CLIL UNITS

TECHNOLOGY

Modules to enhance students' language and social competences in Technology!

Intercultural Competences in Vocational Training. Transnational Strategic Partnership 2015-1-DE02-KA202-002520

Co-funded by the Erasmus+ Programme of the European Union

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Czech Republic Soukromá podřipská střední odborná škola a střední odborné učiliště o.p.s. (SPSOS), Roudnice

Published by: ICVET   **http://icvet.epa.edu.pt/**

Acknowledgements

Authors' Acknowledgements

We would like to thank all the partners, members of companies, staff, teachers and students who have contributed their skills and efforts to producing this handbook. Thanks for their support and patience. We would also like to thank those institutions who piloted the manuscript, and whose comments and feedback were invaluable in the production of the book.

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CLIL UNITS (Content and Language Integrated Learning)

INTRODUCTION

In the EU, content and language integrated learning (CLIL) is a modern concept that is interpreted and implemented differently; some countries apply the concept more whereas others do it less, therefore some countries are more experienced whereas others are still improving.

One of the aims of this project is to create a CLIL module since it has been noticed that the study of English in different learning contexts is at the heart of the development of interculturality.

The intercultural approach of CLIL units, as they are described in this module, is a step forward in globalizing the techniques of integrating diversity in the teaching process. The partners in the project created CLIL units thus offering a wide range of resources that lie at the basis of building a true CLIL network among teachers willing to embrace change, to be creative and apply what they had learned in a variety of professional and social contexts.

The CLIL units are intended to develop a cognitive and cultural space that would facilitate innovative and flexible learning, build a creative and communicative environment for teachers and pupils, help develop cultural competences and openness towards Europe.

The idea is not to focus on either the content or the language, but to combine both of them. Teachers who approach the CLIL teaching technique should develop lessons in which pupils can access ideas, notions, concepts to develop their knowledge and use the vocabulary specific to the subject being taught. The activities in CLIL lessons should be centered both on the reception and understanding of notions and concepts as well as on communication by delivering messages in a foreign language. Pupils should become involved in the lesson because acquisition of knowledge will take place during their interaction with others. Thus the role of CLIL teachers is to provide pupils with methods of interaction in a foreign language on different topics. Successful learning of the content is closely related to language, which must be focused on in CLIL since the foreign language is not entirely mastered.

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Integrating content and language cannot be achieved in teaching if pupils answer specific questions from the teacher, but by using techniques that involve pupils in independent research and study that encourage pupil-pupil interaction rather than pupil-teacher interaction. When pupils begin to share information, to answer each other's questions and to discuss, only then does communication learning that reinforces understanding and helps build general knowledge take place.

A very good teaching method for CLIL lessons includes project-based work, which consists of solving real-life problems through tasks that involve communication among pupils, individual study and presentations in front of the class. Communication in class should be organized in such a way that pupils understand concepts and phenomena by exchanging information. If the new concepts are introduced in an attractive way and they are understood by pupils, then this also helps improve foreign language skills at the same time with knowledge of the subject matter taught.

All CLIL teaching procedures are chosen based on the subject taught, and the selection of materials is in accordance with the objectives of the lesson. Thus, we will have different CLIL approaches, depending on the type of subject taught. For humanities and social subjects, a language closer to the everyday one will be used and communication will be mostly verbal, giving opportunities for debate. In scientific and technical subjects, in which language is somewhat standardized, the words used have clear meanings without leaving room for verbal speculation. In this type of subjects there are many symbols, codes, graphs that can be interpreted by pupils, and a real exchange of information can take place. Another category of subjects are those that include artistic and practical activities in which verbal communication is quite low during lessons and can be replaced by lectures or demonstrations.

CLIL lessons emphasize verbal communication in order to develop language skills, but depending on the type of subject matter taught, it can play different roles within the teaching techniques.

The activities used in CLIL are those that facilitate learning, so their choice is very important. Thus, we encounter activities that will lead to language exercises, gaining a specific vocabulary, and more complex activities, such as tasks in a project which are specific to the subject taught and require pupils to use already acquired knowledge, to think in order to get

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to a certain result, all these by using the language. Many activities used in CLIL can be found in this paper under the heading 'Worksheets' that accompany CLIL lesson plans for different subjects.

The role of teachers in implementing CLIL lessons is to keep the focus on 3 levels: language, content and learning skills. They will need to develop a language specific to the subject matter, to teach pupils how to work with authentic materials in order to anchor them in everyday life, and to distinguish between content errors and language errors in order to motivate students to communicate in a foreign language and not stop them from expressing themselves freely. Teachers who work with CLIL should also give higher importance to constructive feedback focused on what the pupils involved in various CLIL activities do, become aware of the fact that errors are part of the learning process and alternate content teaching techniques with those that develop thinking or language skills.

A specific aspect of CLIL is the assessment that should cover both content and language, focusing on all aspects of communication used in the lesson. A basic principle in CLIL is text comprehension, which is monitored through specific strategies - individual observation sheets, worksheets with pupils' feedback - and language accuracy that can be achieved by allowing enough time to correct pupils' errors.

In CLIL assessment, it is desirable to have activities that make use of the pupils' creativity in addition to the tools that render the degree of text comprehension.

In the following chapter the modules implemented and revised during the project and applied especially during the intercultural exchanges of the project are presented. All the modules were designed by taking into consideration the subject matter taught as well as the multicultural aspect of the target group and the school characteristics where the mobility-learning activity took place. The planning of the CLIL units is simple and clear so that any teacher willing to implement them could use the existing ones or change and adapt them to match their school characteristics, subject taught, target group and lesson objectives. A similar structure has been preserved throughout the planning of the CLIL units, which gives homogeneity to the present paper and simplifies understanding for those who wish to use this material for didactic and innovative purposes.

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c. Technology

Unit Title: Technical solutions for daily problems given by computer.

By Thomas Müller, OSZ LAUSITZ

Topic: Small technical solutions by programming with the raspberry pi

Language: English

Language Level B1 / B2

Target students: Secondary school (ages from 16years)

Time: 4 hours

Aims:

- to learn new words/expressions in English like Operating system, single board computer, power supply, resistor, circuit, transistor, capacitor, diode, display, connectivity cable, direct voltage, alternating voltage,
- to seek information about the raspberry pi using various sources of information
- to communicate using words and expressions related to computer especially raspberry pi in order to:
  - o identify the parts of the pi and their meaning
  - o analyze the possibilities given using the pi
- to cooperate successfully with peers

Final product: *A presentation of an self-built technical solution/ project using the pi.*

Methodology, classroom activities: (some examples)

- ☑ teacher's speech
- ☑ group work
- ☑ pairwork
- ☑ individual activities
- ☑ internet research

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☑ warm up

☑ mutimedia

Assessment tools: CLIL analytic grid

Documents and materials : presentation, worksheets

Description of activities

Students work	Methods and resources	Assessment
Lesson 1		
Introducing the topic raspberry pi, Computer	Teacher's speech	Not all the students did understand the language, but those got help from English teacher.
Reflecting the knowledge of the students about the topic of raspberry pi.	Group work Worksheet 1	They haven't ever heard about raspberry pi before, but they knew a lot of things connected to the computer. It would be better to start with a text or an internet research to the topic to activate them in a better way.
Discourse of the german students about their school and the raspberry pi.	Students speech, listening and understanding as individual activity.	The students were listening carefully to the discourse. There were some questions they asked after discourse. The discourse of students showed that they were well prepared.
Working on worksheet 2 - searching for translations of unknown words, asking for the correct writing of unknown words.	Group work Worksheet 2	Mostly there haven't been unknown words for the students. Maybe they didn't write words, because they didn't understand or

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Students work	Methods and resources	Assessment
		knew the writing or spelling.
Sharing of the results	Class activity	It was not easy for the students to present their results in front of the class, but in every group was mainly one person who was enough self confident to do that. Some phrases has been iterated often.
Worksheet 3 – new words, phrases sentences.	Individual activities Worksheet 3	The majority of students really learnt some new words. In the test many of them wrote down 6 until 10 new words. In the second part most of them had been able to write 5 to 10 sentences. Only less of them did it very well. One or two students couldn't write one useful sentence.
Lesson 2		
Warming up		
What do I know from the last lesson	Individual activity	
Working on worksheet 4	Group activity	

Worksheet 1: Build groups of three students. Write down 10 words/expressions associated with the Raspberry PI or the topic computer.

word/ expression	Translation

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Write down 10 sentences associated with the raspberry PI or the topic computer. You can also disclose your expectations to the topic/ lessons about Raspberry PI.

Worksheet 2" Listen to the following presentation and write down unknown words in a word list.

word/ expression	meaning in my language

- **Search for the meaning of the words in wordbook or translate with your mobile. Save your result on a flip chart paper. Ask the lecturers the questions occurring during the presentation.**

- **Present your results shortly in front of the audience.**

Worksheet 3: Write down 10 words/expressions associated with the Raspberry PI or the topic computer.

word/ expression	Translation(IT/ RO/ DE)

Write down 10 sentences associated with the raspberry PI or the topic computer.

Worksheet 4: Fill in the missing words.

Cloze –The Raspberry Pi

The Raspberry Pi is a low cost, **credit-card sized** _____ that plugs into a computer

monitor or TV, and uses a standard _____and_____. It is a capable little device

that _____people of all ages to explore computing, and to learn how to _____in

languages like Scratch and_____. It's capable of doing everything you'd expect a

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desktop computer to do, from _____ the internet and playing _____ video, to making _____, word-processing, and playing games.

What's more, the _____ Pi has the ability to interact with the _____ world, and has been used in a wide _____ of digital maker projects, from music machines and parent to weather stations and tweeting birdhouses with _____ cameras. We want to see the Raspberry Pi being used by kids all over the world to learn _____ and understand how computers work.

Use the following words and phrases.

> **computer,** to program, spreadsheets, Raspberry, array, enables, mouse, Python, program, high-definition, keyboard, browsing, outside, detectors

1. Write down some pros and contras of raspberry pi on your own.

2. Speak/ discuss in your group five minutes about Raspberry PI and his opportunities, problems and benefits.

3. There are many possibilities to work with the raspberry pi. Speak in your group about projects with the pi you could imagine to do. Choose one of your projects your group would like to do with the pi. Make a plan for doing this in your group.

4. Introduce your idea in front of the class.

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Unit Title: Unconventional energy sources

By Anca Petriuc, Mircea Apahidean & Raluca Tehei, COLEGIUL TECHNIC ENERGETIC

Topic: Clean energy

Subject area : Science and cross-curricular: technology, chemistry, geography, ecology

Language : English

Language Level   B1   /   B2

Target students : Secondary school (ages 16-17)

Time : 8 hours

Aims:

- To learn new words/expressions in English like *protecting, preserving, solar energy, inverter, generator, turbine, tank, device, alternative current, direct current, wind energy, geothermal energy, wave/tide energy, conductor, isolator;*

- to list the factors of pollution in the atmosphere, water and soil;

- to seek information on a given topic using various sources of information;
- to analyze the importance of renewable energy;
- to communicate using words and expressions related to environment and clean energy in order to:
    o analyze the role of the power plant components
    o design and prepare presentation about the importance of producing clean energy;
- to successfully cooperate with peers.

Final product : PPT presentation about clean energy, Journal with renewable energy and power plant components

Methodology, classroom activities:

☑ teacher's speech

☑ group work

☑ pairwork

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☑   individual activities

☑   internet research

☑   mutimedia

Assessment tools: worksheets, group portfolios, self-evaluation paper

Documents and materials

- dictionary, magazines

- worksheets 1,2,3,4,5,6,7,8,9,10

- images/movies with parts of the power plant

- PPT presentation with renewable sources of energy

- Printer, computer, Internet connection

- Whiteboard, flipchart, paper

Description of activities

Students work	Methods and resources	Assessment
Preparatory activities		
Class is divided into groups of four students by criteria established by the teacher. During the entire ~~period~~ unit, students have to search the Internet, pictures, magazines about the clean energy. Information may be in English or Romanian	- Internet, photos, images, movies - individual work, in pairs or in group, at home or in classroom all the time	- Each group has a portfolio where they bring all the materials found or made by them selves.
Lesson 1: Solar energy		
Brainstorming: each student writes something about the sun. After they discuss in pairs and they correct each other's words.	- paper - individual activity > 5 minutes	-Each student reads their classmates' expressions. -Self-correction, by comparison with the classmates.

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Group work: the students are shown a short movie in English about solar energy. They have to sum it up in a few short sentences and underline the key words.	- movie about solar energy - paper - group work >15 minutes	- They read what they have written - Students from another groups correct peers' text. - 5 minutes
Students receive a **journal** where they have to write 4 sentences on the first topic proposed (worksheet 1) *Write 4 sentences about solar energy*	- **journal** (worksheet 1) - individual activity >15 minutes	- Direct observation - The students write in the journal
Students exchange journals with a classmate and they have to correct the sentences using a dictionary and computer with Internet connection.	- journal (worksheet 1) - activity in pairs - 10 minutes	- Direct observation - The students read the correction made by the others.
Lesson 2: Producing solar energy		
Short presentation about a solar power plant. The students watch the presentation and then they discuss in groups and decide what part of the solar power plant is the most important from their point of view.	- group work - 10 minutes	- Direct observation -The other students listen and correct pronunciation.
Using the computer with Internet connection the students working in group have to: - identify the components of the solar power plant: - draw the elements and the connection between them (on the paper)	- group work - paper, colour pencils, markers - computer (Internet) > 30 minutes	- Direct observation

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Students fill in the journal on topics 2 and 3: *General function of the solar power plant* *The role of the components of the solar power plant* Students exchange journals with a classmates and correct the text at home using the dictionary.	- journal (worksheet 1) - individual activity >10 minutes	- Direct observation - The students write in the journal
Lesson 3: Wind energy		
The students have to make a spider web about wind. .After they discuss in pairs, they correct each other's words.	- paper - individual activity > 5 minutes	- Each student reads their classmates' expressions . - Self-correction, by comparison with the classmates.
Group work: the students are shown a short movie in English about the wind energy. They have to sum it up in a few short sentences and underline the key words.	- movie about wind energy - paper - group work >15 minutes	- They read what they write - Students from the other groups can correct their text. - 5 minutes
Students have to write 4 sentences in the journal on topic 4 proposed there. (worksheet 1) *Write 4 sentences about wind energy*	-journal (worksheet 1) - individual activity > 15 minutes	- Direct observation - The students write on the journal
Students exchange journals with a classmates and they have to correct the sentences using the dictionary and computer with Internet connection	- journal (worksheet 1) - activity in pairs > 10 minutes	- Direct observation

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		- The students read correction made by the others.
Lesson 4 : Producing wind energy		
Short presentation about the wind power plant. The students watch the presentation and then they discuss in groups and decide what part of the wind power plant is the most important from their point of view.	- group work - 10 minutes	- Direct observation - The other students listen and correct pronunciation.
Using the computer with Internet connection the students working in group have to: - identify the components of the wind power plant: - draw the elements and the connection between them (on paper)	- group work - paper, colour pencils, markers - computer (Internet) >30 minutes	- Direct observation
Students fill in the journal on topics 5 and 6: *General function of the wind power plant* *The role of the components of the wind power plant* Students exchange journals with a classmates and correct the text at home using the dictionary.	- journal (worksheet 1) - individual activity >10 minutes	- Direct observation - The students write on the journal
Lesson 5: Geothermal energy		
The teacher announces the subject "Geothermal energy" and, individually, the students have to find on the web pages information about: - what geothermal energy means	- computer (Internet connection) - whiteboard, markers - individual/ group activity	- Direct observation - Each group has to present their materials (5 min) - The other students listen and correct pronunciation.

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- how a geothermal power plant is constructed - where one can find this kind of power plant. Then they have to discuss about all these things in groups and prepare an oral presentation and write a few key words on the whiteboard.	> 35 minutes	
Students fill in the journal on topics 7, 8 and 9 *Write 4 sentences about geothermal energy* *General function of geothermal power plant* *The role of the components of the geothermal power plant* Students exchange their journal with their classmates' and correct the text at home using the dictionary.	- journal (worksheet 1) - individual activity > 10 minutes	- Direct observation -The students write on the journal
Lesson 6 : Wave and tide energy		
Brainstorming: What do we know about waves and tide?	- 5 minutes	- The students express opinions
Group work : The students watch two short movies about wave energy and tide energy. Then they have to discuss in groups and prepare an oral presentation and write a few key words on the whiteboard	- group activity - computer (Internet connection) - whiteboard, markers > 30 minutes	- Direct observation - Each group has to present their materials (5 min) -The other students listen and correct pronunciation.
Students fill in the journal on topics 10, 11 and 12 *Write 4 sentences about wave/tide energy* *General function of wave/tide power plant* *The role of the components of the wave/tide power plant*	- journal (worksheet 1) - individual activity > 10 minutes	- Direct observation - The students write on the journal

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Students exchange their journal with a classmates' and correct the text at home using the dictionary.		
Lesson 7: Clean energy - presentation		
Students make a spider web about the clean energy.	- Whole class - whiteboard, markers > 5 minutes	- Direct observation
Group work: The students use information found about clean energy and prepare a presentation - advantages and disadvantages of clean energy - solar energy - wind energy - geothermal energy - wave/tide energy - conclusions	- group work - computer (Internet connection) >45 minutes	- Discussions and answer to all questions
Lesson 8: Clean energy - presentation		
Each group has to share on the video projector their "Clean energy presentation". The other students look at the presentation and put questions or make comments.	- group work - video projector, computer > 35 minutes	- Direct observation - Each group has to present their materials.
Individually they have to fill in the self evaluation paper (worksheet 2)	- individual activity - worksheet 2 > 15 minutes	- Self-correction looking into the journal. -Students have to mark the number of words and sentences they learned. They analyse and evaluate progress during the activity of the unit.

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WORKSHEET 1

JOURNAL OF RENEWABLE ENERGY

No	Topic	Correction of the topic
1	Write 4 sentences about **solar energy** (underline advantages and disadvantages) ……………………………………………. ……………………………………………..	
2.	General function of solar power plant …………………………………………. ………………………………………….	
3.	The role of the components into a solar power plant.	
4.	Write 4 sentences about **wind energy** (underline advantages and disadvantages) ……………………………………………. …………………………………………..	
5.	General function of wind power plant …………………………………………. ………………………………………….	
6.	The role of the components into a wind power plant.	
7.	Write 4 sentences about **geothermal energy** (underline advantages and disadvantages) …………………………………………….	

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	…………………………………………..	
8.	General function of geothermal power plant. …………………………………………. ………………………………………….	
9.	The role of the components into a geothermal power plant.	
10.	Write 4 sentences about **wave/tide energy** (underline advantages and disadvantages) ……………………………………………. …………………………………………….	
11.	General function of wave/tide power plant. …………………………………………. ………………………………………….	
12.	The role of the components into a wave/tide power plant.	

Worksheet 2: Self – evaluation paper

1. **How many words/expressions in English do you know related to the …….**

2. **How many sentences you write on the journal on topic 1,4, 7 and10 (Look in the journal and fill in the table).**

	Totally correct	Partial correct	Incorrect
Between 1 and 4 sentences	2	1	-2
Between 5 and 8 sentences	4	2	-4
Between 9 and 12 sentences	6	3	-6
Between 13 and 16 sentences	8	4	-8

Evaluation 1:

-If you remember less than 20 words/expression   2p

-If you remember between 21 and 30 words/expressions 4p

-If you remember more than 31 word/expressions 6p

Evaluation 2:

Your score is: Total1 + Total2 =

Unit Title: Multimedia presentation

By Richard Červený, SPSOS ROUDNICE

Topic: How to prepare a proper presentation and how to present it

Language: English

Language Level   B1 / B2

Target students: Secondary school (15 - 19 years)

Time: 4 hours

Aims:

- to learn new words/expressions in English (or other foreign language) related to the topic of the presentation
- to cooperate in team (in pair)
- to communicate in English (or other foreign language) using words and expressions related to the topic of the presentation
- to look for information on the internet or elsewhere (books, magazines, other media)
- to use information resources, mainly internet (to seek information)
- to use ICT
- to gain presentation skills
  - Soft skills
    - Speaking in front of the auditorium.

- to work with the amount of information

- to process information

- to differ between presentation and to present
    - Electronic presentation - slides is not enough for proper presentation (keynote).

Description of activities

- Group of students is divided into pairs (students in pair are not from the same country). The goal is to prepare proper electronic presentation as a supporting material for great oral presentation.
    - The teams are determined by the draw.
    - The students should be not from the same country.
    - The team must agree on the topic of their presentation.
        - It is a free choice but teacher should coordinate and confirm the topic.
            - Examples:
                - Sport
                - Culture (music group)
                - History
                - Vocational topic which is common to both of them
                - Famous entrepreneurs, people…
                - …

- Time for presentation is 10 minutes in maximum.

- There is no mandatory number of slides. But the teams must follow the rules of proper presentation.

- The teams should use pictures, video, diagrams and other visual points but in accordance to the rules.

- Both students must present part of the presentation.

- Introduction to the lesson by teacher

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○ Frontal…

○ Presentation about how to present

○ Examples of best practices - good presentation and good keynoters

Tools and equipment

- Projector

- Remote controller (if possible)

- Computers (or laptops, tablets, smartphones)

- Speakers (if necessary)

- Camera or tablet, smartphone to shoot the presentation

- Microphone (if possible)

- Software or application for creating videos

- Printer (if needed)

- Other equipment (if needed)

Final product:

- Electronic presentation - slides (PowerPoint, LibreOffice, Google Slides, Prezi, PDF…) in English as a support material for presenting
- Video of the presentation

Methodology, classroom activities: (some examples)

- ☑ teacher's speech
- ☑ group work
- ☑ pairwork
- ☑ individual activities
- ☑ internet research
- ☑ warm up
- ☑ multimedia

Assessment tools:

- Self assessment paper

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● Assessment by other students or audience - questionnaire

● Teacher

● Evaluation will be done by students themselves using checklist.

Evaluation criteria - CLIL grid

● Time - duration of the presentation

● Body language, eye contact

● Voice effectiveness

● Clear message - core message

● Interest

● Achieving goals

● Readability of slides

● Interactiveness

Description of activities

Students work	Methods and resources	Assessment
Lesson 1		
Icebreaking activities		
Dividing class into pairs by a draw or as a result of icebreaking activities		
Brainstorming: each student writes what does he think about a good presentation. Discussing the rules within the teams and then within whole class. Goal is to collect and define all necessary rules of the proper presentation.		
The team must agree on the topic of their presentation.	Teacher presents the presentation about the proper presentation -	

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It is a free choice but teacher should coordinate and confirm the topic.	summarizing the rules, showing best practices.	
Examples: Sport, Culture (music group), History, Vocational topic which is common to both of them, Famous entrepreneurs, people…	Confirmation of the topic by teacher	
Working on the presentation.		
Structure of the presentation - introduction, main message - core message, expected results, conclusion…	Collecting materials, finding pictures, information etc. Writing slides…	
	Preparing the speech, training…	
	Technical precising...visibility of text on the projector screen. Timing.	
Presenting + video taking	Rehearsal	Teacher evaluation

Worksheet - Tasks for students

Presentation, to present

1.What is a presentation? How would you describe it?

2.What can you use to create a presentation?

3.What are pros and cons of these solutions?

4.Where to make a presentation?

5.When to make a presentation?

6.Are there any rules for creating a presentation?

Any ideas for an effective presentation?

- **Try to find some perfect presentation (keynote) online?**

- **Who is the best keynoter in the World?**

Unit Title: Types of power plants

By Anca Petriuc, Mircea Pahidean, Raluca Tehei, COLEGIUL TECHNIK ENERGETIC& Bayram

Gökbulut, Dr., ISKILIP VOCATIONAL HIGH SCHOOL

Topic: Conversion of solar energy into electric energy

Language: English

Language Level: B1 / B2

Target students: Secondary school (ages 16-18)

Time: 90 minute (1½ hours)

Aims:

- to find information from the video presentation;
- to communicate using words and expressions related to solar energy, in order to:
    - define solar energy / photovoltaic cells / solar power plant
    - analyze the role of solar energy in the context of unconventional energy sources
- to successfully cooperate with peers;
- to make connection between components, on small-scale device that uses solar energy.

Final product: small-scale devices that use solar energy

Methodology, classroom activities:

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- ☑ video presentation

- ☑ brainstorming

- ☑ pair work

- ☑ group work

- ☑ individual activities

- ☑ practice activity

Assessment tools: worksheets, direct observation, self-assessment

Documents and materials

- Worksheets

- Video presentation;

- Video projector

- Computer

- Whiteboard, flipchart, paper, markers, gum fix

- Solar power kit, glue gun, cutting pliers, tin and solder paste

Description of activities

Students work	Methods and resources	Assessment
The class is divided into groups of 4-5 students by the teacher. Brainstorming: group work The students get small pieces of colored papers and markers to write ideas / concepts related to solar energy, in 5 minutes: e.g. clean, renewable, cheap / expensive, etc. Then they go and stick the small colored papers, on the table. The teacher will categorize the ideas.	- pieces of colored paper - markers, gum fix > 10 minutes	- Direct observation
Individual work: worksheet 1	- movie about solar energy	- Direct observation

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The students are looking at a short movie, in English, about solar energy (How a photovoltaic cell works). Then they get worksheet 1(How does a PV cell works), with gaps and some new words related to the topic, which they will use to fill in the blanks. For the self-assessment, teacher will project the right answers for the worksheet 1. The students will note the score on their own worksheet.	- worksheet 1 - individual work > 15 minutes	- Self-assessment
Group work: worksheet 2 The students are looking at a short movie, in English, about solar PV System (How does an On-Grid Solar PV System work) Then they get worksheet 2 with the drawing of a micro solar plant and they will identify it's main elements.	- group work - worksheet 2 > 15 minutes	- Direct observation - they check with the teacher
Practice: Working in the same groups, the students have to build a solar flasher using worksheet 3 (Electrical scheme of the solar flasher). The teacher gives them the kit that they need to use.	- group work - worksheet 3 - kit for making a solar flasher, glue gun, cutting pliers, tin and solder paste >30 minutes	- Direct observation - the functioning of the solar flasher built
Reflexion Students fill in the worksheet 4 (Discussion web). One student from each group will present the worksheet 4 – discussion web and stick it on the table.	- group work > 20 minutes	- Direct observation
EXTRA **Students have to find an application that can make use of the circuit they built.**	- individual/ group activity	- Direct observation

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	>10 minutes	

WORKSHEET 1: HOW DOES A PHOTOVOLTAIC (PV) CELL WORKS
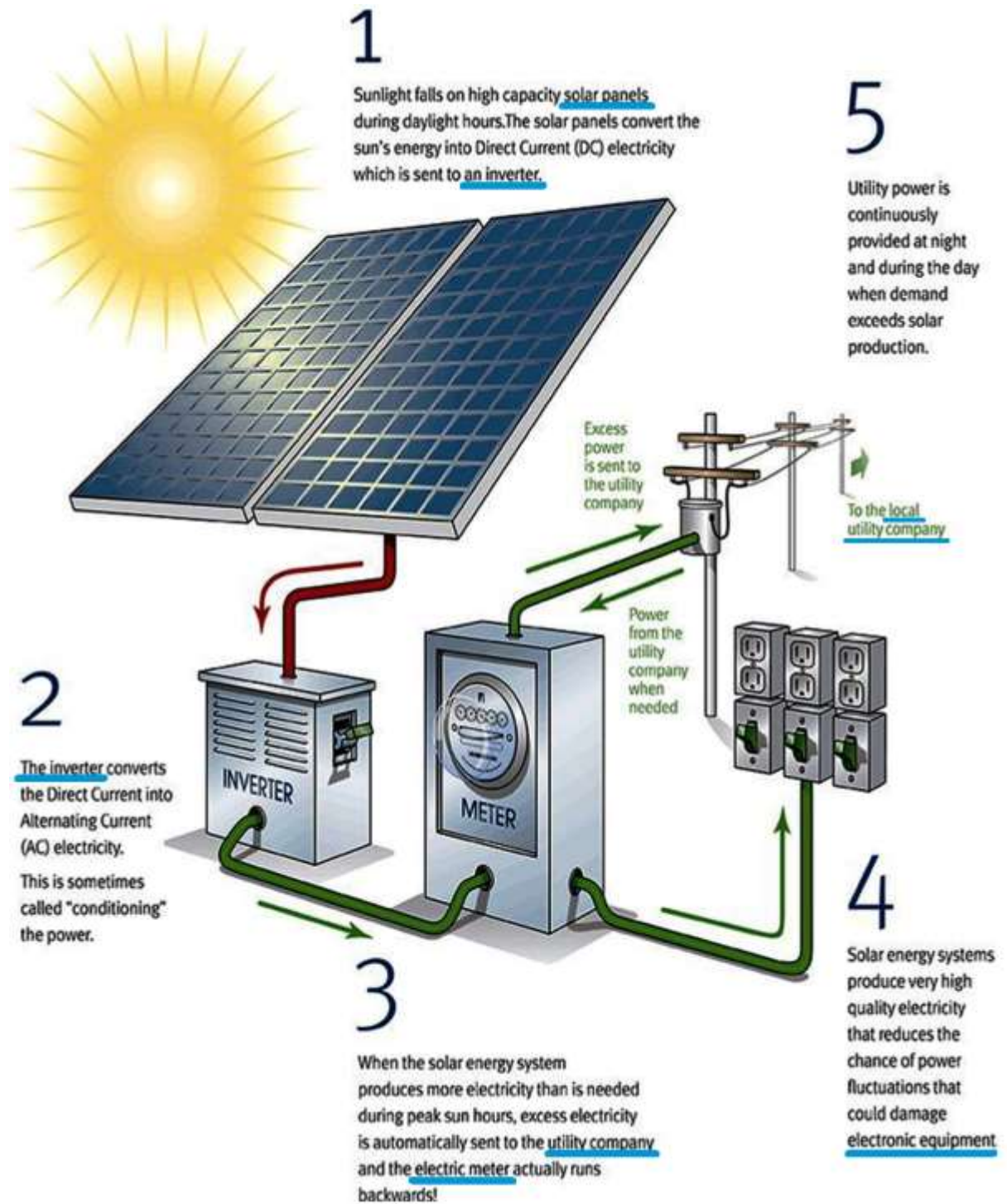
Fill in the blanks with the next words:

- ALTERNATING
- BATTERIES
- INVERTER
- PHOTONS
- SILICON
- SOLAR FARMS
- SUNLIGHT

Photovoltaic cells are designed to turn ……………………. into electricity. They are usually set up in groups or arrays mounted on buildings or in open spaces. The energy produced can be used to run something or can be stored in ……………………………. Arrays for large scale power generation are huge being usually called ………………………….

Each cell has four components: a top layer of glass, a …………………….. wafer, a backing layer and conducting materials (contact). Each side of the wafer is treated differently, thus affecting the behavior of the electrons in the silicon atoms and creating an electrical field at the internal interface. The …………………..…. of the sunlight penetrate the silicon wafer and give the loose electrons enough energy to enable them to move across the electrical field. Thus electricity is created. Many PV installations incorporate a ………………………. in the circuit instead of a battery to transform the voltage to a suitable rate or direct current to ……………………… current.

WORKSHEET 2: THE DRAWING OF A MICRO SOLAR PLANT

2. **Carefully read the diagram and instructions below.**

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1

Sunlight falls on high capacity solar panels during daylight hours.The solar panels convert the sun's energy into Direct Current (DC) electricity which is sent to an inverter.

5

Utility power is continuously provided at night and during the day when demand exceeds solar production.

Excess power is sent to the utility company

To the local utility company

Power from the utility company when needed

2

The inverter converts the Direct Current into Alternating Current (AC) electricity.

This is sometimes called "conditioning" the power.

INVERTER

METER

4

Solar energy systems produce very high quality electricity that reduces the chance of power fluctuations that could damage electronic equipment.

3

When the solar energy system produces more electricity than is needed during peak sun hours, excess electricity is automatically sent to the utility company and the electric meter actually runs backwards!

2. On the separate sheet of paper, using the pictures and the following diagram below, build a solar power plant making the necessary connections, and note each commponent.
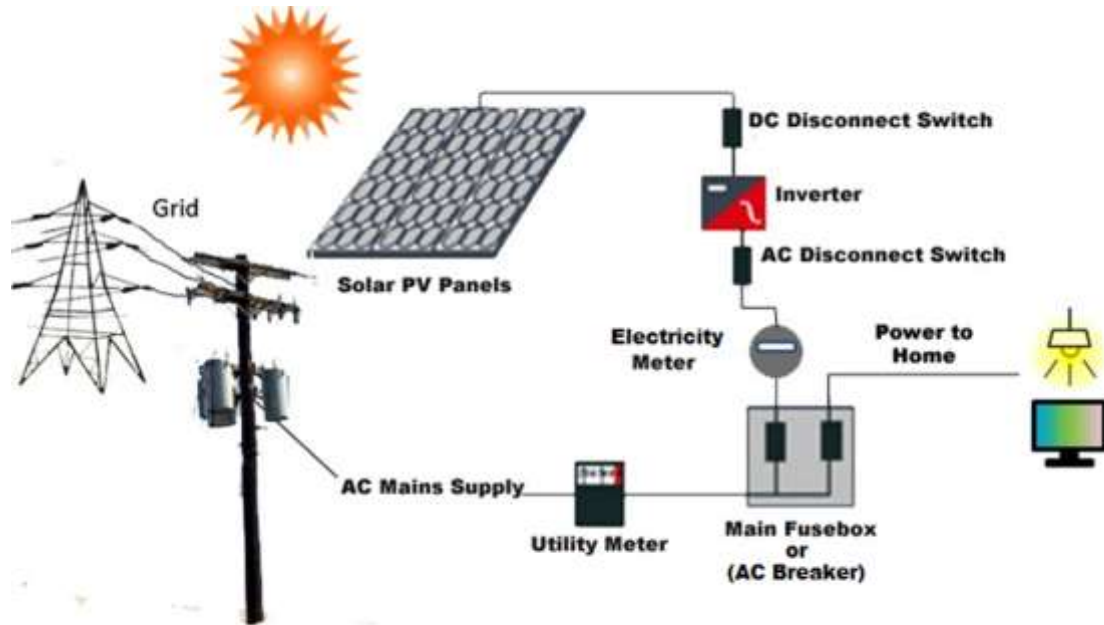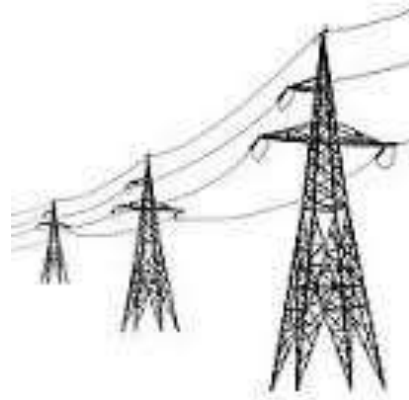
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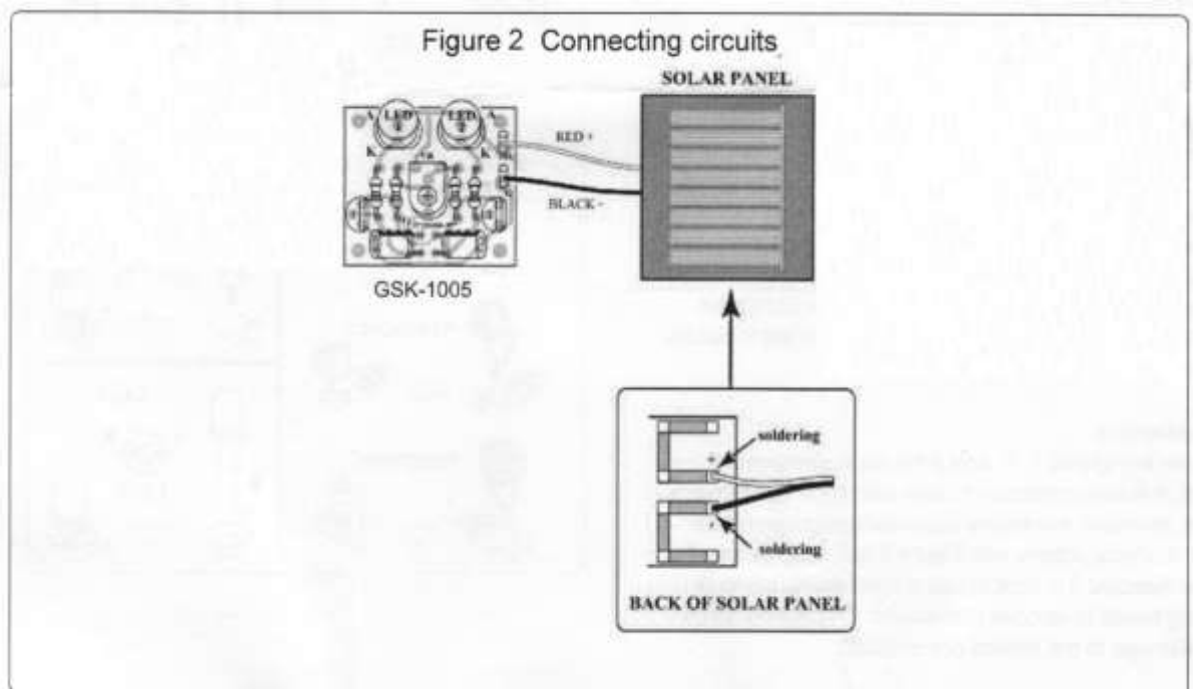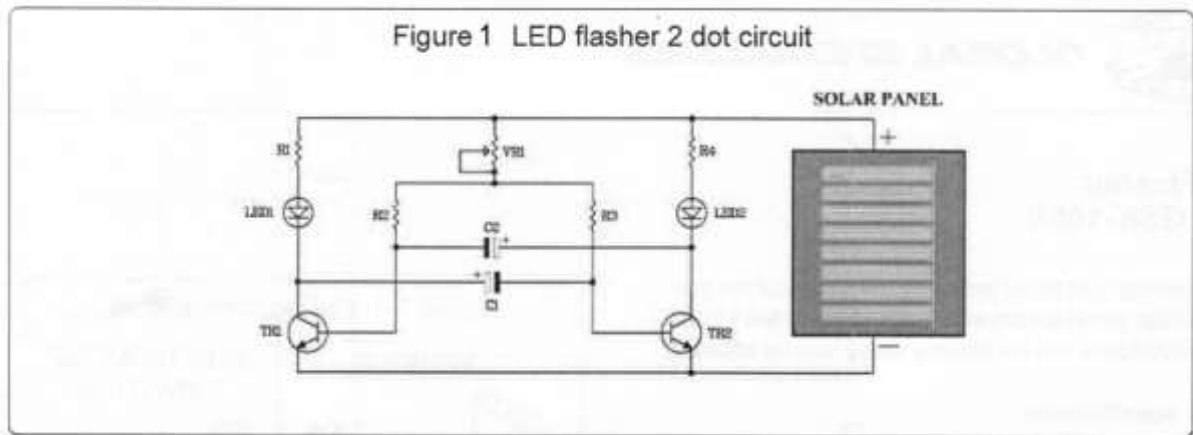2015-1-DE02-KA202-002520

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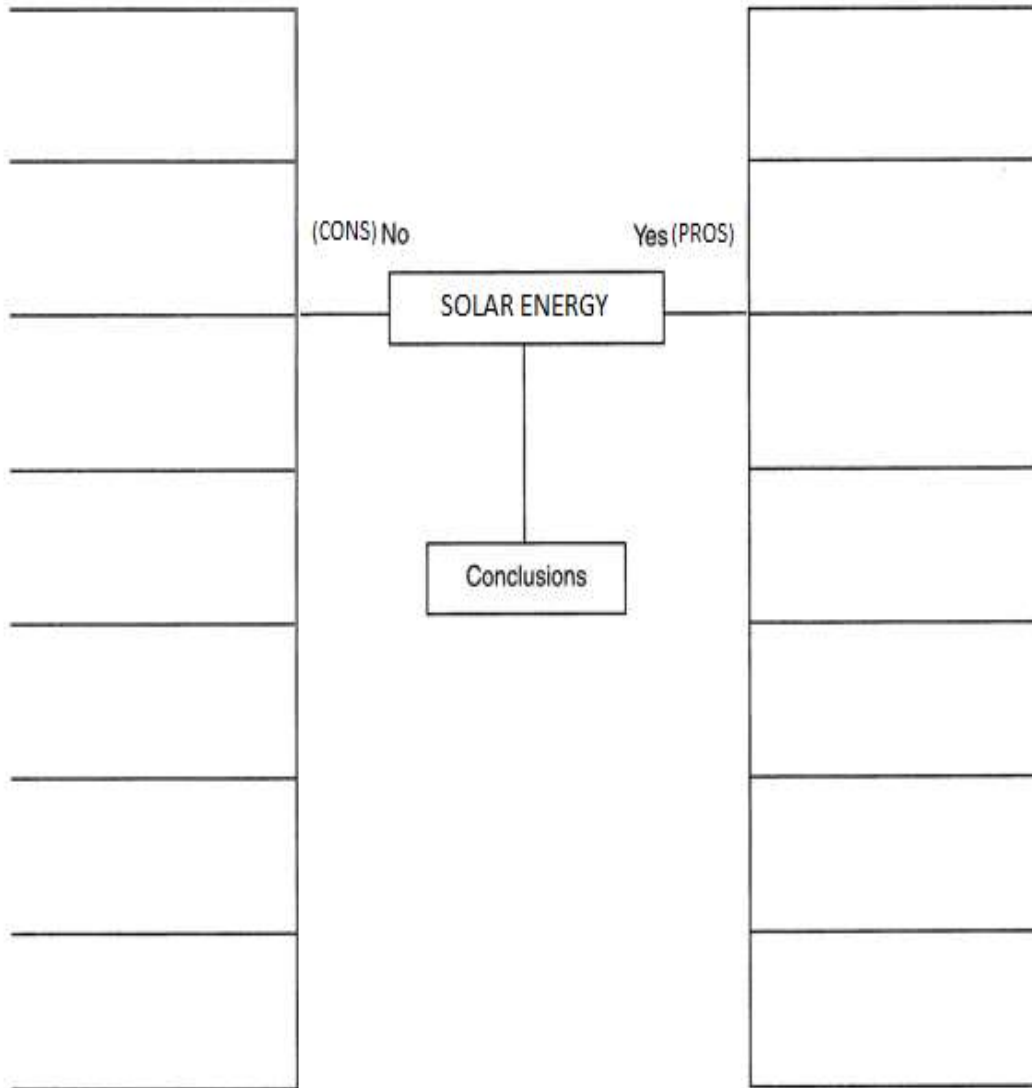
WORKSHEET 3: ELECTRICAL SCHEME OF THE SOLAR FLASHER

Please, build in group a solar flasher using the following electrical scheme:

Figure 1 LED flasher 2 dot circuit

Figure 2 Connecting circuits

WORKSHEET 4: DISCUSSION WEB

Please, discuss in group the pros / cons about solar energy:

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(CONS) No   Yes (PROS)

SOLAR ENERGY

Conclusions

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Participating Schools/Organizations

BFI Oberösterreich: http://www.bfi-ooe.at/bfiweb/

SPSOS, Roudnice: http://www.podripskaskola.cz/

WEQUA GmbH: http://www.wequa.de/

Verein der Freunde und Förderer des Oberstufenzentrums Lausitz e.V.:
http://www.oszlausitz.de/

IHK- Projektgesellschaft: https://www.ihk-projekt.de/

General Lyceum of Lavrio: http://blogs.sch.gr/lyklavri/author/lyklavri/

Formaorienta: http://www.formaorienta.org/

Escola Profissional Aveiro: http://www.epa.edu.pt/

Colegiul Technik Energetic: http://www.energetic-cluj.ro/

Iskilip Vocational High School: http://iskilipeml.meb.k12.tr/

Project number:2015-1-DE02-KA202-002520