Arts)
- Create artwork (e.g., land art and eco-art) that raises awareness of the impacts of climate change on the environment and inspires action to mitigate them.
- Use various artistic media (paintings, videos, small movies), to express their views/messages of the climate change campaign.
- Collaborate with artists and stakeholders to create public art exhibitions, and events that engage, activate and educate the community about climate change.

(Language Arts)
- Advance media literacy skills to critically analyze and evaluate the accuracy/ bias of climate change messages in different media sources (articles, social media, videos, news, etc.).
- Use creative writing/audiovisual skills to produce persuasive and informative texts (articles, speeches, scripts, social media posts, etc.) that convey the complexity of climate change and inspire people to take action.
- Adapt their writing style and tone to different audiences and purposes (informing, persuading, inspiring or other) and inspire active citizenship and participation.

c. **On Agile Methodology**
- Learn about agile methodology and its application in project management and problem-solving.
- Participate in a process that addresses a real-world problem, such as climate change.
- Develop effective communication skills and the ability to present their ideas and solutions to others.

5 Pre-game

This phase includes all the all the preparatory steps that should take place before the STE(A)M project implementation begins. These are:

1. Introduction of the topic of climate change to the students. This will be done through a presentation, a video or a Climate Game or any other visuals and examples that provide an overview of climate change, its causes and its effects. In this way, the team discover **the project vision**, the "North Star" of their project, that is to raise awareness of the local and global community on how to mitigate the climate change effects through a Students Campaign!

2. Next, the students may brainstorm ideas for their project. They could come up with several ideas that will promote their goal, including creating a website, an app, videos, small movies, writing articles and making posters. They will prioritize their ideas based on their feasibility and potential impact, and decide to create for example a website that could provide information (in all the forementioned ways) about climate change as well as offer tips for reducing for example one's carbon footprint.

3. The students will then be divided into teams and given an introduction to the agile methodology, the scrum process, including its key concepts such as sprints, daily stand-ups, product backlog and retrospectives.

4. They will develop the initial project plan, as well as the initial set of project requirements (project inception), in the form of "user stories".

The Users in this STE(A)M project could be the following three categories:

- The *Students in High Schools* who are studying Science, Mathematics, Language, Technology and Fine Arts. The goal is to obtain a comprehensive understanding of climate change and its impact on the environment and human society as well as to take action to mitigate its effects. They are curious about the science behind climate change, as well as the ways in which human activity contributes to it. They want to be part of a grate Campaign about climate change impacts and solutions.

- The *Teachers of the above-mentioned specialties* have the goal to provide the students with the necessary resources and materials to teach them about climate change and its impact on the environment in an engaging and effective way.
- The *Local, Regional or Global Community* that will be interested to supporting the students' project and its goals. The goal is to get motivated and educated about climate change and the ways they may achieve active citizenship in supporting and reproducing the students' message.

The project will involve students working in teams and be assigned to specific roles, such as researcher, designer, presenter, reporter, etc.

Then, a draft **product backlog** will be created by using all user stories (Trello tool) (for example, Table 1).

PRODUCT BACKLOG REPORT					
ID	AS …	WANT TO …	SO THAT …	PRIORITY	SPRINT
Us1	Students	Research and learn about climate change - greenhouse effect	they take action to combat it	High	1
Us2	Science teacher	introduce climate change to students	the students understand its impact on the environment and human society	High	1
Us3	Math teacher	make data analysis	the students analyze global temperature trends & greenhouse gas emissions	Medium	4
Us4	Engineering teacher	Solution Brainstorming	they brainstorm potential solutions to mitigate climate change	Medium	5
Us4	Environmental Art teacher	facilitate students to explore Eco-Art, Land-Art	create artwork using natural material	Low	8
Us5	Language Arts teacher	promote their media literacy skills - critical thinking and creative writing skills	write articles, produce audio-visual texts (videos, movie) & promote their active citizenship	Medium	7
Us6	Outreach: Activate community	engage in & support the students' program	raise awareness about the program and its goals- this could include social media campaigns, community events, or partnerships with local businesses	Medium	6
Us7	Technology teacher	introduce renewable energy sources	Research renewable energy sources- find ways to incorporate renewable energy into the campaign	Medium	3
Us7	Technology teacher	develop a website that provides the causes, the effects of climate change etc.	raise awareness about climate change in the local, regional or even global community by informing and offering ideas-tips for reducing climate change effects (through videos, articles and other students' artwork) and activate to participate in the students' campaign.	High	2

Table 1. Initial Product Backlog _ A STE(A)M project for a Students' Climate Change Campaign

Before starting the game, the teacher of the corresponding specialty will introduce the learning outcomes of the specific lesson. Students will be divided into small teams, and each team will choose the specific topic they want to work on. The teacher will provide resources and guidance to help the teams research their chosen topics and reach the learning outcomes of the specific lesson each time.

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The **steps of the project** are shown in the following Figure:
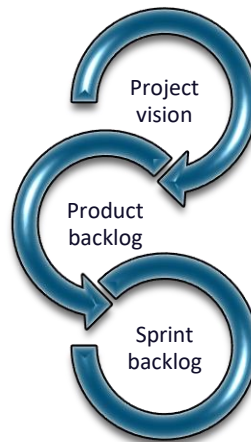

Figure 1. The steps of the project

5 The game

Edu Scrum is a variation of the Scrum framework specifically tailored for educational institutions, such as schools and universities. The aim of Edu Scrum is to provide a flexible and adaptive approach to teaching and learning that can be applied to different subjects and educational levels. It emphasizes the importance of collaboration, continuous improvement, and student-centered teaching and learning.

In Edu Scrum, teachers and students are considered the development team, while the course objectives and outcomes serve as the product backlog. The teacher takes on the role of the Scrum Master and facilitates the process, while the students are responsible for delivering their learning goals. Regular meetings, such as Sprint Planning, Daily Scrum, Sprint Review, and Sprint Retrospective, provide opportunities for the teacher and students to reflect on their progress, plan their next steps, and identify areas for improvement. The goal of Edu Scrum is to create a more engaging and dynamic learning environment where students can take ownership of their education and collaborate with their peers to achieve their goals.

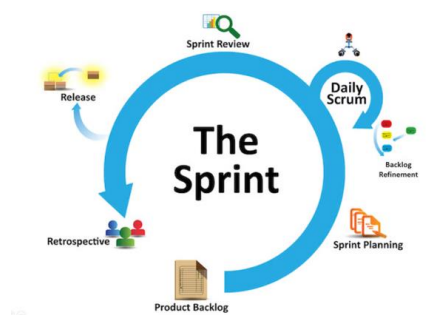In the Figure 2 the Scrum process is presented.

Figure 2: Scrum process

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In the proposed STE(A)M project, there are eight sprints. Feel free to customize this list according to your project scope, class and duration limitations.

1st Sprint - Science: Introduction to Climate Change (1st Week)

- Watch a video on climate change and discuss its causes and effects.
- Define key terms related to climate change, such as greenhouse gases and global warming.
- Conduct a temperature experiment to demonstrate the greenhouse effect.
- Students will create a "Know- Want to learn - Learned" (KWL) chart to track their learning throughout this unit.

2nd Sprint - Technology: Develop a website (2nd Week)

- The students will create a prototype of their website, which will include information about the causes and effects of climate change, ways of reducing it.
- They test the website with their target audience (peers, community members) and receive feedback on how to improve it.
- Based on the feedback, the students make improvements to their website until they are satisfied with the final product.
- Finally, the students launch their website and share it with the community.

3rd Sprint - Technology: Renewable Energy (3rd Week)

- Introduce renewable energy sources and discuss their potential to reduce greenhouse gas emissions.
- Students will research different types of renewable energy and create a presentation on their findings.
- As a class, they will brainstorm on ways to incorporate renewable energy into their Climate Change Campaign.

4th Sprint - Math: Climate Change Data Analysis (4th Week)

- Students will research and gather data on global temperature trends and greenhouse gas emissions.
- They will graph the data using spreadsheets, Excel or other similar program and analyze the trends.

- Students will discuss the implications and correlations in the data, such as the correlation between increasing greenhouse gas emissions and rising temperatures and what it means for the environment.

5th Sprint - Engineering: Solution Brainstorming (5th Week)

- Students will brainstorm on potential solutions to mitigate climate change.
- They will be encouraged to think creatively and broadly, including technologies, policies, and individual actions.
- Students will organize their ideas into categories, such as energy efficiency, renewable energy, transportation and land use.

6th Sprint - Outreach: Educate – Activate Community (6th Week)

- Students will develop a plan for reaching out to parents, community members and local /regional organizations to raise awareness about the program and its goals.
- They will implement their campaign by using technology to reach out to their target audience and educate them on the benefits of renewable energy
- They will probably organize social media campaigns, community events or partnerships with local businesses, create, produce videos or podcasts, or host events and workshops.

7th Sprint – Language Arts: Media Literacy- Creative writing skills (7th Week)

- Students will advance their creative audiovisual reading and writing skills.
- They will discover how to become "Young Reporters" as they will learn to write articles for the phenomenon of climate change (e.g., a newspaper or a website article)
- They will prepare the scripts to produce audiovisual texts (e.g., video, small movies, podcasts) targeting the society's awareness raising about climate change – adaptation and protection.
- They will promote their active citizenship and create presentations showcasing their proposed solutions and their impact on climate change.
- They will present the proposed solutions through their campaign and receive feedback.

8th Sprint - Fine Arts: Climate Change Impacts (8th Week)

- Students will explore different types of environmental art, such as Land Art and Eco-Art.

- They will create their own artwork using natural materials found outside, such as leaves, rocks and flowers.
- Students will discuss the significance of environmental art and its role in raising awareness about climate change.

Note: The number and duration of the sprints will depend on the scope of the STE(A)M project, the disciplines that will be connected, the students interests and the available timeline. So, the forementioned sprints and indicative activities are just an example and may vary based on the specific requirements of the class, the available teacher specialties, the available sources, etc.

The second or main game phase includes the "Sprint" phase, where is the phase the STE(A)M project is executed. This phase includes:

Sprint Planning: At the beginning of each week the teacher of each specialty will work with the team to:

- define the scope of the sprint
- identify the learning outcomes for the specific Discipline of the week
- pick items/ tasks from the Backlog that are highest in priority level
- decide who will be responsible for their completion.
- identify the learning outcomes for the specific Discipline of the week
- outline the tasks that should be completed during each sprint
- create a plan for achieving those outcomes.

Daily Stand-up Meeting: This is an essential characteristic of Agile Learning process as it keeps keep the team as a whole on track. Each day, the team has to "stand up" together for not more than 15 minutes, at the same time every day, and give a quick update about:

- Teams' progress on the day before
- Any obstacles/roadblocks that may be preventing progress
- Any guidance and support they probably be needed.

The daily Stand-Up is not for discussions or decisions. If there is a need for something like this, then another separate meeting should be organized with the members of the team that have to deal with the certain issue.

Sprint Review: At the end of each week, the team will:

- present their work to the class and the stakeholders
- demonstrate any completed work to them
- review the progress made /evaluate whether they have achieved the goals
- gather and use feedback on their progress

- reflect on their learning (based on the feedback) and
- make any necessary adjustments/improvises to their approach.

Sprint Retrospective: At the end of each week, the teacher of each specialty will:

- lead a reflection session with the team to identify:
  - what worked well
  - what didn't work and
  - what could be improved in the next week.

This will allow the team to continuously improve their approach and achieve their learning outcomes more effectively.

Note: The acceptance criteria -that must be met for a User Story to be accepted as completed- have been set by the teacher of each specialty at the beginning of the STE(A)M project. The students' teams reflect the requirements set by each specialty's teacher for them during the sprints. At the end of each sprint, the students´ team must demonstrate the relevant knowledge that accumulated during the sprint.

6 Post- game

At the third or postgame phase a presentation of the entire STE(A)M project, and a general review (retrospective) take place. It is the phase where each team evaluates its performance, reflects on good or bad practices applied during the previous phases **at all Disciplines implementation**, identify good practices and identify what competences they felt that **developed or improved** during the Sprints. Specifically, they can focus on:

- What they learned (knowledge related to all the disciplines they dealt with)
- What they learn from the process - collaboration (emphasis on competencies)
- Whether their collaboration improved from Sprint to Sprint
- If not, what was at fault?
- What should have been done?
- What would they like to improve on (competencies)? Etc.

The evaluation criteria that we can take into account when applying the agile methods are the following:

- the active engagement
- the successful execution and fulfillment of the objectives
- the ability to solve problems and take initiative.
- the development of social skills (dialogue, communication, collectivity, conflict management, etc.)

- the personal creative expression and integration of each student into the whole transformative learning and changing attitudes
- the evaluation of the results of the STE(A)M project by the students themselves

An Alternative assessment option through a Rubric

The following example of a Rubric Assessment of the above STE(A)M Project _ *"A Students' Climate Change Campaign"* could be an alternative proposal for the students' teams assessment process in the STE(A)M project that presented by an agile methodology.

Assessment Scoring: Each category will be scored on a scale of 0-4, with 4 being the highest score. The total score will be the sum of the scores from each category, with a maximum possible score of 36. The Following (Table 2) is an example outline of how the specific classroom STE(A)M project can be executed through the implementation of agile methods but it is not the only alternative.

Note: Teachers can adjust the previous STE(A)M approach or use their own approach as long as they respect the steps of agile methodologies and follow the guidelines described within the modules offered in the pilot training of Agile2Learn project.

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Table 2. An Assessment Rubric for the STE(A)M Project: "A Students' Climate Change Campaign "					
Category	**Criteria:** **The students …**	**1** Minimal evidence of meeting criteria	**2** Adequate evidence of meeting criteria	**3** Good evidence of meeting criteria	**4** Excellent evidence of meeting criteria
1. **Science** **(Introduction to Climate Change)**	1.Demonstrate understanding of climate change and its causes.				
	2. Identify the key environmental issues related to climate change.				
	3. Make use of scientific evidence to support and communicate arguments.				
2. **Technology** **(Develop a website)**	1. Make use of appropriate technology to develop a website that is engaging and informative.				
	2. Make effective use of multimedia to convey information.				
	3. Have a clear and organized presentation of website usability, accessibility from users and stakeholders.				
3. **Technology** **(Renewable Energy)**	1. Demonstrate their understanding of renewable energy sources and their benefits.				
	2. Make use of technology to design & implement a plan for incorporating renewable energy in the campaign.				
4.	1. Use effectively mathematical models to analyze climate change data.				

Math (Climate Change Data Analysis)	2. communicate in a clear manner their findings and conclusions.				
	3. Correlate their finding to possible solutions for reducing the climate change impact.				
5. Environmental Arts	1. Demonstrate understanding of land art and eco-art				
	2. Use Arts to convey environmental messages				
	3. Use the Art in an Original and creative way, create public art exhibitions, and events that engage and educate the community about climate change.				
6. Language Arts (Media Literacy Creative Writing Skills)	1. Make effective use of creative writing to convey information and ideas.				
	2. Use media literacy to critically evaluate sources of information.				
	3. Make use of creative and engaging audiovisual writing ways (podcasts, videos, etc.)				
	4. Adapt their writing style and tone to the different audiences and purposes (informing, persuading, inspiring or other.				
7. Engineering	1. Design and implementation of solutions to environmental problems related to climate change.				

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	2. Use of engineering principles to create innovative solutions.				
8. **Outreach (Raise Awareness)**	1. Demonstrate effective outreach strategies to raise public awareness about climate change.				
	2. Make a clear communication of the campaign's goals and objectives.				
	3. Present evidence of successful outreach efforts.				
9. **Agile Methodologies (implementation)**	1. Include team working based on agile methodology guidelines.				
	2. Facilitate the identification of STE(A)M project requirements - product backlog.				
	3.Allow and encourage self-organized teams.				
	4.Encourage and facilitate the identification criteria of completion for students' work and evaluation.				
	5. Include the opportunity to organize at least 3 sprint cycles.				
	6. Create the sprint backlog - what they will implement in each sprint.				
	7. Encourage students to reflect on their activities after each sprint and at the end of the whole process and record their findings.				