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DESIGN THINKING FOR SUSTAINABILITY

Design Thinking For Sustainability Education

2019-1-TR01-KA201-076710

O4: Instructional Process Support Learning Sheets

CONTENT

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Accessible Education in Pandemic

Name of the learning sheet

Accessible Education in Pandemic

Topic (keywords)

special needs, special education, disabled

Introduction

Quarantine is difficult for everyone during the course of the pandemic, but it is a much more difficult and stressful process for children, young people, and their families with developmental gaps and special education needs. Schools have started distance learning, but unfortunately distance learning is not suitable for students with poor mutual attention, limited receptive language skills, attention deficit, hyperactivity, or severe intellectual disability. Not available. All the burden was left on the family. Daily and even weekly routines are very important for students of different developments. Disruption in daily life causes students to exhibit problem behaviors and forget what they have learned.

Description of the activity

Context

In this activity, the students will get to know all about the disability, disabled students, the problem of accessing education for them. As a responsible individuals, the students will think about possible solutions for a inclusive education for these student.

Learning goals

The learning goals of this activity are to get to know the types of disability and challenges the disabled students face

To get a better understanding of the disability

To use brainstorming and research to understand the problem core.

To use design thinking methodologies for a deeper understanding of the problem.

To use innovative thinking to provide new and better solutions.

To create prototypes of ideas.

To test prototypes.

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To improve prototypes according to the results of testing sessions and feedback.

To work in teams on a joint goal.

To give and receive feedback.

Learning objectives and outcome

After completing this activity, the students will have a better understanding of the disability and challenges to access education for the disabled students. They have gone through the design thinking process and provided new ideas with brainstorming sessions. They have provided new solutions and improvements to the existing solutions. They have learned how to cooperate in teams and discuss in groups in order to achieve a common goal.

Core concepts

Inclusion, accessible education, disability

Class activity

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1. EMPATHY

First level of the Design Thinking process is empathy. In this step we will get to know the situation about disability and challenges for the diasbled people to access education. Then, they will complete a small warm-up task about them with the other members of the activity. Students will present themselves and express their views on disability. As a next task, they will watch a video on Youtube. The task's objectives are to present them a first-hand experiences on a disasbled people. The teachers can ask some guiding or reflective questions to students after they watch the video.

a. The group will make a research about disability;
b. The group will make a research on the given topics;
c. The group will do a further autonomous research about the topic and present what they found by including it the canvas (its preferable to think local);
d. The group will later organize all the information gathered. They can make an interview and share the recordings.

2. DEFINE

Second level of the Design Thinking process is called „Define". Here we need to develop further understanding of why things are the way they are and identify the problematic parts. This is the level where students will engage in their own research. By using the previous knowledge from the first level and by combining it with their own research combining it with their own research students will develop their own opinions on sustainability problems related to human settlements pollution. The goal is to have a better understanding of the disability and challenges they face to access education. Define level is important for providing a basis for solutions developed in the next level. While defining, problems can be approached by „How might we solve this?" question to gain more insight and help with the Design Thinking process.

a. Each participant will define the disability with their own words, define the problems of disabled students to reachh education, tell the reflections of disabled people and their families.

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3. IDEATE

„Ideate“ is the level where new ideas are generated and possible solutions explored for the problem in hand. Here, brainstorming could be implemented and students should be provided with guidance in brainstorming strategies. Additionally they should be reminded and encouraged that while brainstorming, quantity is more important than quality so it is important to be non-judgemental, to be open to different ideas and let imagination run free. This reminder could also help to avoid reproaching among students. The level provides supportive thematic materials for inspiration and encouragement which should be studied before engaging with the task. The task requires the students to work together as a team and come up with a lot of different ideas on how to to provide solutions for disabled students in pandemic.

a. They will discuss as a group about possible ideas for solutions for your problem statement, they are supposed to build on each others' ideas and not make hasty judgements.
b. In the end, after discussing to achieve a consensus about the solution among all the ideas, they are supposed to highlight the selected solution.

4. PROTOTYPE

Prototyping phase allows you to get ideas into physical form and gain feedback. This is an important step in creating new products because through trial and error the best possible solutions can be developed. The goal is to start with a low fidelity version of the intended idea and improve it over time. These tasks are based on the previous levels and tie them all together. Here in this level the team members will study a prototyping method by themselves and put their new knowledge into practical use as well as trying to figure out a suitable medium for the task in hand. We will be concentrating on paper prototyping because it's more executable online than a model prototype, for example. Students can lean on the materials provided or do their own personal research. After individual research the teacher should give a review of the subject as well to ensure mutual understanding.

a. The group should discuss if the solution is feasible, and if so, determine how to test and assess it.

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b. The group should identify what kind of information is needed to verify the efficiency of the proposed solution and how to collect that data to prove it.
c. To test the solution, the participants should determine the frequency of data collection and subsequently collect it using the predefined moments and tools.
d. Following, all data collected by each individual should be gathered and discussed in a team.
e. After discussing in group, decide if it is necessary to change some parameters to the test and to the data collection process.
f. The last step is to present the choice made for the chosen solution, in terms of sustainable cities, in an online presentation.

5. TEST

This is the fifth and final phase of Design Thinking. This allows students to test their prototype on the users to gain feedback on their idea. The rest of the class will assume the users' role but the audience can be expanded of course, if possible. The team should revisit the problem at hand and gain feedback. This helps the team to conclude if and how their solution needs tweaking. By testing, we're seeking to learn if we've made an impact, if we are on the right track and what needs to be changed. By getting feedback from users we are mapping their needs and ways we haven't met these needs yet. In conclusion, testing can be seen as a second round of empathy.

a. The students will create an online presentation to their class (or any given audience) about their product/idea. This task was designed to argue the choice made for the chosen solution in terms of online education for the disabled student in pandemic.

b. After presentations a feedback and analysis session will ensue. The audience (i.e. the rest of the class) should give the presenting team feedback and share their polite opinions on the subject. This should be done for each team separately. The session is led by the teacher. The feedback is important in order to give feedback about the product/idea and see which improvements could and should be done. The teacher will also provide the team with their own professional feedback regarding the teams' final product/idea.

c. If possible the analysis session should also include a discussion with the teams separately so that the teacher can give personal feedback and students can assess their

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experience. The teacher creates a discussion among students and encourages each team member to express their experience and thoughts. If necessary, the teacher provides professional feedback on students' process. Taking a closer look into the whole Design Thinking process and how it was implemented is another recommended subject for the analysis session. Reflecting on teamwork experience is an important part of the assessment. Self-reflection could contribute to enhancing analyzing skills and finding new ways to approach creative problem solving in the future.

d. For further development the Design Thinking cycle starts over to achieve a more refined solution. However, this is not mandatory.

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What is Cultural Heritage? Why is it important?

Name of the learning sheet

What is Cultural Heritage? Why is it important?

Topic (keywords)

Cultural heritage; Monuments; History; Tangible; Intangible; Community; Protection; Conservation

Introduction

During the first half of the last century, many historical towns, monuments and buildings were destroyed or damaged by two world wars. In response to this destruction, the United Nations appealed for worldwide cooperation in protecting the cultural heritage. The World Heritage List gets longer every year as new nominations are accepted and more countries sign the Convention but there are also monuments, buildings and other cultural heritage that are less known and need our protection.

Description of the activity

Context

The educational, civilizing and, last but not least, economic value of the cultural heritage, for the whole society, is of public interest. We are all interested in legislating the status of patrimonial assets and the regime of its protection, establishing, first of all, limits of the property right, be it public or private, on patrimonial assets. We are interested in preserving and enhancing these assets.

Students will be in 4 – 5 groups and each group will go through a guided discussion to brainstorm on how they can contribute to the preservation and conservation of the cultural heritage but also to learn how they can inform those in the community regarding the sites in their local area that are culturally or naturally significant to the community.

Learning goals

- During the thought design process, students will quickly go through a series of tasks that will lead them to observe, brainstorm, synthesize, prototype and discuss
- They will know how to structure their activities and better manage their working time.

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- They will understand design thinking and will be able to use it later in other training situations.
- They will learn to work together.
- They will think critically.
- They will know how to look for solutions to problems in other areas of their lives in an organized way.
- They will be creative, inventive and will learn to trust the thinking and team members.
- They will learn to provide feedback and assistance.

Learning objectives and outcome

At the end of the training, students will have a correct perception and perspective regarding the identification, conservation, preservation, restoration, and cultural heritage.
Knowledge of the notions related to the identification and protection of national and world cultural heritage will have a positive impact on their behavior.
Students will be able to identify elements of tangible and intangible heritage. They will be aware of the importance of cultural heritage for the sustainable development of society.

Core concepts

Tangible heritage, intangible heritage, “tangible” and “intangible” cultural heritage, tourist attractions, cultural sites, property rights, volunteering

Class activity

1. EMPATHY

The first Level of the Design Thinking methodology is Empathy. In this step the students will have to introduce themselves to the members of the group to which they belong and to add on the platform everything they found regarding the cultural heritage at a global and / or national level (as decided by the teacher). It can be links, images, presentations and/or videos.

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2. DEFINE

The second level of the Design Thinking methodology is Define. In this level, the students will have to resolve the following tasks:

- ***Task 1:*** Think what "tangible" and "intangible" cultural heritage means. The teacher will provide different images, as tangible or intangible heritage, added in different notes and the students must identify them as cultural or natural heritage.
- ***Task 2:*** Offer other examples of cultural or historical heritage. The students will have to document themselves, find different images or videos and upload them in the platform and specify if they are tangible or intangible heritage. Some possible responses could include language, literature, art, music, dance, or religion or even buildings and monuments.

3. IDEATE

The third level of the Design Thinking methodology is Ideate, the level where new ideas are generated and possible solutions explored for the problem in hand. In this level the students will have to resolve the following tasks:

- ***Task 1:*** Use an actual map of your city or other city or use the google map and identify sites that are culturally or naturally significant to your community/town/country. Search and upload images of those sites on the platform.
- ***Task 2:*** Answer to the following questions:
    a) What value does the site hold for your community?
    b) Does the site represent natural or cultural heritage?
    c) Is the site important or known to people outside of your local area?
    d) What would happen if the site was damaged or destroyed? g.
    e) What might cause damage or destruction to the site?
    f) Would the site still be remembered following destruction or would people quickly forget about it?

4. PROTOTYPE

The fourth level of the Design Thinking methodology is Prototype. In this level the students will have to use one of the sites identified at level 3 - Ideate and develop a plan to make sure visitors/tourists will not damage it when visiting. They will have to explain how visitors can best experience the site by including in their plan the following steps:

- The characteristics of the site and its values.
- Current condition/state of the site.

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- Possible threats or hazards to the site.
- Examples of how to protect the site but offering in the same time to the visitors a best experience.

5. TESTING

The five level of the Design Thinking methodology is Test. In this step the students can test and presents their prototype to gain feedback on their idea. In this level the students will have to make an online presentation and argue why their plan is the best solution to protect the cultural heritage.

ADDITIONAL LEVEL

Beside the five levels of the Design Thinking methodology, an additional level can be created in the form of Reflexion task. In this additional level, the students can visit different places in their town and take pictures of historical buildings, old buildings, monuments, etc and upload them on the platform. They will also have to specify if the identified cultural objectives are in danger and what measures can be taken to avoid their degradation.

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How can my behavior regarding transportation reduce global warming?

Learning sheet name

How can my behavior regarding transportation reduce global warming?

Topic (keywords)

Transport; Global warming; Road transportation; Pollution; Zero emissions.

Introduction

Is human activity responsible for the major cause of global warming? How do we know humans are causing the current explosive rise in temperatures? Warming and cooling have happened before but not with the intensity of today. Reducing transportation emissions is one of the most vital steps in fighting global warming, and solutions to the transportation problem are already available but all of us need to work together toward zero emissions in all transport sectors.

Description of the activity

Context

Climate change is affecting the entire planet and threatening every person in every country on every continent. However, we can come up with solutions. We humans cause climate change by polluting the atmosphere with too much carbon dioxide (CO2) and other greenhouse gasses. If we were the cause, we too can be the solution. The necessary technologies already exist. To ensure the future of the planet, we can all contribute.
Students will be divided in three groups (4-5 students per group)and each group will focus on a scenario, regarding the road transportation, the greatest contributor to global warming for the next 50 years according to NASA's Goddard Institute for Space Studies. The course links, images, videos as educational resources, regarding:

- Global warming: definition, which represents the planet
- Pollution: causes, factors leading to pollution, effects of the pollution,

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- Transport: definition, evolution of means of transport, forms of transport, noxious substances
- Environmental policies; Climate law (EU)

Learning goals

- During the thought design process, students will quickly go through a series of tasks that will lead them to observe, brainstorm, synthesize, prototype and discuss.
- They will know how to structure their activities and better manage their working time.
- They will understand design thinking and will be able to use it later in other training situations.
- They will learn to work together.
- They will think critically.
- To look in an organized way for solutions to problems in other areas of their lives.
- Be inventive and trust the thinking and members of your team.
- Provides feedback and assistance.

Learning objectives and outcome

At the end of the training process, students will have new notions, such as: cosmic phenomena, greenhouse effect, solar maximum, solar minimum, green energy, but also a better understanding of the notions related to ensuring an ecological transport, which reduce greenhouse gas emissions as much as possible.

They will know what needs to be done to ensure a future for our planet, in which human health is the central element.

Students will be aware of the importance of reducing pollution due to transportation. Assimilation of knowledge related to global warming: causes and effects, but also methods of reduction. Change of behavior regarding moving to and from school.

They will be able to become poles of influence for other students and even for their parents, in choosing the most suitable means of transport and justifying the choice.

Core concepts

Transport, temperature, average temperature, physical phenomena, cosmic phenomena, air pollution, environmental pollution, causes, effects

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Class activity

1. EMPATHY

The first Level of the Design Thinking methodology is Empathy. In this step the students will have to introduce themselves to the members of the group to which they belong and to add on the platform everything they found regarding the road transportation and its impact of global warming. It can be links, images, presentations and videos.

2. DEFINE

The second level of the Design Thinking methodology is Define. In this level, the students will have to resolve the following tasks at individual and group level:

- ***Task 1 – At individual level.*** The student will have to add his/her name on the note and lock it and answer the following questions:
    a) What is your main type of transport?
    b) How much do you think is your impact on the environment, in terms of the type of transport used?
    c) What can you do as an individual to improve the current situation?
- ***Task 2 – At group level.*** Each group will have to answer the following questions:
    a) What do you consider to be the most polluting means of transport?
    b) What would be the preferred type of transport (among the available options) and why?
    c) What can you do as a group to improve the current situation?

3. IDEATE

The third level of the Design Thinking methodology is Ideate, the level where new ideas are generated and possible solutions explored for the problem in hand. The major problem of today's society, global warming, is due to the largest transport. Thus, solutions must be found quickly to reduce greenhouse gas emissions. The solution can start with each of us. In this level, the students will let their imaginations run wild and propose ideas, solutions to reduce global warming by choosing the most environmentally friendly transport solutions. Within each group they will have to imagine how the world's climate could change over the next 50 years if humans do nothing to limit the levels of their gas pollution. They will need to make predictions about the effects of such climate changes could have on humans and generate 3-5 scenarios and choose the most voted for further discussions.

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4. PROTOTYPE

The fourth level of the Design Thinking methodology is Prototype. In this level the students will have to create a visual representation of the chosen scenario and identify in the group sustainable solutions to prevent the selected scenario, from occurring. It can be a 3d representation, a drawing, or a collage.

5. TESTING

The five level of the Design Thinking methodology is the Test. In this step the students can test and present their prototype to gain feedback on their idea. In this level the students will have to make an online presentation and argue the benefits of the sustainable solutions identified and present how they can be implemented to improve the current situation.

ADDITIONAL LEVEL

Beside the five levels of the Design Thinking methodology, an additional level can be created in the form of the Reflection task. In this additional level, the students can create an essay where they can present the outcomes from the platform and other information, to the school management, to the school inspectorate, in order to implement the solutions (part of the solutions) found by the students. It can be posted and the link distributed to decision makers and responsibility.

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Is this reusable?

Name of the learning sheet:

Is this reusable?

Topic (keywords)

Packaging; Cardboard; Paper; Plastic; Metal; Wood; Glass; Rethink; Reuse; Reduce; Refuse Recycle; Green community.

Introduction

Caring for planet earth has become a well publicised topic in the modern world and it's up to everyone to do their part. Words like reduce, reuse, reinvent and recycle are helpful in reinforcing things that can easily be done to improve not only your local area but also the wider world. Your food, clothes, everyday products, come packaged in a variety of ways, all of which have impacts on the environment. So, what can be done to reduce the waste and give a new life to these packages?

Description of the activity

Context

A circular economy minimises resource consumption, waste, emissions and energy losses. This can be achieved through rugged design, maintenance, repair, reuse and recycling. Reusable packaging: packaging that has been designed, engineered and placed on the market to achieve several cycles during its lifetime or to be reused for the same purpose for which it was designed.

Students will be divided into five groups (4-5 students). The course will include:

1. Description of a learning situation that caught the students attention, regardless of the positive or negative nature of the experience: positive and negative memories; influences; how the experiences changed their learning behaviour. The activity will help the teacher to empathise with the students, will relax the atmosphere in the group and will help to choose the way of approaching the knowledge that they want to be acquired by the students.

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2. Materials to describe and provide a real picture of the situation regarding the repurpose of packaging. By acting as a "projection screen", students will be able to identify needs and possible patterns of behaviour. Students will develop an opinion on how to proceed at home. Photos, videos, graphics, information extracted from various reports to complete the current picture of the repurpose of packaging.

3. Brainstorming session to explain that not all packaging is wasteful or undesirable. The brainstorming session will focus on:

- a list of the reasons why manufacturers use packaging for their products.
- a list of the reasons why it is advisable to reuse them.
- a list of means and methods by which we can reuse packaging.
- a list of identified environmental problems that may arise from improper use and disposal of packaging.

The groups will focus on different types of packaging: cardboard/paper; wood; glass; metal; plastic. There will be 5 groups created (according to the 5 types of packaging) and the students can join in a group either by affinities, or in alphabetical order, or according to the students' desire to study one group or another of types of packaging.

Each student will work in the corresponding team/group and will follow five design sheets/levels with structured prompts. At the end the students will need to complete two additional levels which address a reflection task and a short evaluation of the knowledge acquired.

Learning goals

- At the end of the learning experience, students will understand concepts such as: circular economy, environmental protection, judicious use of resources, sustainable development.
- They will know how to structure their activities and better manage their working time.
- They will understand design thinking and will be able to use it later in other training situations.
- They will learn to work together.
- To think critically.
- To look in an organised way for solutions to problems in other areas of their lives.
- Be inventive and trust their thinking and team members.
- Provide feedback and support.

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Learning objectives and outcome

Each team will go through a guided discussion to brainstorm the purpose and function of cardboard / paper, wood, glass, metal, plastic packaging and develop creative ideas on how these packages can be reused or recycled.

Thus, each student will assimilate new knowledge related to environmental protection, judicious use of materials, reuse of different types of packaging, will better understand the need to reuse them, to protect natural resources.

They will understand the purpose of the Designing Thinking methodology and how to use it, to find solutions to problems related to sustainability.

Core concepts

environmental protection, judicious use of resources, reduce, reuse, reinvent, recycle

Class activity

1. EMPATHY

The first Level of the Design Thinking methodology is Empathy. In this step the students will have to introduce themselves to the members of the group to which they belong and to document on different types of packaging and the reusability of them. In this level, the students will have the following tasks:

- Students will watch videos about the planet's resources, existing types of packaging and their characteristics; how to choose a package; ways to reuse and recycle them; notions such as: circular economy, sustainable development.
- Each student will add on the platform different materials, regarding different types of packaging. It can be links, images, presentations and videos.
- Each student will understand better the importance of reuse or recycle.

2. DEFINE

The second level of the Design Thinking methodology is Define. In this level the students will have to document themselves on different environmental problems that can be solved by reusing or as a last resort recycling the type of packaging assigned to their group. They will have to explain why not all packaging is wasteful or undesirable and create a list of the reasons why manufacturers use packaging for their products, through a brainstorming session. The purpose of this level is to understand better the complexity of the problem, where each team

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will later have a clear picture of how to develop better solutions for reusability or recycling of the type of packaging allocated to their group.

3. IDEATE

The third level of the Design Thinking methodology is Ideate, the level where new ideas are generated and possible solutions explored for the problem in hand.

In this level the students will be encouraged to find as many solutions as possible for the type of packaging allocated to their group. They will have to look at the objects around them and create ideas on how different objects can be reused, reduced, rethought or rejected to prevent them from ending up in recycling. They will have to develop 3-5 ideas about reusing the type of packaging assigned to their group, in order to give a new life to the packaging.

4. PROTOTYPE

The fourth level of the Design Thinking methodology is Prototype. Given the proposed theme, the prototyping will be done in electronic format (it can be listed on paper, if necessary) and / or a model - a new packaging - for another object. In this level each group will select the best received idea from level 3, the most interesting for the group, the most likely for implementation, the most unusual or the solution with the most options for collaborating with others. The group will have to design a prototype or a three-dimensional representation of their repurposed type of packaging and sketch it in more detail. The teacher will supervise the group work and will offer support to the students if they encounter problems in the designing process.

5. TEST

The five level of the Design Thinking methodology is the Test. In this step the students can test and present their prototype to gain feedback on their idea. In this step the group will have to make an online presentation and argue the choice made for the chosen solution, in terms of environmental protection. All groups will participate in a general brainstorm session, to gather ideas for improvement or further development of the prototypes and to open-ended questions.

ADDITIONAL LEVEL OUTSIDE THE PLATFORM

Beside the five levels of the Design Thinking methodology, an additional level can be created in the form of a Reflection task but it will be carried out outside the platform. In this task each student can appoint another member of the group to specify what he/she learned in the

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activity carried out in the platform. Everyone must have at least one connection within the group. This is how a learning network emerges.

Assessment task: Each student receives a test, online, which includes a puzzle, closed questions, drag and drop, matching correct answer. Also, each student will receive a summary of the results from the reflection task, and an online opinion poll, which will include 7-8 questions, of which 4 open.

External Evaluation

1. Fill in the blanks so that the word "packaging" appears vertically. (It is an Excel doc) (2 points)

2. Associate each term in the first column with a characteristic in the second column, if there is a correlation between them (1 point)

A packaging materials	**B Feature**
1 glass	a small table
2 plastic materials	b may positively influence the organoleptic characteristics of the products
3 metallic materials	c resistance in the humid environment
4 cellulosic materials	d barrier effect against water, gases, ultraviolet, microorganisms
5 wood	e can imprint an unpleasant taste on products
6 textiles	f fragility, relatively large mass
7 complex materials	g favourable environment for the development of microorganisms

Answer: 1 - f; 2 - c; 3 - b; 4 –a; 5 - e; 6 - g; 7 – d

3. Circle the correct option (2pct)

1. Classifications of recoverable and non-recoverable packaging shall be made according to the following criteria: 0.5 pc

a. Type of packaging

b. Locking system

c. Duration of use

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d. Field of use

Answer: a

2. Identify the type of packaging that is a favourable environment for the development of microorganisms: 0.5 pc

a. Plastic packaging

b. Glass packaging

c. Packaging made of complex materials

d. Wooden packaging

Answer: d

3. Identify the physical factor that may adversely affect the quality of the goods: 0.5 points

a. Water

b. Light

c. Microorganisms

d. Vapours

Answer: c

4. The fact that the new packaging must be superior to the old one does not lead to a decrease in the trust of loyal customers in the quality of the product is reflected in the following function of the packaging: 0,5 pt

a. Handling, transport, storage function

b. The function of promoting goods and informing consumers

c. Preservation and protection function of the product

d. Social function

Answer. b

4. Note with A or F the following notices: (1 point)

1. Acceptance of products by consumers depends to a small extent on the aesthetics of the packaging. 0.5 pct

2. Glass packaging has a high resistance to mechanical shock. 0.5 pct

Answer:

1 - A

2 – F

5. Fill in the blanks with the appropriate terms: (2 points)

The packaging is a ..... intended to contain a product, to ensure its protection in terms of ....., mechanical, ... in order to maintain .... and .... to him, during handling ....., storage and sale.

The packaging allows the circulation of products from .... to the consumer .....

Answer:

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The packaging is a **MEANS (OR ASSEMBLY OF MEANS)** intended to contain a product, to ensure its protection from a **PHYSICAL, CHEMICAL,** mechanical, **BIOLOGICAL** point of view, in order to maintain its **INTEGRITY** and **QUALITY**, during handling, **TRANSPORT,** storage and disposal.

The packaging allows the circulation of products from the **MANUFACTURER** to **the FINAL** consumer.

6.Plastic and glass packaging has a high share among the types of packaging: (2pct)

1. Present the properties of plastics that you recommend for obtaining packaging.
2. Present the properties of the bottle, which recommends it for obtaining packaging.

Answer:

1. Plastics
   - Low specific mass (1-1.5 g / cm3),
   - Resistance to humid environment,
   - Resistance to the action of acids and alkalis,
   - Good mechanical strength,
   - Easy processing, obtaining packaging of different shapes and sizes,
   - Hygienic-sanitary properties (does not constitute a favourable environment for the development of microorganisms).

2. Glass:
   - Provides good protection (barrier to gases, vapours, liquids)
   - It is transparent (allows the visualisation of the product, being thus a factor of sales promotion)
   - It is chemically inert to food
   - It has high stability to alkalis, acids (the only acid that attacks it is hydrofluoric acid)
   - It has no smell, does not change the taste of food
   - Can be colored, protecting the product from ultraviolet radiation, thus avoiding discoloration of the product or loss of vitamins
   - Can be processed into different shapes
   - It has a good resistance to high internal pressures (used for packaging champagne)
   - High hardness
   - Hygienic-sanitary properties (it is a hygienic material, easy to wash, which supports sterilisation; it is not a favourable environment for the development of microorganisms)
   - Recyclable and economical material.

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Hug the Life

Name of the learning sheet

Hug the Life

Topic (keywords)

Homelessness

Introduction

The number of homeless people living on the streets is increasing rapidly around the world. Worldwide, nearly 100 million homeless people live on the streets, separated from their families, according to a report released by an independent NGO by the United Nations. In some countries, authorities are trying to help the homeless, but it's not enough. Additionally, homeless people with special needs, the elderly, or those with chronic illnesses should be considered.

Description of the activity

Context

In this activity, the students will gain awareness of homeless people in their country and think about the reasons for that. As a responsible individuals, the students will think about possible solutions for homeless people.

Learning goals

The learning goals of this activity are to get to know the reasons leading people to be homeless,

To get a better understanding of the problems of homeless people

To use brainstorming and research to understand the problem core.

To use design thinking methodologies for a deeper understanding of the problem.

To use innovative thinking to provide new and better solutions.

To create prototypes of ideas.

To test prototypes.

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To improve prototypes according to the results of testing sessions and feedback.

To work in teams on a joint goal.

To give and receive feedback.

Learning objectives and outcome

After completing this activity, the students will have a better understanding of the problems leading people to become homeless. They have gone through the design thinking process and provided new ideas with brainstorming sessions. They have provided new solutions and improvements to the existing solutions. They have learned how to cooperate in teams and discuss in groups in order to achieve a common goal.

Core concepts

social responsibility, homeless

Class activity

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1. EMPATHY

First level of the Design Thinking process is empathy. In this step we will get to know the situation about homeless people in our countries, understand the reasons leading them to be homeless, understand their problems on the streets and try to bring a solution or added value for them. Then, they will complete a small warm-up task about them with the other members of the activity. Students will present themselves and express their views on climate change and water. As a next task, they will watch a video on Youtube. The task's objectives are to make them aware about the increasing problem of homelessness. The teachers can ask some guiding or reflective questions to students after they watch the video.

a. The group will make a research on the given topics;
b. The group will do a further autonomous research about the topic and present what they found by including it the canvas (its preferable to think local);
c. The group can also make an interview with people about how they use water in their daily life, whether they save, etc
d. The group will later organize all the information gathered. They can share the recordings.

2. DEFINE

Second level of the Design Thinking process is called „Define". Here we need to develop further understanding of why things are the way they are and identify the problematic parts. This is the level where students will engage in their own research. By using the previous knowledge from the first level and by combining it with their own research combining it with their own research students will develop their own opinions on sustainability problems related to human impact. The goal is to have a better understanding of the water problem and reasons. Define level is important for providing a basis for solutions developed in the next level. While defining, problems can be approached by „How might we solve this?" question to gain more insight and help with the Design Thinking process.

a. Each participant will define the reasons for homlessness, the problems of homeless people.

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3. IDEATE

„Ideate“ is the level where new ideas are generated and possible solutions explored for the problem in hand. Here, brainstorming could be implemented and students should be provided with guidance in brainstorming strategies. Additionally they should be reminded and encouraged that while brainstorming, quantity is more important than quality so it is important to be non-judgemental, to be open to different ideas and let imagination run free. This reminder could also help to avoid reproaching among students. The level provides supportive thematic materials for inspiration and encouragement which should be studied before engaging with the task. The task requires the students to work together as a team and come up with a lot of different ideas on how to provide solutions for water shortage in the world.

a. They will discuss as a group about possible ideas for solutions for your problem statement, they are supposed to build on each others' ideas and not make hasty judgements.
b. In the end, after discussing to achieve a consensus about the solution among all the ideas, they are supposed to highlight the selected solution.

4. PROTOTYPE

Prototyping phase allows you to get ideas into physical form and gain feedback. This is an important step in creating new products because through trial and error the best possible solutions can be developed. The goal is to start with a low fidelity version of the intended idea and improve it over time. These tasks are based on the previous levels and tie them all together. Here in this level the team members will study a prototyping method by themselves and put their new knowledge into practical use as well as trying to figure out a suitable medium for the task in hand. We will be concentrating on the explanation and presentation of the provided solution. Students can lean on the materials provided or do their own personal research. After individual research the teacher should give a review of the subject as well to ensure mutual understanding.

a. The group should discuss if the solution is feasible, and if so, determine how to test and assess it.
b. The group should identify what kind of information is needed to verify the efficiency of the proposed solution and how to collect that data to prove it.

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c. To test the solution, the participants should determine the frequency of data collection and subsequently collect it using the predefined moments and tools.
d. Following, all data collected by each individual should be gathered and discussed in a team.
e. After discussing in group, decide if it is necessary to change some parameters to the test and to the data collection process.
f. The last step is to present the choice made for the chosen solution, in terms of sustainable cities, in an online presentation.

5. TEST

This is the fifth and final phase of Design Thinking. This allows students to test their prototype on the users to gain feedback on their idea. The rest of the class will assume the users' role but the audience can be expanded of course, if possible. The team should revisit the problem at hand and gain feedback. This helps the team to conclude if and how their solution needs tweaking. By testing, we're seeking to learn if we've made an impact, if we are on the right track and what needs to be changed. By getting feedback from users we are mapping their needs and ways we haven't met these needs yet. In conclusion, testing can be seen as a second round of empathy.

a. The students will create an online presentation to their class (or any given audience) about their product/idea. This task was designed to argue the choice made for the chosen solution in terms of water lack in the world.

b. After presentations a feedback and analysis session will ensue. The audience (i.e. the rest of the class) should give the presenting team feedback and share their polite opinions on the subject. This should be done for each team separately. The session is led by the teacher. The feedback is important in order to give feedback about the product/idea and see which improvements could and should be done. The teacher will also provide the team with their own professional feedback regarding the teams' final product/idea.

c. If possible the analysis session should also include a discussion with the teams separately so that the teacher can give personal feedback and students can assess their experience. The teacher creates a discussion among students and encourages each team member to express their experience and thoughts. If necessary, the teacher provides professional feedback on students' process. Taking a closer look into the whole Design Thinking process and how it was implemented is another recommended subject for the analysis session. Reflecting on

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teamwork experience is an important part of the assessment. Self-reflection could contribute to enhancing analyzing skills and finding new ways to approach creative problem solving in the future.

d. For further development the Design Thinking cycle starts over to achieve a more refined solution. However, this is not mandatory.

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Great Danger Drought

Name of the learning sheet

Great Danger Drought

Topic (keywords)

Drought, water resources, global warming

Introduction

So far, available freshwater resources have nearly met humanity's water needs, but experts warn this won't last long. It warns that about half of the world's population could be at risk of drought by 2050 as a result of the rapid decline in clean water resources due to problems caused by climate change and rapid population growth.

Description of the activity

Context

In this activity, the students will get to know the importance of water for living things, the threats for water and sea in the world, the problem of water lack in the world and the human impact on it. As a responsible individuals, the students will think about possible solutions for saving water.

Learning goals

The learning goals of this activity are to get to know the reasons for draught, lack of water in the world

To get a better understanding of the vitality of water for living beings

To use brainstorming and research to understand the problem core.

To use design thinking methodologies for a deeper understanding of the problem.

To use innovative thinking to provide new and better solutions.

To create prototypes of ideas.

To test prototypes.

To improve prototypes according to the results of testing sessions and feedback.

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To work in teams on a joint goal.

To give and receive feedback.

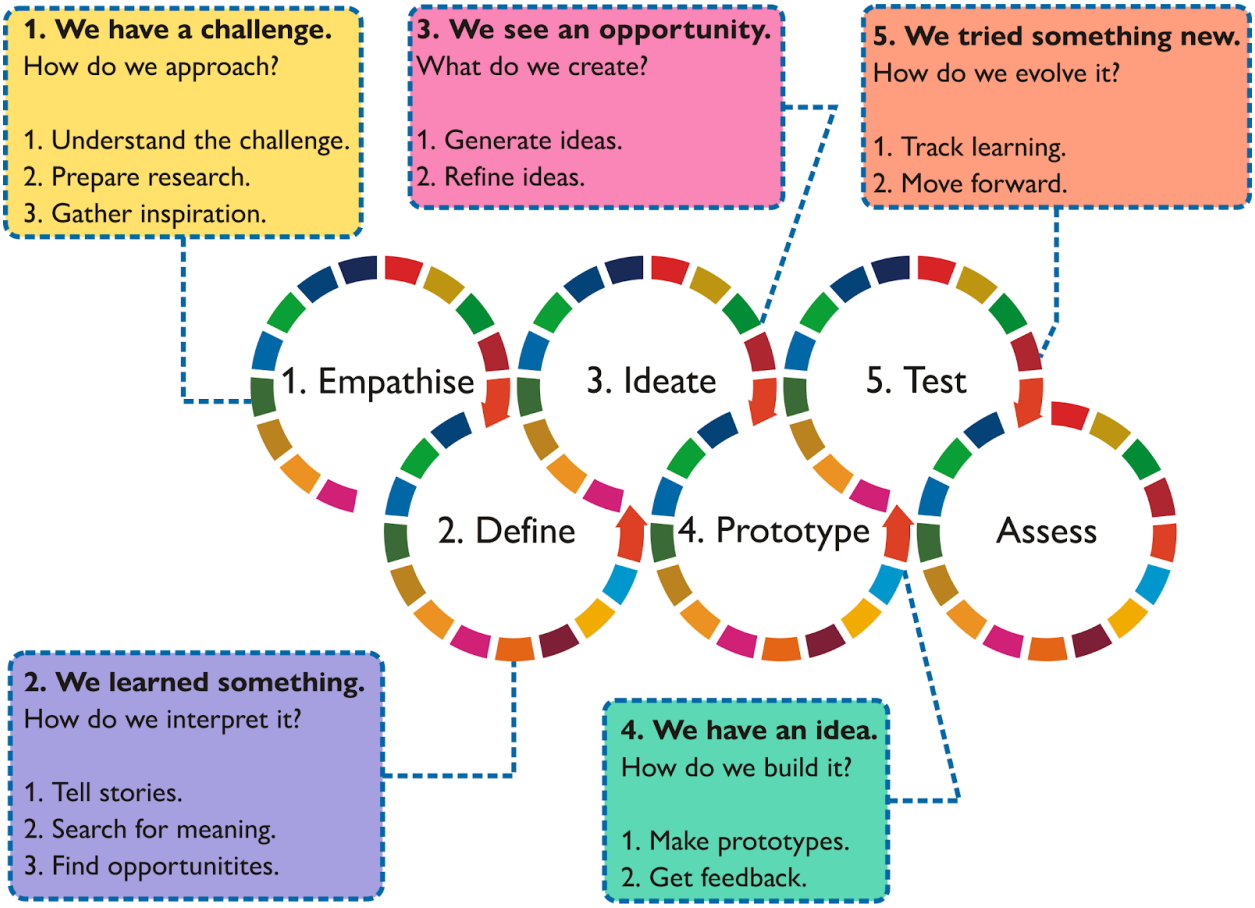
Learning objectives and outcome

After completing this activity, the students will have a better understanding of the problems leading to water lack in the world. They have gone through the design thinking process and provided new ideas with brainstorming sessions. They have provided new solutions and improvements to the existing solutions. They have learned how to cooperate in teams and discuss in groups in order to achieve a common goal.

Core concepts

sustainability, climate change, saving water

Class activity



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1. EMPATHY

First level of the Design Thinking process is empathy. In this step we will get to know the situation about water problem, lack of water, reasons leading to water decrease in the world. Then, they will complete a small warm-up task about them with the other members of the activity. Students will present themselves and express their views on climate change and water. As a next task, they will watch a video on Youtube. The task's objectives are to make them aware about the less availability of water in the world. The teachers can ask some guiding or reflective questions to students after they watch the video.

a. The group will read the text in the resource link about means of water, its vitality in ecosystem, threats for water and seas, the role of humnabeings, how to make water more sustainable;
b. The group will make a research on the given topics;
c. The group will do a further autonomous research about the topic and present what they found by including it the canvas (its preferable to think local);
d. The group can also make an interview with people about how they use water in their daily life, whether they save, etc
e. The group will later organize all the information gathered. They can share the recordings.

2. DEFINE

Second level of the Design Thinking process is called „Define". Here we need to develop further understanding of why things are the way they are and identify the problematic parts. This is the level where students will engage in their own research. By using the previous knowledge from the first level and by combining it with their own research combining it with their own research students will develop their own opinions on sustainability problems related to human impact. The goal is to have a better understanding of the water problem and reasons. Define level is important for providing a basis for solutions developed in the next level. While defining, problems can be approached by „How might we solve this?" question to gain more insight and help with the Design Thinking process.

a. Each participant will define the problems leading to lack of water, the impacts, accessibility to water locally and globally.

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3. IDEATE

„Ideate“ is the level where new ideas are generated and possible solutions explored for the problem in hand. Here, brainstorming could be implemented and students should be provided with guidance in brainstorming strategies. Additionally they should be reminded and encouraged that while brainstorming, quantity is more important than quality so it is important to be non-judgemental, to be open to different ideas and let imagination run free. This reminder could also help to avoid reproaching among students. The level provides supportive thematic materials for inspiration and encouragement which should be studied before engaging with the task. The task requires the students to work together as a team and come up with a lot of different ideas on how to provide solutions for water lack in the world.

a. They will discuss as a group about possible ideas for solutions for your problem statement, they are supposed to build on each others' ideas and not make hasty judgements.
b. In the end, after discussing to achieve a consensus about the solution among all the ideas, they are supposed to highlight the selected solution.

4. PROTOTYPE

Prototyping phase allows you to get ideas into physical form and gain feedback. This is an important step in creating new products because through trial and error the best possible solutions can be developed. The goal is to start with a low fidelity version of the intended idea and improve it over time. These tasks are based on the previous levels and tie them all together. Here in this level the team members will study a prototyping method by themselves and put their new knowledge into practical use as well as trying to figure out a suitable medium for the task in hand. We will be concentrating on the explanation and presentation of the provided solution. Students can lean on the materials provided or do their own personal research. After individual research the teacher should give a review of the subject as well to ensure mutual understanding.

a. The group should discuss if the solution is feasible, and if so, determine how to test and assess it.
b. The group should identify what kind of information is needed to verify the efficiency of the proposed solution and how to collect that data to prove it.

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c. To test the solution, the participants should determine the frequency of data collection and subsequently collect it using the predefined moments and tools.
d. Following, all data collected by each individual should be gathered and discussed in a team.
e. After discussing in group, decide if it is necessary to change some parameters to the test and to the data collection process.
f. The last step is to present the choice made for the chosen solution, in terms of sustainable cities, in an online presentation.

5. TEST

This is the fifth and final phase of Design Thinking. This allows students to test their prototype on the users to gain feedback on their idea. The rest of the class will assume the users' role but the audience can be expanded of course, if possible. The team should revisit the problem at hand and gain feedback. This helps the team to conclude if and how their solution needs weaking. By testing, we're seeking to learn if we've made an impact, if we are on the right track and what needs to be changed. By getting feedback from users we are mapping their needs and ways we haven't met these needs yet. In conclusion, testing can be seen as a second round of empathy.

a. The students will create an online presentation to their class (or any given audience) about their product/idea. This task was designed to argue the choice made for the chosen solution in terms of water lack in the world.

b. After presentations a feedback and analysis session will ensue. The audience (i.e. the rest of the class) should give the presenting team feedback and share their polite opinions on the subject. This should be done for each team separately. The session is led by the teacher. The feedback is important in order to give feedback about the product/idea and see which improvements could and should be done. The teacher will also provide the team with their own professional feedback regarding the teams' final product/idea.

c. If possible the analysis session should also include a discussion with the teams separately so that the teacher can give personal feedback and students can assess their experience. The teacher creates a discussion among students and encourages each team member to express their experience and thoughts. If necessary, the teacher provides professional feedback on students' process. Taking a closer look into the whole Design Thinking process and how it was implemented is another recommended subject for the analysis session. Reflecting on

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teamwork experience is an important part of the assessment. Self-reflection could contribute to enhancing analyzing skills and finding new ways to approach creative problem solving in the future.

d. For further development the Design Thinking cycle starts over to achieve a more refined solution. However, this is not mandatory.

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How to make schools more energy efficient? - ELECTRICITY

Name of the learning sheet:

How to make schools more energy efficient? - ELECTRICITY

Topic (keywords)

Electricity, Sustainability, Design Thinking, Schools, Alternative sources of energy, Innovation

Introduction

Sustainability is becoming more and more important because of the consumption of natural resources. Schools use a lot of energy to provide us with a comfortable place to study and make friends.

Description of the activity

Context

There are ways to cut down on energy consumption. Let's put our heads together and see what we can do to reduce our consumption of energy in our school.

Learning goals

The learning goals of this activity are to get to know the issues of sustainability, more specifically electricity.

To get a better understanding of the importance of electricity consumption.

To use brainstorming and research to understand the core of the problem.

To use design thinking methodologies for a deeper understanding of the problem and for the creation of better and out-of-the-box solutions.

To use innovative thinking to provide new and better solutions.

To create prototypes of ideas.

To test prototypes.

To improve prototypes according to the results of testing sessions and feedback.

To work in teams on a common goal.

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To practice teamwork and learn to communicate and cooperate better.

To give and receive feedback.

Learning objectives and outcome

After completing this activity the students will have a better understanding of sustainability issues related to electricity. They have gone through the Design Thinking process and have created new ideas during brainstorming sessions. Students have provided new solutions to issues regarding electricity usage or made improvements to already existing ideas.

Core concepts

Consumption, Electricity, Energy, Resources, Alternative sources of energy

Class activity

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1. EMPATHY

First phase of the Design Thinking process is empathy. In this step we will get to know the situation regarding energy consumption and complete a small bonding task about them. Students will share their viewpoint and thoughts firstly in pairs and later with the rest of their team. The task's objectives are to discover one's personal responsibilities and assess flexibility, be creative, encourage empathy, teamwork and understanding. The level contains additional materials that can be relied on to help with the process.

a. Students will watch a video about global energy demand to understand the greater scale of things and the underlying issues. Then they will get acquainted with a graph that depicts sectoral shares of global energy consumption. This task is meant to be food for thought for the upcoming school related tasks.

b. The second task requires the students to put the newly gained knowledge into use and think about their own personal willingness and how much they are able to affect electricity consumption. Students will pair up and create at least an 8-link word chain of the things they are willing to give up or change in their lives in order to help save energy. Playful tasks like this could help to break the ice and encourage discussions.

c. There are also some discussion ideas provided for the word chain exercise for further thoughts.

2. DEFINE

Second phase of the Design Thinking process is called „Define". Here we need to develop further understanding of why things are the way they are and identify the problematic parts. This is where students will engage in their own research. By using the previous knowledge from the first level and by combining it with their own research students will fill a two-part task about energy production. The goal is to have a better understanding of the ways that are contributing to the exploitation of natural resources in order to generate electricity. Juxtaposing it with sustainable production options should help to identify and define the problematic aspects of the subject. Define phase is important for providing a basis for solutions developed in the next phase. While defining, problems can be approached by „How might we solve this?" question to gain more insight and help with the Design Thinking process.

a. Students will work together to find at least 7 ways how electricity is being produced. Some of the answers are well-known but others might need a bit more research and could come as a surprise which will help to broaden the horizon. After completing the first part students will need to identify the sustainable options from the previously mentioned ones. This exercise

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helps to distinguish unsustainable ways from more viable alternatives. Personal research helps to reinforce self-sufficiency and embed new knowledge by making new discoveries without being given the answers right away.

b. As the activity is meant to work out potential solutions for schools, additional steps should be done to create connections with the latter. Students will do additional research together to find out the biggest electricity consumers in schools. This will help to put things into perspective and define the place of concerns specifically in the school area. Additional discussion ideas are also provided.

3. IDEATE

„Ideate“ is the phase where new ideas are generated and possible solutions explored for the problem in hand. Here, brainstorming could be implemented and students should be provided with guidance in brainstorming strategies. Additionally they should be reminded and encouraged that in brainstorming it is important to be non-judgemental, open to different ideas and let imagination run free. This is because in brainstorming the quantity of ideas is more important than the quality. This reminder could also help to avoid reproaching among students. The level provides supportive thematic materials for inspiration and encouragement which should be studied before engaging with the task. The task requires the students to work together as a team and come up with different ideas on how to make their school more energy efficient – the more ideas the better.

a. Students will get acquainted with the materials provided – a video about implementation of renewable energy, an article about an innovative way to create light and a list of energy saving ideas for schools. The materials are meant to provide food for thought and to help with the ideation process.

b. The most important part of this level is to come up with ideas on how to create a more electricity efficient school. The ideas don’t have to be feasible yet because the goal of the „Ideation“ step is to stimulate the flow of ideas regarding a specific subject. Teacher’s guidance about different methods is important here. The task also provides a variety of factors students could take into account while trying to come up with solutions. Another option is to return to the problems defined in the previous “Define” phase and ask again “How might we solve this?“ to provide students with inspiration.

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4. PROTOTYPE

Prototyping phase allows students to get ideas into physical form and gain feedback. This is an important step in creating new products because the best possible solutions can be developed only through trial and error. The goal is to start with a simple idea and improve it over time. These tasks are based on the previous levels and tie them all together. Here in this level the team members will study a prototyping method by themselves and put their new knowledge into practical use as well as try to figure out a suitable medium for the task in hand. This activity focuses on paper prototyping because it's more executable online than a model prototype, for example. Students can use the materials provided or do their own personal research. After individual research the teacher should give a small introduction to the subject (prototyping, designing in teams, non-linear thinking) to give tips and ensure mutual understanding regarding the task.

a. Students will get acquainted with materials provided and learn about paper prototyping on their own. There's also an exemplary video about paper prototyping for an app for inspiration. Students are free to search for additional information. They can post their materials on the canvas too.

b. The second task is about going back to the previous „Ideation" phase for a moment. Students will need to choose their best or the most impactful idea from the previous level that can be developed further into a feasible solution. Also, the solution has one limitation - the energy used must be sustainable. Guiding tips and questions provided in this task could assist the team in choosing the best idea to move forward with.

c. The students will start working on their chosen idea - they will need to create a paper prototype of it themselves. Now the team has to really work together and come up with an idea how to make it possible online. If students are truly unable to come up with a solution the teacher should provide it for them in order to continue with the Design Thinking process. The result should be an uploaded photo of their paper prototype that the students will post to the canvas. Great drawing abilities and perfecting the design are not important in this phase. This phase is more about working towards solving a problem. There is also a thematic reminder for the students about it as well. This task puts the students' new knowledge into use, enhances teamwork skills and gets them acquainted with new mediums. This task could assist in ice breaking as well as in overcoming difficulties together as a team.

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5. TESTING

His is the fifth and final phase of Design Thinking. This allows students to test their prototype on the users to gain feedback on their idea. The rest of the class will assume the users' role but the audience can be expanded of course, if possible. The team should revisit the problem at hand and gain feedback. This helps the team to conclude if and how their solution needs tweaking. By testing, we're seeking to learn if we've made an impact, if we are on the right track and what needs to be changed. By getting feedback from users we are mapping their needs and ways we haven't met these needs yet. In conclusion, testing can be seen as a second round of empathy.

a. The students will create an online presentation to their class (or any given audience) about their product/idea. This task was designed to prepare the materials in order to gain feedback as well as to take a closer look into the thought processes leading to results. The presentation should contain a photo of the paper prototype itself, description of the idea and how it works, and how the solution is following sustainability principles. Also a description of the work process – how the team got their inspiration, what affected their choice making and how they organized teamwork. Not only will this presentation provide feedback and prompt discussions but it also lets students reflect on their Design Thinking journey.

b. After presentations a feedback and analysis session will ensue. The audience (i.e. the rest of the class) should give the presenting team feedback and share their polite opinions on the subject. This should be done for each team separately. The session is led by the teacher. The feedback is important in order to give feedback about the product/idea and see which improvements could and should be done. The teacher will also provide the team with their own professional feedback regarding the teams' final product/idea.

c. If possible the analysis session should also include a discussion with the teams separately so that the teacher can give personal feedback and students can assess their experience. The teacher creates a discussion among students and encourages each team member to express their experience and thoughts. If necessary, the teacher provides professional feedback on students' process. Taking a closer look into the whole Design Thinking process and how it was implemented is another recommended subject for the analysis session. Reflecting on teamwork experience is an important part of the assessment. Self-reflection could contribute to enhancing analyzing skills and finding new ways to approach creative problem solving in the future.

d. For further development the Design Thinking cycle starts over to achieve a more refined solution. However, this is not mandatory.

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Recycling and Reducing Garbage

Name of the learning sheet:

Recycling and Reducing Garbage

Topic (keywords)

Garbage, Recycling, Sustainable School, Design Thinking, 3R Strategy, Innovation

Introduction

The amount of garbage on our planet keeps increasing while at the same time natural resources are declining. We need innovative ideas now more than ever to reverse wasting our resources. Let's think about what can be done and how to make our schools more environmentally friendly while contributing to sustainability at the same time!

Description of the activity

Context

There are many ways to cut down the amount of waste that is produced. One of the examples is the 3R Strategy – reduce, reuse, recycle. Let's get acquainted with the issues at hand and figure out how we can help contribute to a more sustainable resource management.

Learning goals

The learning goals of this activity are to get to know the issues of sustainability, more specifically problems related to garbage.

To get a better understanding of the causes for wasting materials and how to reduce it.

To use brainstorming and research to understand the core of the problem.

To use Design Thinking methodologies for a deeper understanding of the problem and for the creation of out-of-the-box solutions.

To create prototypes of ideas.

To test prototypes.

To improve prototypes according to the results of testing sessions and feedback.

To work in teams towards a common goal.

To practice teamwork and learn to communicate and cooperate better.

To give and receive feedback.

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Learning objectives and outcome

After completing this activity the students will have a better understanding of sustainability issues related to garbage – how people use resources unsustainably, why people produce so much waste and what are the consequences of it. Students have gone through the Design Thinking process and have created new ideas during brainstorming sessions. Students have provided ideas for waste management by following the 3R Strategy.

Core concepts

Consumption, Waste, Natural resources, Sustainability, Garbage, Recycling, Materials, Product Life Cycle

Class Activity

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1. EMPATHY

First phase of the Design Thinking process is empathy. In this step we will get to know the situation regarding wasting natural resources and how the resources end up back in nature as garbage. A task about empathizing with the issue at hand will be completed. Understanding a problem and its causes are paramount to developing a solution. Students will get acquainted with two videos, one about natural resources depletion, and the other about an example of a serious pollution issue – the Great Pacific Garbage Patch, and subsequently share their viewpoint and thoughts. The task's objectives are to aid in understanding one's thoughts as well as hear out others' viewpoints, encourage discussion and understanding.

a. First, the students will watch two videos. The first video talks about the Great Pacific Garbage Patch. The goal of the video is to help put issues at hand into perspective by showing a very serious consequence to our waste management problem. Visual medium helps to illustrate the issue and aid in emphasizing. The second video is about the ratio of human population and the resources we consume. It illustrates the imbalance of resource accessibility, consumption and how much is truly sustainable.

b. The second task lets students express their thoughts and feelings. They need to discuss together and point out reasons why such things as imbalance in consumption among different castes, overconsumption, pollution and/or heavy littering happens. Not only it aids in understanding one's peers but also helps to prepare students for the next phase where they need to define the problem.

Secondly, each of the students should share their feelings on how these issues depicted in attached videos make them feel. This task helps to connect with one's self and other team members.

c. An additional idea for discussion is provided for this level: „Do you know where your garbage goes after you throw it away?“ The discussion can be prompted by the teacher and done verbally in class, separately in teams or can be given as homework for further research.

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2. DEFINE

Second phase of the Design Thinking process is called „Define“. Here we need to develop further understanding of why things are the way they are and identify the problematic parts. This is where students will engage in their own research to develop a deeper understanding of the underlying issues. In this activity the “Define” phase focuses on what contributes to wasting resources and how these problems can be solved. The additional material (article about global economy’s linearity) included on the canvas below should help with students’ research by providing a few ideas for the requested tasks as well as references for further information.

a. In the first task we will be defining some causes for our waste problem. Students need to do additional research and create a list of ways how society (infrastructure, values, habits, etc.) either influences us to act wastefully or makes recycling difficult. An example for inspiration is provided. This will help enhance understanding and contribute to broadening the horizon regarding how the problem is created. Personal research helps to reinforce self-sufficiency and embed new knowledge by making new discoveries without being given the answers right away.

b. The second task’s goal is to provide possible solutions. Students will copy their bullet points from the first task to this one and tackle the issues one by one. They will approach the issues mentioned by asking “How might we solve this?”. Students should engage in a discussion and figure out possible solutions together. This enhances teamwork, innovative thinking and communication. Jointly developed solutions will be written down on the post-it note. This task will help prepare students for the next “Ideate” phase.

3. IDEATE

„Ideate“ is the phase where new ideas are generated and possible solutions explored for the problem at hand. Here, brainstorming could be implemented and students should be provided with guidance in brainstorming strategies. Additionally they should be reminded and encouraged that in brainstorming it is important to be non-judgemental, open to different ideas and let imagination run free. This is because in brainstorming the quantity of ideas is more important than the quality. This reminder could also help to avoid reproaching among students. The level provides supportive thematic materials for inspiration and encouragement which should be studied before engaging with the task. The task requires the students to work together as a team and come up with different ideas on how to make their school more 3R Strategy-friendly – the more ideas the better.

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a. Students will get acquainted with the four materials provided. Firstly, with the 3R Strategy - a simple and concise article is provided about the subject. There is also an inspiring and exemplary example of recycling– an article of the PlasticRoad prototype which is a road made of plastic removed from the oceans. There are also two videos of products included. One is a short upbeat success story from Kenya about creating construction bricks from plastic waste and the other video demonstrates a biodegradable plastic bag from Bangladesh. These examples will most likely come as a surprise to most students and help to expand their horizon as these are not well known globally. The materials are meant to provide food for thought and to help with the ideation process. Before moving on to the task teacher should do a quick briefing on the 3R Strategy to ensure mutual understanding among students.

b. The most important part of this level is to come up with ideas on how to contribute to a more resource efficient school. This is an important exercise because the last two phases will be based on this one. The task is based on the 3R Strategy. The team will brainstorm for ways how they can help their school to reduce, reuse and/or recycle more efficiently either personally or with their whole class. Either that or how the school itself can become more sustainable regarding materials and resource management. The ideas don't have to be feasible yet because the goal of the „Ideation" step is to stimulate the flow of ideas regarding a specific subject. For example in this phase the ideas can be completely out-of-the-box or even magical. Refining and making it tangible will be done in the next phase.

4. PROTOTYPE

Prototyping phase allows students to get ideas into physical form and gain feedback. This is an important step in creating new products because the best possible solutions can be developed only through trial and error. The goal is to start with a simple idea and improve it over time. The task is based on the previous levels and ties them all together. Here in this level the team members will study prototyping methods by themselves and put their new knowledge into practical use as well as try to figure out a suitable medium for the task in hand. Students can use the materials provided or do their own personal research. After individual research the teacher should give a small introduction to the subject (prototyping, designing in teams, non-linear thinking) to give tips and ensure mutual understanding regarding the task.

a. Students will get acquainted with materials provided and learn about prototyping on their own. Students are free to search for additional information. They can post their materials on the canvas too.

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b. The second task is about going back to the previous „Ideation“ phase for a moment. Students will need to choose their best or the most impactful idea from the previous level that can be developed further into a feasible solution. The idea can be chosen from any of the three categories (reduce, reuse, recycle). Guiding tips and questions provided in this task could assist the team in choosing the best idea to move forward with.

c. After choosing their favourite idea the students will start working on it. They won't need to create a physical prototype but they will need to have a well-thought out plan and how to execute it. Sketches or paper prototyping could be helpful in mapping down the idea and keeping track of their plan, especially if it is a product or a piece of technology. All visual aids should be posted on the canvas. This task encourages innovative and strategic thinking. Also it puts the students' new knowledge into use and enhances teamwork skills. This task could assist in ice breaking as well as in overcoming difficulties together as a team.

5. TESTING

This is the fifth and final phase of Design Thinking. This allows students to test their prototype on the users to gain feedback on their idea. By testing, we're seeking to learn if we've made an impact, if we are on the right track and what needs to be changed. However, this time the team members themselves will assume the users' role and will be generating self-feedback. The team will take a look at their product/idea together and assess how well it was executed. This helps the team to conclude if and how their solution needs tweaking, too.

a. The students will need to look at their product/idea from a potential users' perspective and write down positive and negative aspects of their product or idea. They should think about how it affects the user – is it comfortable, is it accessible, what is lacking, general user experience, etc. It requires critical thinking as well as empathizing with the potential user to understand their needs. This roleplay-type approach helps to see a subject from a different and a fresh perspective and give more insight. Any additional thoughts or observations can be written down in the "Additional notes" section.

b. A feedback session led by the teacher will ensue. The teacher will analyze together with each team the positive and negative aspects the students came up with. Additionally, the teacher will provide the team with their own professional feedback on the chosen product/idea as well as students' teamwork dynamics if possible.

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How to make schools more energy efficient? - WATER

Name of the learning sheet:

How to make schools more energy efficient? - WATER

Topic (keywords)

Water, Sustainability, Design Thinking, Schools, Natural resources, Innovation

Introduction

Sustainability is becoming more and more important because of the consumption of natural resources. Schools use a significant amount of water daily to provide us with a comfortable place to study and make friends. It is important to realize the importance of water and how to use it sustainably.

Description of the activity

Context

There are ways to cut down on water consumption. Let's figure out how we can help schools save precious life supporting liquid – water!

Learning goals

The learning goals of this activity are to get to know the issues of sustainability, more specifically problems related to water.

To get a better understanding of balance between water scarcity and consumption.

To use brainstorming and research to understand the core of the problem.

To use Design Thinking methodologies for a deeper understanding of the problem and for the creation of better and out-of-the-box solutions.

To create prototypes of ideas.

To test prototypes.

To improve prototypes according to the results of testing sessions and feedback.

To work in teams towards a common goal.

To practice teamwork and learn to communicate and cooperate better.

To give and receive feedback.

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Learning objectives and outcome

After completing this activity the students will have a better understanding of sustainability issues related to water, mainly about the balance between scarcity and consumption. They have gone through the Design Thinking process and have created new ideas during brainstorming sessions. Students have provided new solutions to issues regarding water usage or made improvements to already existing ideas.

Core concepts

Consumption, Water, Natural resources, Sustainability

Class Activity

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1. EMPATHY

First phase of the Design Thinking process is empathy. In this step we will get to know the situation regarding water consumption and complete a small task about potential consequences of wasting water. Understanding a problem and its causes are paramount to developing a solution. Students will get acquainted with a video and an article about water resources and share their viewpoint and thoughts in order to complete the task. The task's objectives are to be creative, encourage empathy, teamwork and understanding. The level contains additional materials that can be relied on to help understand the problem at hand.

a. Students will watch a short fact based video about water usage and scarcity. The goal of the video is to help put issues at hand into perspective. Then the students will get acquainted with a graph that depicts how and where Earths' water resources are allocated. This contributes to understanding the importance of proper water management and the value of this natural resource.

b. The second task lets students come up with possible consequences and outcomes if humans keep wasting water. The task requires creativity and some previous knowledge. For that, the task asks students to get acquainted with an article about wasting water to help stimulate their thinking. The article lists 125 reasons and is illustrated with infographics and is easy to read. This task allows students to be creative as well as get immersed in the issue and empathize with possible future scenarios.

2. DEFINE

Second phase of the Design Thinking process is called „Define". Here we need to develop further understanding of why things are the way they are and identify the problematic parts. This is where students will engage in their own research. In this activity "Define" phase focuses on what causes the issues at hand. By using the previous knowledge from the first level and by combining it with their own research students will first identify the causes for water depletion and secondly, create a list of reasons why people engage in wasteful habits. By juxtaposing reasons for water stress and our own wasteful habits students will have a better understanding of how water scarcity occurs and what are the contributing factors. The tasks are supported by an animated TED-Ed video about global water consumption. Define phase is important for providing a basis for solutions developed in the next phase. While defining,

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problems can be approached by „How might we solve this?“ question to gain more insight and help with the Design Thinking process in the next phases.

a. Students will work together to find at least 4 things that cause water stress and water depletion. Some of the answers are well-known but others might need a bit more research. This will contribute to broadening the horizon regarding the subject. Personal research helps to reinforce self-sufficiency and embed new knowledge by making new discoveries without being given the answers right away.

b. As the activity is meant to work out potential solutions for schools, additional steps need to be taken to prepare for the next level. In the second task students are prompted to think about our own wasteful habits. Each of the team members need to find at least four wasteful reasons or habits why so much water is being wasted. The task is split into two sections: micro scale and macro scale. Micro scale refers more to daily habits and personal values and behaviours whereas marco scale is related to structural and organizational themes like policies, technology, infrastructure, laws etc. This will help to understand the problem from a broader angle as well as from a more personal perspective, allowing to realise one’s own impact and emphatize even further.

3. IDEATE

„Ideate“ is the phase where new ideas are generated and possible solutions explored for the problem at hand. Here, brainstorming could be implemented and students should be provided with guidance in brainstorming strategies. Additionally they should be reminded and encouraged that in brainstorming it is important to be non-judgemental, open to different ideas and let imagination run free. This is because in brainstorming the quantity of ideas is more important than the quality. This reminder could also help to avoid reproaching among students. The level provides supportive thematic materials for inspiration and encouragement which should be studied before engaging with the task. The task requires the students to work together as a team and come up with different ideas on how to make their school more water efficient – the more ideas the better.

a. Students will get acquainted with the materials provided – a video about an award winning small-scale water recycling system and a graph from a research article about different factors affecting water usage in schools. The materials are meant to provide food for thought and to help with the ideation process.

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b. The most important part of this level is to come up with ideas on how to create a more water efficient school. The ideas don't have to be feasible yet because the goal of the „Ideation" step is to stimulate the flow of ideas regarding a specific subject. Teacher's guidance about different methods is important here. The task also provides a variety of factors students could take into account while trying to come up with solutions. Another option is to return to the problems defined in the previous "Define" phase and ask again "How might we solve this?" to provide students with inspiration.

4. PROTOTYPE

Prototyping phase allows students to get ideas into physical form and gain feedback. This is an important step in creating new products because the best possible solutions can be developed only through trial and error. The goal is to start with a simple idea and improve it over time. These tasks are based on the previous levels and tie them all together. Here in this level the team members will study a prototyping method by themselves and put their new knowledge into practical use as well as try to figure out a suitable medium for the task at hand. This activity focuses on paper prototyping because it's more executable online than a model prototype, for example. Students can use the materials provided or do their own personal research. After individual research the teacher should give a small introduction to the subject (prototyping, designing in teams, non-linear thinking) to give tips and ensure mutual understanding regarding the task.

a. Students will get acquainted with materials provided and learn about paper prototyping on their own. There's also an exemplary video about paper prototyping for an app for inspiration. Students are free to search for additional information. They can post their materials on the canvas too.

b. The second task is about going back to the previous „Ideation" phase for a moment. Students will need to choose their best or the most impactful idea from the previous level that can be developed further into a feasible solution. Also, the solution has one limitation - the water usage must be sustainable. Guiding tips and questions provided in this task could assist the team in choosing the best idea to move forward with.

c. The students will start working on their chosen idea - they will need to create a paper prototype of it themselves. Now the team has to really work together and come up with an idea how to make it possible online. If students are **truly** unable to come up with a solution the teacher should provide it for them in order to continue with the Design Thinking process. The result should be an uploaded photo of their paper prototype that the students will post

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to the canvas. Great drawing abilities and perfecting the design are not important in this phase. This phase is more about working towards solving a problem. There is also a thematic reminder for the students about it as well. This task puts the students' new knowledge into use, enhances teamwork skills and gets them acquainted with new mediums. This task could assist in ice breaking as well as in overcoming difficulties together as a team.

5. TESTING

This is the fifth and final phase of Design Thinking. This allows students to test their prototype on the users to gain feedback on their idea. The rest of the class will assume the users' role but the audience can be expanded of course, if possible. The team should revisit the problem at hand and gain feedback. This helps the team to conclude if and how their solution needs tweaking. By testing, we're seeking to learn if we've made an impact, if we are on the right track and what needs to be changed. By getting feedback from users we are mapping their needs and ways we haven't met these needs yet. In conclusion, testing can be seen as a second round of empathy.

a. The students will create an online presentation to their class (or any given audience) about their product/idea. This task was designed to prepare the materials in order to gain feedback as well as to take a closer look into the thought processes leading to results. The presentation should contain a photo of the paper prototype itself, description of the idea and how it works, and how the solution is following sustainability principles. Also a description of the work process – how the team got their inspiration, what affected their choice making and how they organized teamwork. Not only will this presentation provide feedback and prompt discussions but it also lets students reflect on their Design Thinking journey.

b. After presentations a feedback and analysis session will ensue. The audience (i.e. the rest of the class) should give the presenting team feedback and share their polite opinions on the subject. This should be done for each team separately. The session is led by the teacher. The feedback is important in order to give feedback about the product/idea and see which improvements could and should be done. The teacher will also provide the team with their own professional feedback regarding the teams' final product/idea.

c. If possible the analysis session should also include a discussion with the teams separately so that the teacher can give personal feedback and students can assess their experience. The teacher creates a discussion among students and encourages each team member to express their experience and thoughts. If necessary, the teacher provides professional feedback on students' process. Taking a closer look into the whole Design Thinking process and how it was

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implemented is another recommended subject for the analysis session. Reflecting on teamwork experience is an important part of the assessment. Self-reflection could contribute to enhancing analyzing skills and finding new ways to approach creative problem solving in the future.

d. For further development the Design Thinking cycle starts over to achieve a more refined solution. However, this is not mandatory.

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Healthy Lives and Well-Being for All

Name of the learning sheet

Healthy Lives and Well-Being for All

Topic (keywords)

Sustainability, Health, Contamination, Pollution, Health Hazards

Introduction

In 2016, indoor (household) and outdoor (ambient) air pollution caused some 7 million deaths worldwide. Inadequate water, sanitation and hygiene led to a total of 870,000 deaths in the same year. The United Nations target 3.9 plans to "by 2030, substantially reduce the number of deaths and illnesses from hazardous chemicals and air, water and soil pollution and contamination".

Description of the activity

Context

In this activity the students will get to know all about pollution, contamination and the health-related problems that emerge because of these issues, especially, the problems happening in the region surrounding their daily life.

Learning goals

The learning goals of this activity are to get to know the health related problems that emerge from pollution and contamination.

To get a better understanding of the concept of pollution and contamination.

To use brainstorming and research to understand the problem core.

To use design thinking methodologies for a deeper understanding of the problem.

To use innovative thinking to provide new and better solutions.

To create prototypes of ideas.

To test prototypes.

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To improve prototypes according to the results of testing sessions and feedback.

To work in teams on a joint goal.

To give and receive feedback.

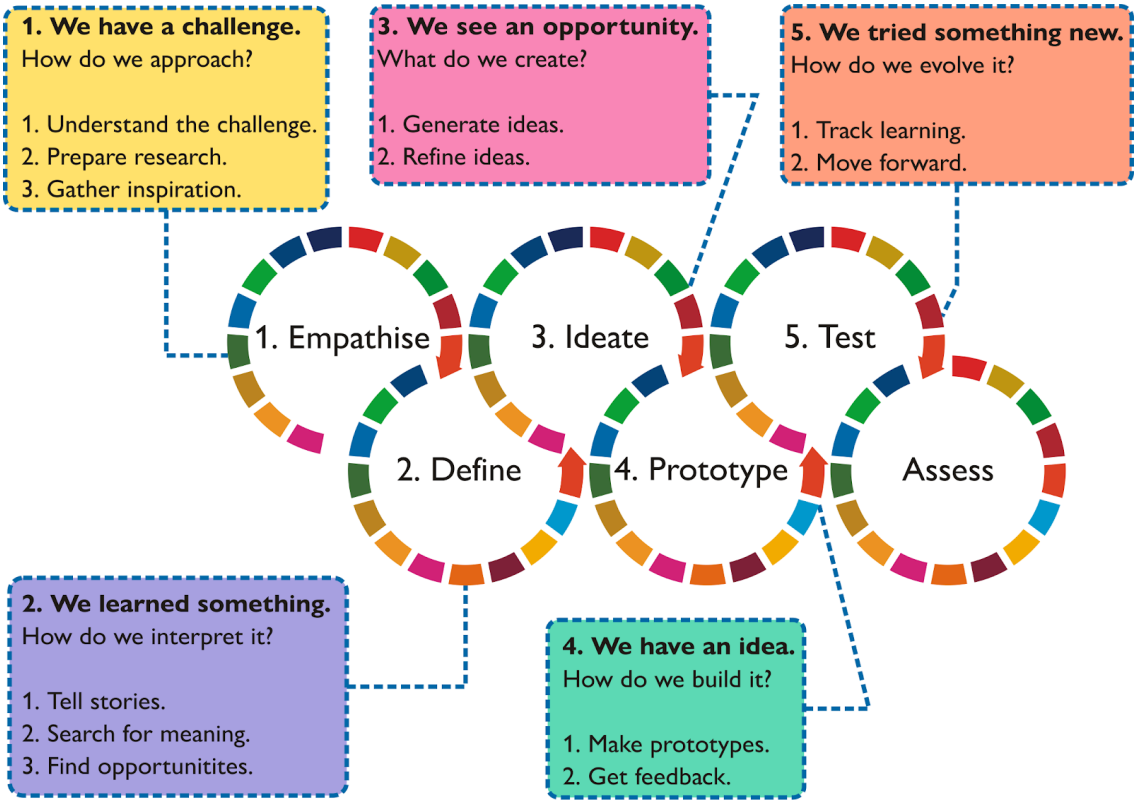
Learning objectives and outcome

After completing this activity the students will have a better understanding of the health related problems that emerge from pollution and contamination. They have gone through the design thinking process and provided new ideas with brainstorming sessions. They have provided new solutions and improvements to the existing solutions. They have learned how to cooperate in teams and discuss in groups in order to achieve a common goal.

Core concepts

Sustainability, Health, Contamination, Pollution, Health Hazards.

Class activity



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1. **EMPATHY**

First level of the Design Thinking process is empathy. In this step we will get to know the situation regarding pollution and contamination related to health protection and complete a small bonding task about them with the other members of the activity. Students will share their viewpoint and thoughts with the rest of their team. The task's objectives are to discover your personal responsibilities, assess your flexibility, be creative, encourage empathy, teamwork and understanding. The level contains additional materials that can be relied on to help with the process.

a. The group will read the text in the resource link about pollution;
b. The group will read the text in the resource link about well-known cases;
c. The group will do a further autonomous research about the topic and present what they found by including it the canvas (its preferable to think local);
d. The group will later organize all the information gathered.

2. **DEFINE**

Second level of the Design Thinking process is called „Define". Here we need to develop further understanding of why things are the way they are and identify the problematic parts. This is the level where students will engage in their own research. By using the previous knowledge from the first level and by combining it with their own research students will develop their own opinions on health issues related to sustainability problems (pollution and contamination). The goal is to have a better understanding of the source of pollutants in your vicinity. Juxtaposing it with sustainable production options should help to identify and define the problematic aspects of the subject. Define level is important for providing a basis for solutions developed in the next level. While defining, problems can be approached by „How might we solve this?" question to gain more insight and help with the Design Thinking process.

a. Each participant will create a statement for a pollution/contamination problem and identify all the constraints related to it.

3. **IDEATE**

„Ideate" is the level where new ideas are generated and possible solutions explored for the problem in hand. Here, brainstorming could be implemented and students should be provided with guidance in brainstorming strategies. Additionally they should be reminded and encouraged that while brainstorming, quantity is more important than quality so it is important to be non-judgemental, to be open to different ideas

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and let imagination run free. This reminder could also help to avoid reproaching among students. The level provides supportive thematic materials for inspiration and encouragement which should be studied before engaging with the task. The task requires the students to work together as a team and come up with a lot of different ideas on how to make their own school more energy efficient – the more ideas the better.

b. They will discuss as a group about possible ideas for solutions for your problem statement, they are supposed to build on each others' ideas and not make hasty judgments.
c. In the end, after discussing to achieve a consensus about the solution among all the ideas, they are supposed to highlight the selected solution.

4. PROTOTYPE

Prototyping phase allows you to get ideas into physical form and gain feedback. This is an important step in creating new products because through trial and error the best possible solutions can be developed. The goal is to start with a low fidelity version of the intended idea and improve it over time. These tasks are based on the previous levels and tie them all together. Here in this level the team members will study a prototyping method by themselves and put their new knowledge into practical use as well as trying to figure out a suitable medium for the task in hand. We will be concentrating on paper prototyping because it's more executable online than a model prototype, for example. Students can lean on the materials provided or do their own personal research. After individual research the teacher should give a review of the subject as well to ensure mutual understanding.

a. The group should discuss if the solution is feasible, and if so, determine how to test and assess it.
b. The group should identify what kind of information is needed to verify the efficiency of the proposed solution and how to collect that data to prove it.
c. To test the solution, the participants should determine the frequency of data collection and subsequently collect it using the predefined moments and tools.
d. Following, all data collected by each individual should be gathered and discussed in a team.
e. After discussing in group, decide if it is necessary to change some parameters to the test and to the data collection process.
f. The last step is to present the choice made for the chosen solution, in terms of environmental protection, in an online presentation.

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Sustainable Cities

Name of the learning sheet

Sustainable Cities

Topic (keywords)

Sustainability, Contamination, Pollution and CIties

Introduction

One of the United Nations sustainable development goals is to make cities and human settlements inclusive, safe, resilient and sustainable.

Description of the activity

Context

In this activity the students will get to know all about the sustainable development goals of the United Nations, especially, information on how to cope with pollution, contamination and sustainability in rural and urban areas.

Learning goals

The learning goals of this activity are to get to know the sustainability problems that emerge from pollution and contamination from urban and rural human settlements.

To get a better understanding of the concept of pollution, contamination and identify sustainability issues in human settlements.

To use brainstorming and research to understand the problem core.

To use design thinking methodologies for a deeper understanding of the problem.

To use innovative thinking to provide new and better solutions.

To create prototypes of ideas.

To test prototypes.

To improve prototypes according to the results of testing sessions and feedback.

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To work in teams on a joint goal.

To give and receive feedback.

Learning objectives and outcome

After completing this activity the students will have a better understanding of the sustainability issues that emerge from the pollution and contamination present on human settlements. They have gone through the design thinking process and provided new ideas with brainstorming sessions. They have provided new solutions and improvements to the existing solutions. They have learned how to cooperate in teams and discuss in groups in order to achieve a common goal.

Core concepts

Sustainability, Contamination, Pollution and CIties

Class activity

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1. **EMPATHY**

First level of the Design Thinking process is empathy. In this step we will get to know the situation about sustainability issues that emerge from the pollution and contamination present on human settlements and the United Nations initiative on how to cope with these problems. Then, they will complete a small bonding task about them with the other members of the activity. Students will share their viewpoint and thoughts with the rest of their team. The task's objectives are to discover your personal responsibilities, assess your flexibility, be creative, encourage empathy, teamwork and understanding. The level contains additional materials that can be relied on to help with the process.

a. The group will read the text in the resource link about sustainability in cities;
b. The group will read the text in the resource link about proposed cases;
c. The group will do a further autonomous research about the topic and present what they found by including it the canvas (its preferable to think local);
d. The group will later organize all the information gathered.

2. DEFINE

Second level of the Design Thinking process is called „Define". Here we need to develop further understanding of why things are the way they are and identify the problematic parts. This is the level where students will engage in their own research. By using the previous knowledge from the first level and by combining it with their own research combining it with their own research students will develop their own opinions on sustainability problems related to human settlements pollution. The goal is to have a better understanding of the sustainability problems in cities from your own context. Juxtaposing it with sustainable production options should help to identify and define the problematic aspects of the subject. Define level is important for providing a basis for solutions developed in the next level. While defining, problems can be approached by „How might we solve this?" question to gain more insight and help with the Design Thinking process.

a. Each participant will create a statement for a sustainability related city problem and identify all the constraints related to it.

3. **IDEATE**

„Ideate" is the level where new ideas are generated and possible solutions explored for the problem in hand. Here, brainstorming could be implemented and students

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should be provided with guidance in brainstorming strategies. Additionally they should be reminded and encouraged that while brainstorming, quantity is more important than quality so it is important to be non-judgemental, to be open to different ideas and let imagination run free. This reminder could also help to avoid reproaching among students. The level provides supportive thematic materials for inspiration and encouragement which should be studied before engaging with the task. The task requires the students to work together as a team and come up with a lot of different ideas on how to make their own school more energy efficient – the more ideas the better.

a. They will discuss as a group about possible ideas for solutions for your problem statement, they are supposed to build on each others' ideas and not make hasty judgments.
b. In the end, after discussing to achieve a consensus about the solution among all the ideas, they are supposed to highlight the selected solution.

4. PROTOTYPE

Prototyping phase allows you to get ideas into physical form and gain feedback. This is an important step in creating new products because through trial and error the best possible solutions can be developed. The goal is to start with a low fidelity version of the intended idea and improve it over time. These tasks are based on the previous levels and tie them all together. Here in this level the team members will study a prototyping method by themselves and put their new knowledge into practical use as well as trying to figure out a suitable medium for the task in hand. We will be concentrating on paper prototyping because it's more executable online than a model prototype, for example. Students can lean on the materials provided or do their own personal research. After individual research the teacher should give a review of the subject as well to ensure mutual understanding.

a. The group should discuss if the solution is feasible, and if so, determine how to test and assess it.
b. The group should identify what kind of information is needed to verify the efficiency of the proposed solution and how to collect that data to prove it.
c. To test the solution, the participants should determine the frequency of data collection and subsequently collect it using the predefined moments and tools.
d. Following, all data collected by each individual should be gathered and discussed in a team.
e. After discussing in group, decide if it is necessary to change some parameters to the test and to the data collection process.

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f. The last step is to present the choice made for the chosen solution, in terms of sustainable cities, in an online presentation.

Sustainable Transport

Name of the learning sheet

Sustainable Transport

Topic (keywords)

Sustainability, Transport

Introduction

Sustainable transport supports inclusive growth, job creation, poverty reduction, access to markets, the empowerment of women, and the well-being of persons with disabilities and other vulnerable groups. It is also essential to our efforts to fight climate change, reduce air pollution and improve road safety.

Description of the activity

Context

In this activity the students will get to know all about the sustainable transport topic, that is, its concept, available options, its features, development process and global trends. Also, the participant will get to know about other topics related to the transportation scope, such as, sustainable fuel development and other social concerns.

Learning goals

The learning goals of this activity are to get to know about the sustainable transport topic and concerns that emerge from it.

To get a better understanding of the concept of sustainable transport within your local possibilities.

To use brainstorming and research to understand the problem core.

To use design thinking methodologies for a deeper understanding of the problem.

To use innovative thinking to provide new and better solutions.

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To create prototypes of ideas.

To test prototypes.

To improve prototypes according to the results of testing sessions and feedback.

To work in teams on a joint goal.

To give and receive feedback.

Learning objectives and outcome

After completing this activity the students will have a better understanding of the sustainability issues that emerge from the transportation scope. They have gone through the design thinking process and provided new ideas with brainstorming sessions. They have provided new solutions and improvements to the existing solutions. They have learned how to cooperate in teams and discuss in groups in order to achieve a common goal.

Core concepts

Sustainability, Transport

Class activity

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1. **EMPATHY**

First level of the Design Thinking process is empathy. In this step we will get to know the situation about sustainability issues that emerge from the transportation scope, other concerns that emerge from this debate and the local limitation for development . Then, they will complete a small bonding task about them with the other members of the activity. Students will share their viewpoint and thoughts with the rest of their team. The task's objectives are to discover your personal responsibilities, assess your flexibility, be creative, encourage empathy, teamwork and understanding. The level contains additional materials that can be relied on to help with the process.

a. The group will read the text in the resource link about sustainable transport;

b. The group will read the text in the resource link about a UN report on sustainable transportation development;

c. The group will do a further autonomous research about the topic and present what they found by including it the canvas (its preferable to think local);

d. The group will later organize all the information gathered.

2. DEFINE

Second level of the Design Thinking process is called „Define". Here we need to develop further understanding of why things are the way they are and identify the problematic parts. This is the level where students will engage in their own research. By using the previous knowledge from the first level and by combining it with their own research students will develop their own opinions on sustainability problems related to transportation. The goal is to have a better understanding of the sustainability problems in the way people transport themselves in your city, and by your own daily life necessities, eg. how to travel from home to school in a sustainable way? Is it safe or close to walk or to cycle? Juxtaposing it with sustainable production options should help to identify and define the problematic aspects of the subject. Define level is important for providing a basis for solutions developed in the next level. While defining, problems can be approached by „How might we solve this?" question to gain more insight and help with the Design Thinking process.

a. Each participant will create a statement for a sustainability related transport problem and identify all the constraints related to it.

3. IDEATE

„Ideate" is the level where new ideas are generated and possible solutions explored for the problem in hand. Here, brainstorming could be implemented and students should be provided with guidance in brainstorming strategies. Additionally they should be reminded

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and encouraged that while brainstorming, quantity is more important than quality so it is important to be non-judgemental, to be open to different ideas and let imagination run free. This reminder could also help to avoid reproaching among students. The level provides supportive thematic materials for inspiration and encouragement which should be studied before engaging with the task. The task requires the students to work together as a team and come up with a lot of different ideas on how to make their own school more energy efficient – the more ideas the better.

a. They will discuss as a group about possible ideas for solutions for your problem statement, they are supposed to build on each others' ideas and not make hasty judgments.

b. In the end, after discussing to achieve a consensus about the solution among all the ideas, they are supposed to highlight the selected solution.

4. PROTOTYPE

Prototyping phase allows you to get ideas into physical form and gain feedback. This is an important step in creating new products because through trial and error the best possible solutions can be developed. The goal is to start with a low fidelity version of the intended idea and improve it over time. These tasks are based on the previous levels and tie them all together. Here in this level the team members will study a prototyping method by themselves and put their new knowledge into practical use as well as trying to figure out a suitable medium for the task in hand. We will be concentrating on paper prototyping because it's more executable online than a model prototype, for example. Students can lean on the materials provided or do their own personal research. After individual research the teacher should give a review of the subject as well to ensure mutual understanding.

a. The group should discuss if the solution is feasible, and if so, determine how to test and assess it.

b. The group should identify what kind of information is needed to verify the efficiency of the proposed solution and how to collect that data to prove it.

c. To test the solution, the participants should determine the frequency of data collection and subsequently collect it using the predefined moments and tools.

d. Following, all data collected by each individual should be gathered and discussed in a team.

e. After discussing in group, decide if it is necessary to change some parameters to the test and to the data collection process.

f. The last step is to present the choice made for the chosen solution, in terms of environmental protection, in an online presentation.

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1,2,3...Recycle

Name of the learning sheet

1,2,3...Recycle

Topic (keywords)

Recycling, waste, paper, glass, aluminium, plastic

Introduction

There are many reasons why recycling is essential. Not only can it help reduce your carbon footprint, but it also helps reduce the need for harvesting raw materials, saves energy, reduces greenhouse gases, prevents pollution, and more.

By improving our recycling habits, we can help keep the environment clean and preserve our natural resources.

Description of the activity

Context

The modern way of life has the huge problem of waste management. The proper use of waste, starting from the individual level is considered imperative. This activity can help us realize that the issues of the planet are also our issues.

Learning goals

The learning goals of this activity are to get to know the recycling process and its benefits.

To get a better understanding of the recycling process.

To use brainstorming and research to understand the problem core.

To use design thinking methodologies for a deeper understanding of the problem.

To use innovative thinking to provide new and better solutions.

To create prototypes of ideas.

To test prototypes.

To improve prototypes according to the results of testing sessions and feedback.

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To work in teams on a joint goal.

To give and receive feedback.

Learning objectives and outcome

After completing this activity, the students will have a better understanding of the recycling process and its benefits. They have gone through the design thinking process and provided new ideas with brainstorming sessions. They have provided new solutions and improvements to the existing solutions. They have learned how to cooperate in teams and discuss in groups in order to achieve a common goal.

Core concepts

Recycling, waste, paper, glass, aluminium, plastic

Class activity

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1. EMPATHY

First level of the Design Thinking process is empathy. In this step we will get to know the situation about recycling. Then, they will complete a small bonding task about them with the other members of the activity. Students will share their viewpoint and thoughts with the rest of their team. The task's objectives are to discover your personal responsibilities, assess your flexibility, be creative, encourage empathy, teamwork and understanding. The level contains additional materials that can be relied on to help with the process.

a. The group will read the text in the resource link about recycling;
b. The group will read the text in the resource link about proposed cases;
c. The group will do a further autonomous research about the topic and present what they found by including it the canvas (its preferable to think local);
d. The group will later organize all the information gathered.

2. DEFINE

Second level of the Design Thinking process is called „Define". Here we need to develop further understanding of why things are the way they are and identify the problematic parts. This is the level where students will engage in their own research. By using the previous knowledge from the first level and by combining it with their own research combining it with their own research students will develop their own opinions on recycling. Define level is important for providing a basis for solutions developed in the next level. While defining, problems can be approached by „How might we solve this?" question to gain more insight and help with the Design Thinking process.

a. Each participant will create a statement for a recycling related city problem and identify all the constraints related to it.

3. IDEATE

„Ideate" is the level where new ideas are generated and possible solutions explored for the problem in hand. Here, brainstorming could be implemented and students should be provided with guidance in brainstorming strategies. Additionally they should be reminded and encouraged that while brainstorming, quantity is more important than quality so it is important to be non-judgemental, to be open to different ideas and let imagination run free. This reminder could also help to avoid reproaching among students. The level provides supportive thematic materials for inspiration and encouragement which should be studied

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before engaging with the task. The task requires the students to work together as a team and come up with a lot of different ideas– the more ideas the better.
They will discuss as a group about possible ideas for solutions for your problem statement, they are supposed to build on each others' ideas and not make hasty judgments.

a. In the end, after discussing to achieve a consensus about the solution among all the ideas, they are supposed to highlight the selected solution.

4. PROTOTYPE

Prototyping phase allows you to get ideas into physical form and gain feedback. This is an important step in creating new products because through trial and error the best possible solutions can be developed. The goal is to start with a low fidelity version of the intended idea and improve it over time. These tasks are based on the previous levels and tie them all together. Here in this level the team members will study a prototyping method by themselves and put their new knowledge into practical use as well as trying to figure out a suitable medium for the task in hand. We will be concentrating on paper prototyping because it's more executable online than a model prototype, for example. Students can lean on the materials provided or do their own personal research. After individual research the teacher should give a review of the subject as well to ensure mutual understanding.

a. The group should discuss if the solution is feasible, and if so, determine how to test and assess it.
b. The group should identify what kind of information is needed to verify the efficiency of the proposed solution and how to collect that data to prove it.
c. To test the solution, the participants should determine the frequency of data collection and subsequently collect it using the predefined moments and tools.
d. Following, all data collected by each individual should be gathered and discussed in a team.
e. After discussing in group, decide if it is necessary to change some parameters to the test and to the data collection process.
f. The last step is to present the choice made for the chosen solution, in terms of recycling, in an online presentation.

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Food waste problem

Name of the learning sheet

Food waste problem

Topic (keywords)

Food waste

Introduction

Food waste refers to food that is discarded at the level of retailers, food service providers and consumers. Food is wasted in many ways, for example

- Fresh produce that deviates from what is considered optimal (e.g. size, shape or colour) and is removed during sorting actions
- Foods that are discarded by retailers or consumers when it's close to or beyond the best before date.
- Unused or leftover food that is thrown out from households or restaurants.

The UN Sustainable Development Goal 12.3 aims to halve food waste at the retail and consumer level and to reduce food loss across supply chains. Measuring food loss and waste on a national, regional and global scale is not easy, but methodologies and tools are being developed in order to allow us to measure progress.

Description of the activity

Context

Every year one third of the food produced for human consumption, is wasted. During this activity, we will discuss the effects of food waste.

Learning goals

The learning goals of this activity are to get to know the food waste problem.

To get a better understanding of the food waste problem.

To use brainstorming and research to understand the problem core.

To use design thinking methodologies for a deeper understanding of the problem.

To use innovative thinking to provide new and better solutions.

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To create prototypes of ideas.

To test prototypes.

To improve prototypes according to the results of testing sessions and feedback.

To work in teams on a joint goal.

To give and receive feedback.

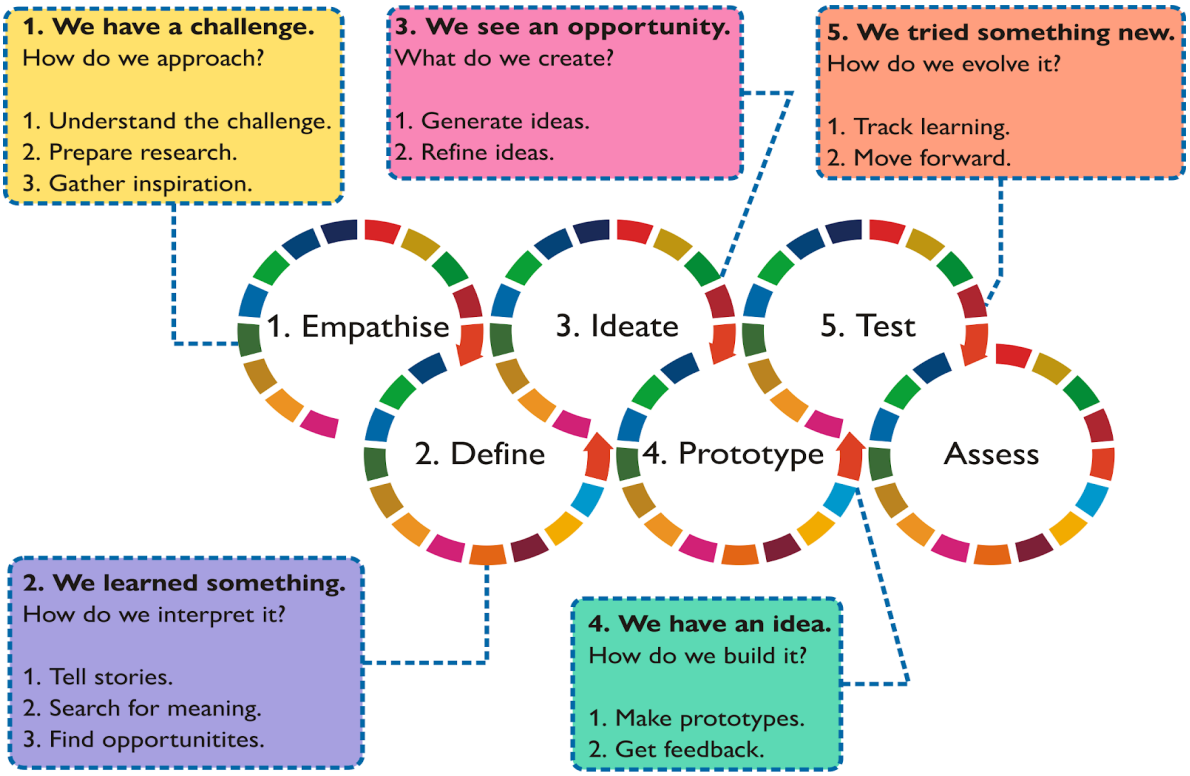
Learning objectives and outcome

After completing this activity, the students will have a better understanding of the food waste problem. They have gone through the design thinking process and provided new ideas with brainstorming sessions. They have provided new solutions and improvements to the existing solutions. They have learned how to cooperate in teams and discuss in groups in order to achieve a common goal.

Core concepts

Food waste

Class activity



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1. EMPATHY

First level of the Design Thinking process is empathy. In this step we will get to know the situation about sustainability issues that emerge from the foos waste problem. Then, they will complete a small bonding task about them with the other members of the activity. Students will share their viewpoint and thoughts with the rest of their team. The task's objectives are to discover your personal responsibilities, assess your flexibility, be creative, encourage empathy, teamwork and understanding. The level contains additional materials that can be relied on to help with the process.

e. The group will read the text in the resource link about food waste;
f. The group will read the text in the resource link about proposed cases;
g. The group will do a further autonomous research about the topic and present what they found by including it the canvas (its preferable to think local);
h. The group will later organize all the information gathered.

2. DEFINE

Second level of the Design Thinking process is called „Define". Here we need to develop further understanding of why things are the way they are and identify the problematic parts. This is the level where students will engage in their own research. By using the previous knowledge from the first level and by combining it with their own research combining it with their own research students will develop their own opinions on food waste. Define level is important for providing a basis for solutions developed in the next level. While defining, problems can be approached by „How might we solve this?" question to gain more insight and help with the Design Thinking process.

b. Each participant will create a statement for a food waste related problem and identify all the constraints related to it.

3. IDEATE

„Ideate" is the level where new ideas are generated and possible solutions explored for the problem in hand. Here, brainstorming could be implemented and students should be provided with guidance in brainstorming strategies. Additionally they should be reminded and encouraged that while brainstorming, quantity is more important than quality so it is important to be non-judgemental, to be open to different ideas and let imagination run free. This reminder could also help to avoid reproaching among students. The level provides

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supportive thematic materials for inspiration and encouragement which should be studied before engaging with the task. The task requires the students to work together as a team and come up with a lot of different ideas – the more ideas the better.
They will discuss as a group about possible ideas for solutions for your problem statement, they are supposed to build on each others' ideas and not make hasty judgments.

b. In the end, after discussing to achieve a consensus about the solution among all the ideas, they are supposed to highlight the selected solution.

4. PROTOTYPE

Prototyping phase allows you to get ideas into physical form and gain feedback. This is an important step in creating new products because through trial and error the best possible solutions can be developed. The goal is to start with a low fidelity version of the intended idea and improve it over time. These tasks are based on the previous levels and tie them all together. Here in this level the team members will study a prototyping method by themselves and put their new knowledge into practical use as well as trying to figure out a suitable medium for the task in hand. We will be concentrating on paper prototyping because it's more executable online than a model prototype, for example. Students can lean on the materials provided or do their own personal research. After individual research the teacher should give a review of the subject as well to ensure mutual understanding.

g. The group should discuss if the solution is feasible, and if so, determine how to test and assess it.
h. The group should identify what kind of information is needed to verify the efficiency of the proposed solution and how to collect that data to prove it.
i. To test the solution, the participants should determine the frequency of data collection and subsequently collect it using the predefined moments and tools.
j. Following, all data collected by each individual should be gathered and discussed in a team.
k. After discussing in group, decide if it is necessary to change some parameters to the test and to the data collection process.
l. The last step is to present the choice made for the chosen solution, in terms of food waste, in an online presentation.

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The greenhouse effect

Name of the learning sheet

The greenhouse effect

Topic (keywords)

Climat change

Introduction

The greenhouse effect is a process that occurs when energy from a planet's host star goes through its atmosphere and warms the planet's surface, but the atmosphere prevents the heat from returning directly to space, resulting in a warmer planet. Light arriving from our Sun passes through Earth's atmosphere and warms its surface. The warmed surface then radiates heat, which is absorbed by greenhouse gases such as carbon dioxide. Without the natural greenhouse effect, Earth's average temperature would be well below freezing. Current human-caused increases in greenhouse gases trap greater amounts of heat, causing the Earth to grow warmer over time.

Description of the activity

Context

The greenhouse effect is a natural process that occurs when an excess amount of greenhouse gases are emitted into the environment and causes the Earth’s surface to warm. During this activity, we will discuss how climate change is directly influenced by the behavior of each individual citizen within a given region.

Learning goals

The learning goals of this activity are to get to know the greenhouse effect and the problem of climate change.

To get a better understanding of the greenhouse effect.

To use brainstorming and research to understand the problem core.

To use design thinking methodologies for a deeper understanding of the problem.

To use innovative thinking to provide new and better solutions.

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To create prototypes of ideas.

To test prototypes.

To improve prototypes according to the results of testing sessions and feedback.

To work in teams on a joint goal.

To give and receive feedback.

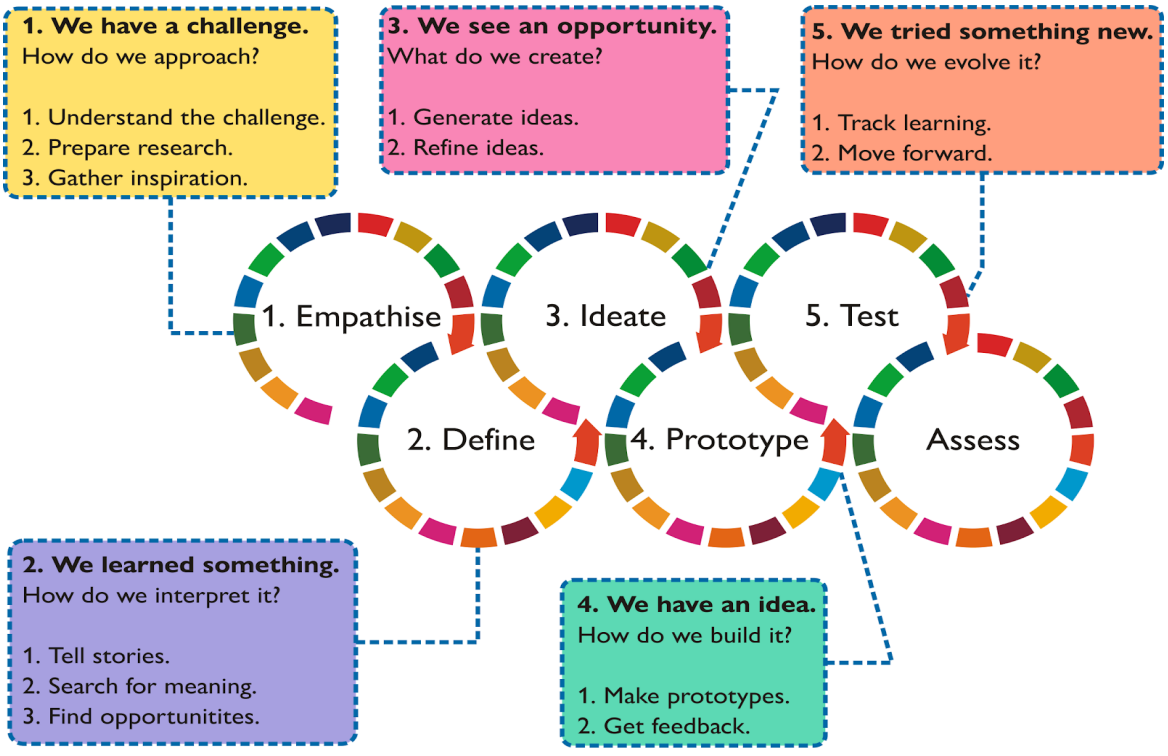
Learning objectives and outcome

After completing this activity, the students will have a better understanding of the greenhouse effect and the problem of the climate change. They have gone through the design thinking process and provided new ideas with brainstorming sessions. They have provided new solutions and improvements to the existing solutions. They have learned how to cooperate in teams and discuss in groups in order to achieve a common goal.

Core concepts

Climate change

Class activity



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1. EMPATHY

First level of the Design Thinking process is empathy. In this step we will get to know the situation about climate change, and especially the greenhouse effect. Then, they will complete a small bonding task about them with the other members of the activity. Students will share their viewpoint and thoughts with the rest of their team. The task's objectives are to discover your personal responsibilities, assess your flexibility, be creative, encourage empathy, teamwork and understanding. The level contains additional materials that can be relied on to help with the process.

i. The group will read the text in the resource link about greenhouse effect;
j. The group will read the text in the resource link about proposed cases;
k. The group will do a further autonomous research about the topic and present what they found by including it the canvas (its preferable to think local);
l. The group will later organize all the information gathered.

2. DEFINE

Second level of the Design Thinking process is called „Define". Here we need to develop further understanding of why things are the way they are and identify the problematic parts. This is the level where students will engage in their own research. By using the previous knowledge from the first level and by combining it with their own research combining it with their own research students will develop their own opinions on greenhouse effect. Define level is important for providing a basis for solutions developed in the next level. While defining, problems can be approached by „How might we solve this?" question to gain more insight and help with the Design Thinking process.

c. Each participant will create a statement for a greenhouse effect related problem and identify all the constraints related to it.

3. IDEATE

„Ideate" is the level where new ideas are generated and possible solutions explored for the problem in hand. Here, brainstorming could be implemented and students should be provided with guidance in brainstorming strategies. Additionally they should be reminded and encouraged that while brainstorming, quantity is more important than quality so it is important to be non-judgemental, to be open to different ideas and let imagination run free. This reminder could also help to avoid reproaching among students. The level provides

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supportive thematic materials for inspiration and encouragement which should be studied before engaging with the task. The task requires the students to work together as a team and come up with a lot of different ideas– the more ideas the better.
They will discuss as a group about possible ideas for solutions for your problem statement, they are supposed to build on each others' ideas and not make hasty judgments.

c. In the end, after discussing to achieve a consensus about the solution among all the ideas, they are supposed to highlight the selected solution.

4. PROTOTYPE

Prototyping phase allows you to get ideas into physical form and gain feedback. This is an important step in creating new products because through trial and error the best possible solutions can be developed. The goal is to start with a low fidelity version of the intended idea and improve it over time. These tasks are based on the previous levels and tie them all together. Here in this level the team members will study a prototyping method by themselves and put their new knowledge into practical use as well as trying to figure out a suitable medium for the task in hand. We will be concentrating on paper prototyping because it's more executable online than a model prototype, for example. Students can lean on the materials provided or do their own personal research. After individual research the teacher should give a review of the subject as well to ensure mutual understanding.

m. The group should discuss if the solution is feasible, and if so, determine how to test and assess it.
n. The group should identify what kind of information is needed to verify the efficiency of the proposed solution and how to collect that data to prove it.
o. To test the solution, the participants should determine the frequency of data collection and subsequently collect it using the predefined moments and tools.
p. Following, all data collected by each individual should be gathered and discussed in a team.
q. After discussing in group, decide if it is necessary to change some parameters to the test and to the data collection process.
r. The last step is to present the choice made for the chosen solution, in terms of greenhouse effect, in an online presentation.

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