



Teacher's name: Johanna Roth

Topic: Study the vocabulary for training about culture (for tourism students)

Aim of lesson: Enhancing field-specific vocabulary in the topic “Culture” and training to express own opinions.

Description: Vocabulary drill with a QR code driven query, returning a written story for the teacher.

Time: 90 minutes

1) Introduction into topic (description of (learning situation) and problem/difficulty/challenge)	Attachments / Remarks
<p><u>Timeframe:</u> 90 minutes → tourism & cooks (exercise 1 & 2)</p> <p><u>Introduction via video:</u> Statement: „Finnish people are supposed to be happy“</p>	<p>Used Apps: Padlet, TaskCards → to cluster</p>
2) Introductory Task(s)	
<p>Question: „What do you think is the reason for that?“</p>	
3) Work phase(s) - individual, tandem and/or group work	
<p>The students receive a QR-code (Link to buzzfeed) → https://www.buzzfeed.com/terripous/finland-facts</p> <p>Content of the article: “16 Facts that perfectly explain why Finland is the happiest country on earth”</p> <p><u>Task 1:</u> The students have to use the article to answer the following questions: 1) Which fact is for you the most important one?</p>	<p>QR-Code, mobile phone</p>





<p>2) Which things in the list are easy for visitors to see if they come to Finland?</p> <p>3) What was missing in the list?</p> <p>4) What makes you happy today? (alternative question: Explain what makes you happy today / in general)</p> <p><u>Task 2:</u></p> <p>1) Design a digital collage with photos (use your mobile device, e.g. photo app, .ppt, keynote...) that show your reasons).</p> <p>2) Be prepared to present your collage to your classmates.</p>	
<p>4) Securing knowledge (checking of results and learning progress) incl. feedback/evaluation (by teacher, classmates, internet)</p>	
<p>1) Open the cluster (TaskCards, padlet...) of the introduction phase and discuss the topics again in the class: „Has something changed your opinion?”</p> <p>2) Completion of the TaskCard, padlet...</p>	





Teacher's name: Dominic Schwartz



Topic: "Two-point controller" (45 Min.)

Aim of lesson: Using the practical example of a defective component-drying oven, the students should understand the possible causes of faults and the mode of operation of a two-point controller.

Description: The students first have to analyze the given circuit. For this purpose they use a simulation tool to get to know the function and also recognize the effects by changing the values of the given resistances. In the second step, they have to evaluate and interpret the results of the measurement. In the third step, they compare the values of the two measurements to each other and write down their discussed results. On the last step, the students have to go back by applying their findings to the initial problem.

Duration: 45 minutes

1) Introduction into topic (description of (learning situation) and problem/difficulty/challenge)	Attachments / Remarks
<p>Appetizer: component-drying oven</p> <p>Problem: The oven heats up only briefly, stops the heating process and immediately starts again with further heating processes.</p> <p>Question: What could have been the problem regarding the initial situation on the worksheet you got at the beginning of the lesson?"</p> <p>Situation:</p> <p>After careful inspection, you discover that the temperature controller of the oven is no longer working correctly.</p>	<p>Media:</p> <ul style="list-style-type: none"> - Own device or school-tablet / device - TaskCards (digital bulletin board) - Multisim (circuit simulation). <p>Circuit diagram (Multisim circuit):</p> <p>https://www.multisim.com/ created circuit</p>





To solve the problem, you must first determine the appropriate controller and the functionality required for it. In the package of the oven, you found the instruction manual with the functional diagram and the electrical circuit of the control system.

On the right side you can see a simplified electrical circuit of the circuit diagram.

2) Introductory Task(s)

Task 1 Work individually:

Open the following link or scan the QR-Code to get access to the TaskCards-Board (use your own device or a school-tablet).

QR-Code
(Link to the
TaskCards-
Board)

Task 2 Partner Work:

Split into groups of max. two students (for Task 1 -> 3).

3) Work phase(s) - individual, tandem and/or group work

Task 3 Work in teams:

Process the work orders (Task 1 → 4) on the TaskCards-Board (note your „First Name“ (Vorname) behind or in front of your answers → see references) (15 Min.).

QR-Code to the Multisim-Simulation

Link: <https://www.multisim.com/content/KLJ5q4KY6jfRKvdnU6WxMt/schmitt-trigger-two-point-controller/open/>

- a) Which type of basic circuit is this - in comparison with already known OPV-circuits? (use for your answers the comment section down below).
- b) What is the function of potentiometer R2 in this circuit? (use for your answers the comment-section down below -> for example: Max & Thomas →).
- c) What would you expect in terms of switching points when the resistance value of the potentiometer R2 is increased or decreased? (use for your answers the comment-section down below).
- d) Open the following link to get to the Multisim-Simulation (a manual for Multisim is on the TaskCard down below).





<p>e) Simulate the circuit for the resistance values of potentiometer R2 for 5kOhm and 10kOhm. Watch the oszillogram (after changing the resistance, the simulation must be restarted). f) Measure the ΔY for both cases (use the cursors C1 & C2 for the measurements). g) Write down the simulation results in the comments-section (for example: Max & Thomas $\rightarrow \Delta Y \rightarrow 5kOhm = \dots / 10kOhm = \dots$).</p> <p>Task 4 Work in teams:</p> <p>Choose one member of your group, who has to present the results from the TaskCards-Board (from Task 1 \rightarrow 3) to the class.</p> <p>a) Compare the values of the two measurements to each other. b) What could have been the problem regarding the initial situation on the worksheet you got at the beginning of the lesson? (Write down in the comments-section \rightarrow for example: Max & Thomas $\rightarrow \dots$)</p>	
<p>4) Securing knowledge (checking of results and learning progress) incl. feedback/evaluation (by teacher, classmates, internet)</p>	
<p>Solution of situation:</p> <p>Securing the measurement results \rightarrow Solution / problem solving (10 Min.)</p> <p>Recourse to control technology (10 Min.):</p> <p>What type of controller could this circuit be? (research online or in the technical book/spreadsheet book) -> Write your answer down in the comments-section)</p> <p>Horizon of expectation:</p> <p>a) Results of the Measurement: $\Delta Y(5k\Omega) = 2,44V / \Delta Y(10k\Omega) = 1,54V$</p>	<p>TaskCard</p>





b) Conclusion: *"The switching thresholds of the controller are too close together, so that the controller starts to oscillate".*

Verification of learning success:

The students were able to successfully complete the required measurement tasks. The feedback showed that the work assignments were formulated uncomplicated for them to understand. They were able to carry out the measurements in the required time and secure their results on the comment-section on the provided TaskCard.

Possible optimization for the lesson:

One way of optimizing the lesson would be to create a separate TaskCard for each group or individual so that the measurement results on access rights remain hidden for the other groups.





Attachments

Worksheet

Learning-Situation:

A component-drying oven (right image) no longer reaches the desired temperature. The oven heats up only briefly, stops the heating process and immediately starts again with further heating processes. You have been instructed by your company to search for the error.

Problem:

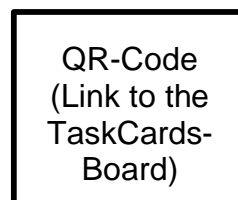
After careful inspection, you discover that the temperature controller of the oven is no longer working correctly.

To solve the problem, you must first determine the appropriate controller and the functionality required for it. In the package of the oven, you found the instruction manual with the functional diagram and the electrical circuit of the control system.

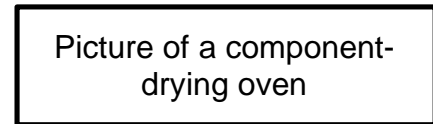
On the right side you can see a simplified electrical circuit of the circuit diagram.

Work Order:

1. Open the following link or scan the QR-Code to get access to the TaskCards-Board (use your own device or a school-tablet):



2. Split into groups of max. two students (for Task 1 → 3).
3. Process the work orders (Task 1 → 4) on the TaskCards-Board (note your „First Name“ (Vorname) behind or in front of your answers see references).
4. Choose one member of your group, who has to present the results from the TaskCards-Board (from Task 1 → 3) to the class.



<https://www.multisim.com/>
| created circuit





If the link on the TaskCards-Board **doesn't work**, scan the following QR-Code to get to the simulation:

QR-Code to
the Multisim-
Simulation

Link: <https://www.multisim.com/content/KLJ5q4KY6jfRKvdnU6WxMt/schmitt-trigger-two-point-controller/open/>



Teacher's name: Ilona Wildemann

Topic: Sustainability (for industrial management assistants)

Aim of lesson: Students know the dimensions of sustainability and can give concrete examples.



Description: Students learn about the three dimensions of sustainability and learn relevant vocabulary. Students design a mind-map in groups with giving concrete examples what (their) companies do concerning sustainability. Students present their results in class.

Duration: 45 minutes

1) Introduction into topic (description of (learning situation) and problem/difficulty/challenge)	Attachments / Remarks
<p>Appetizer: Online-Puzzle with a photo showing the dimensions of sustainability</p> <p>Question: What do you know about sustainability?</p> <p>Situation:</p> <p>You work for an international company.</p> <p>Your boss Sheila wants you to prepare a mind map on the topic the Three Dimensions of Sustainability with concrete examples what companies can do.</p>	<p>https://www.jigsawexplorer.com/</p> <p>Picture 1</p> <p>Text to be put on worksheet or in moodle course</p>
2) Introductory Task(s)	
<p>Task 1 Work individually</p> <p>Scan the codes and learn about the dimensions of sustainability.</p> <p>→ You have 10 minutes time</p>	<p>https://Quizlet.com</p> <p>https://Learningapps.org</p> <p>Clock/Timer: https://www.classroomscreen.com/</p>





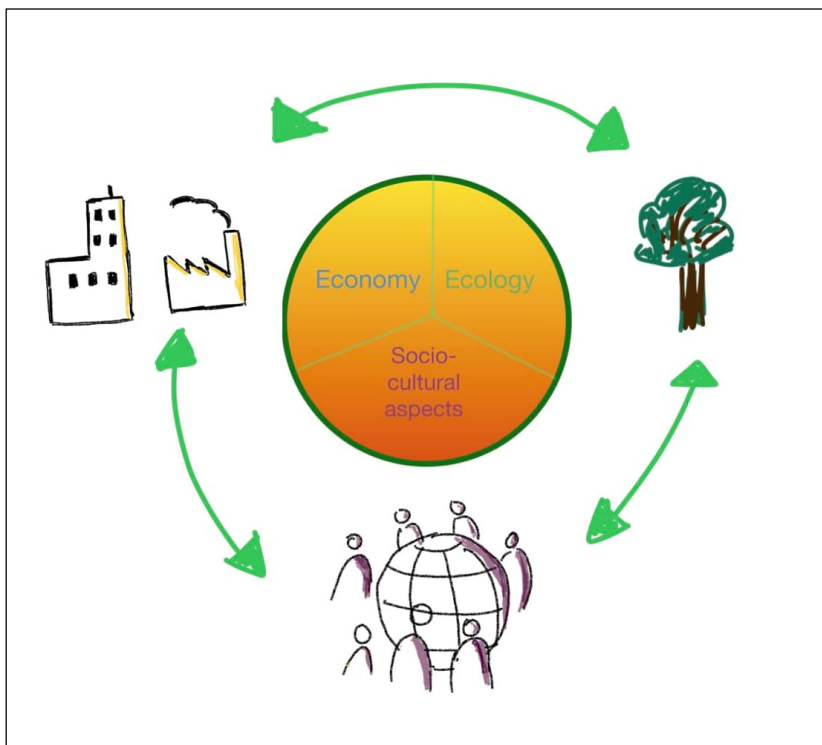
<p>Links:</p> <p>Quizlet Wordlist Sustainability: https://quizlet.com/_bhfmtf?x=1qq&i=5dgo</p> <p>LearningApps: Sustainability: https://learningapps.org/watch?v=psavpeqx322</p>	<p>Wordlist</p> <p>Game content</p>
<p>3) Work phase(s) - individual, tandem and/or group work</p>	
<p>Task 2 Work in teams</p> <ul style="list-style-type: none"> - Design a mind map on the three dimensions of sustainability. Give concrete examples what companies do! - Design a mind map with your own digital device. <p>Task 3 Work in teams</p> <p>Upload your mind map on the digital pin board.</p> <p>→ You have 15 minutes time.</p>	<p>https://map.kits.blog/</p> <p>https://www.taskcards.de/#/home/start</p>
<p>4) Securing knowledge (checking of results and learning progress) incl. feedback/evaluation (by teacher, classmates, internet)</p>	
<p>Solution of situation: Present your mind map in class!</p>	





Attachments

Picture 1



Source: What is sustainability? (o. D.): <https://www.mcgill.ca/sustainability/files/sustainability/what-is-sustainability.pdf>, [online]

Picture: Ilona Wildemann.

Game Content

Content of LearningApp game, created by Ilona Wildemann:

Which aspect belongs to the dimension ecology?

- economic performance
- reduction of pollution
- reduction of debt

Which aspect belongs to the dimension economy?

- promotion of responsible entrepreneurship
- protection of human health
- reduction of pollution

Which aspect belongs to the dimension: socio-cultural aspects?

- fight against poverty
- economic performance
- reduction of debt





Wordlist

Quizlet Wordlist Sustainability: https://quizlet.com/_bhfmtf?x=1qqt&i=5dgo

sustainability	Nachhaltigkeit
sustainable	nachhaltig
climate change	Klimawandel
protection	Schutz
to protect	schützen
ecology	Ökologie
pollution	Verschmutzung
to pollute	verschmutzen
environmentally friendly	umweltfreundlich
natural resources	natürliche Ressourcen
economy	Ökonomie
reduction	Reduzierung
to reduce	reduzieren
to reuse	wiederverwenden
to recycle	recyclen
debt	Schulden
consumption	Konsum, Verbrauch
entrepreneurship	Unternehmertum
assets	Vermögenswerte
economic performance	ökonomische Leistungsfähigkeit
equal rights	Gleichberechtigung
reinforcing inclusion and solidarity	sozialen Zusammenhalt und Solidarität stärken
cultural values	kulturelle Werte
fight against poverty	Armutsbekämpfung
human health	menschliche Gesundheit
education/ training	Bildung/ Ausbildung
equal opportunities	Chancengleichheit
life cycle costs	Lebenszykluskosten
protection of capacity to work and jobs	Sicherung von Erwerbsfähigkeit und Arbeitsplätzen
social cultural aspects	soziokulturelle Aspekte
profit	Gewinn
renewable energies	erneuerbare Energien
fossil fuels	fossile Brennstoffe





Teacher's name: Antti Heikkinen



Topic: Special characters in English (for Aviation mechanics 2nd year students)

Aim of lesson: To learn special characters in English alphabet and to practice using them verbally over the phone or voice messages.

Description: In aviation mechanic duties, as well as in most any jobs requiring specific parts or dealing with shipments or warehousing, knowledge of special characters and symbols is often required. Order numbers, part codes, catalogue numbers, registration numbers or service bulletin or task guides referring to legislation or publications and such often include them. These may often also have to be used over the phone or radio instead of in writing only.

Time: 45 minutes

1) Introduction into topic (description of (learning situation) and problem/difficulty/challenge)	Attachments / Remarks
Introduction and overview on situations where special characters will be required in real life situations; order, parts, or registration numbers.	
2) Introductory Task(s)	
Version 1: - passwords or file paths etc. given over the phone - the alphabet and special letters in English are reviewed by the teacher or pre-arranged presentation e.g. a video - pronunciation of the individual letters/character names, verbally or via audio track/website exercise	Version 1: QR code made available for students to listen to the pronunciation again https://www.deepl.com/
Version 2: Students scan a QR code and individually listen to the alphabet and special letters in English.	Version 2: SOL (headphones required)





<p>3) Work phase(s) - individual, tandem and/or group work</p> <ul style="list-style-type: none"> - All students receive a personal piece of paper (alternatively using a QR code) with an individual message containing a special character sequence (but the messages are numbered) - <p><u>Note:</u> if the number of students is unequal, the teacher may need to be involved. The message is such as could have been left in an audio message from a client/partner in real life and can be adapted to different situations/fields.</p> <ul style="list-style-type: none"> - Each student must then dictate/record their individual message including the character string into their own BYOD device as a voice message (without text recognition). The number of the message is also dictated. ("This was Message number: xy".) - When ready, each student sends its audio message to a neighbor student in the class as instructed by the teacher. Or alternatively, previously randomized partner in the class (via the school's communication/learning platform). - The recipient must listen to the message received and hand-write the message/sequence of characters on paper. - Then the same student dictates his message into the smartphone - with text recognition. 	<p>Mobile phone</p> <p>QR code reader (online scanner, e.g. https://webqr.com/)</p>
<p>4. Securing knowledge (checking of results and learning progress) incl. feedback/evaluation (by teacher, classmates, internet)</p>	
<p>At the end, the students compare the handwritten messages and the messages recognized by the BYOD (speech recognition) with the original message (based on the number)</p>	<p>Mobile phone</p>





Teacher's name: Antti Heikkinen

Topic: Speaking skills enhancement (the lesson can easily be adapted for almost any field and could be an instruction on how to prepare food, use a medical device, etc.)

Aim of lesson: Reduce student stress typically associated making oral examination/oral task videos with real-time speech and performing on video by creating a stop-motion video instead.

Description: Allowing students to work in groups and record the audio after the video is done at a leisurely pace and with a fun setting removed from classroom everyday work. It should provide the students with an experience of succeeding in creating something effective, regardless of their skill level in language, and especially to lower the bar for speaking out in English. The programs used are rather intuitive to use, and no further instruction on their use is given unless requested by a student, to keep it interesting and fresh and allow for the joy of discovery.

Duration: 45 - 60 minutes

1) Introduction into topic (description of (learning situation) and problem/difficulty/challenge)	Attachments / Remarks
<p>In certain situations, you might need to explain usage of tools to new employers, students, and trainees.</p> <p>Furthermore, in many cases it would be effective to have such instructions readily available somewhere as video or pictures and test; learning how to make such videos is a good bonus. It will also be easier to do than performing an oral explanation on live video.</p> <p>Today we will make a stop-motion tool usage instruction video with sound and pictures and try how we can make an effective animation guide video.</p>	<p>mobile smartphone with network access and ability to download and use <i>Stop Motion Studio</i> application</p>





2) Introductory Task(s)

Create groups of max. 3 people and pick a tool or gadget you would like to present!
Write a script how you could describe the usage to someone who doesn't have any idea how the tool is used.

Here are some words and sentence start examples to use in the task:

This is a

This tool is used for....

This is how you use it:

First you....

Select/adjust/turn/move/twist/screw/attach/push/pull/slide/insert...

Hold/squeeze/apply/rotate/bend/touch/release/lock/

sheet of paper and pen

3) Work phase(s) - individual, tandem and/or group work

Once you have drafted out and written down what to say in the group, proceed to take pictures with Stop Motion Studio (Android or iPhone; search the app market for the application.) Only one person in each group needs to install the programme!

You can scan the QR code below to find the app:



Some remarks on the use of the application software:

Mobile phone
QR code reader (for example: Qrafter)





1. To get started, press the big 'plus' sign on the main screen. Start taking the videos. You can focus on targets by clicking directly on the screen.
2. Take enough pictures with small changes. You can slow down the video or freeze individual frames for a longer while in the app, but it is usually best to take plenty of (20 - 50) pictures for a one-minute video nevertheless. For a completely smooth animation you would need 24 pictures for each second of the movie, but for your task the video will run at a much slower pace.
3. Experiment with adding pauses or adjusting the speed of the video and aim to make it at least one minute long to allow for enough room for narration.
4. When narrating, try to talk clearly and understandably; you don't have to sound like a native speaker to create an easy-to-follow sentence. Speak in a normal voice close to the microphone to minimize ambient noises. Each member of your group should speak at least one sentence on the video.

4. Securing knowledge (checking of results and learning progress) incl. feedback/evaluation (by teacher, classmates, internet)

Once you are done, go to the main screen of the app and

- long-press on your video,
- select 'Export' and
- 'save as' and
- save the animation as mp4 video file.

Please send your video result to the teacher as a video file or save it on our cloud where the teacher can access and view it.

We will review the class's results once done.

Mobile phone / Screen



Teacher's name: Arndt Wetzel

Topic: Selecting components for fuel oil storage (for plumbing, heating and air conditioning system mechanics)

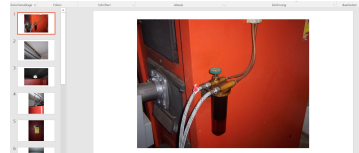


Aim of lesson: The students have the competence to

- name the required components,
- explain the function of the required components,
- show the area of application of the required components.

Description: Based on an existing heating oil storage, the students acquire the competence to select components of the heating oil storage according to current regulations.

Duration: 90 minutes

1) Introduction into topic (description of (learning situation) and problem/difficulty/challenge)	Attachments / Remarks
<p>Appetizer: Presentation showing a learning situation "Starting position Meyer" for the heating oil tank (and integrated QR codes for video, exercise, work assignment).</p> <p>Situation: You work for heating mode XY. Mr Meyer, a customer of your company, has a few questions about installing an oil heating system in an industry building.</p>	 <p>Self made screenshot, Arndt Wetzel</p>



2) Introductory Task(s)

Task 1 Work individually

Watch the learning video and answer the integrated questions. You will then compare your results with your colleagues.

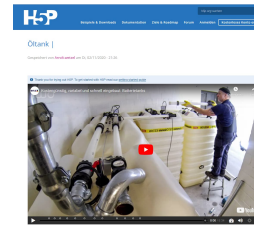
Video with integrated questions: Video from the "Institute for Heat and Oil Technology" with corresponding questions:

1. How many households are supplied with oil heating?
2. What is the lifespan of an oil tank?
3. What problems can occur with old steel tanks?
4. What materials can oil tanks be made of?
5. When can oil tanker renewals take place?
6. Complete the missing word: "Modern tanks have a _____ retention device."
7. What is the purpose of the outer container?
8. What are the sizes of battery tanks?
9. How can the oil tank volume be reduced (decreased)?

Task 2 Work with your seatmate

Exercise: component assignment

LearnigApps: <https://learningapps.org/watch?v=pgg8cuoxk22>



<https://h5p.org/node/721475>





3) Work phase(s) - individual, tandem and/or group work

Task 3 Work in groups of three/four students

Group 1

Filling device - your task:

- Find out more in your work book and in the table book respectively.
- Create a short presentation on your topic: functionality, design type ...
- Edit the corresponding summary.

Filling device:

1. Name the components of a filling device.
2. Enter the storage volume from which a safe and secure connection for filling must be available.
3. Enter the minimum dimensions (diameter) of a filling line (table book).
4. Describe the special features when connecting battery tanks.
5. Describe the piping route to the tank.

Group 2

Ventilation pipe - your task:

- Find out more in your work book and in the table book respectively.
- Create a short presentation on your topic: functionality, design type ...
- Edit the corresponding summary.

Ventilation pipe:

1. Name the two functions of ventilation pipes.

<https://www.zukunftsheizen.de/tank/bauteile-des-heizoeltanks/grenzwertgeber/>

<https://www.zukunftsheizen.de/tank/bauteile-des-heizoeltanks/grenzwertgeber/>





2. Give three regulations for ventilation pipes.
3. Explain the respective reason for the regulations mentioned.
4. Give three regulations for the mouth of the ventilation pipes.
5. Specify the minimum dimensions (diameter) and the minimum distance above the ground.

Group 3

Limit indicator - your task:

- Find out more in your work book.
- Create a short presentation on your topic: functionality, design type ...
- Edit the corresponding summary.

Limit indicator / level limiter:

1. Explain the principle of double security.
2. Describe the overfill protection.
3. Complete the mnemonic:

*It is not _____ to be filled intentionally until _____
by _____!*

4. Explain how the limit indicator works.
5. State the difference between the old and the new type of limit indicator.

<https://www.zukunftsheizen.de/tank/bauteile-des-heizoeltanks/grenzwertgeber/>





Group 4

Level indicator - your task:

- Find out more in your work book and in the table book respectively.
- Create a short presentation on your topic: functionality, design type ...
- Edit the corresponding summary.

Level indicator:

1. Name the task of the level indicator.
2. Enter the calculation of the allowance.
3. State the requirement for omitting a level indicator.
4. Name the four types of level gauges.

Group 5

Extraction device - your task:

- Find out more on the specified page or in the book of tables.
- Create a short presentation on your topic: how it works, how it's built...
- Edit the associated summary.

Extraction devices:

1. Specify the installation position of extraction devices.
2. Name the additionally required built-in part on an extraction device.
3. Explain the reason for the minimum distance of 50 - 100 millimeters between the suction opening and the bottom of the tank.

<https://www.zukunftsheizen.de/tank/bauteile-des-heizoeltanks/fuellstandsanzeiger/>

<https://www.zukunftsheizen.de/tank/bauteile-des-heizoeltanks/entnahmeeinrichtung/>





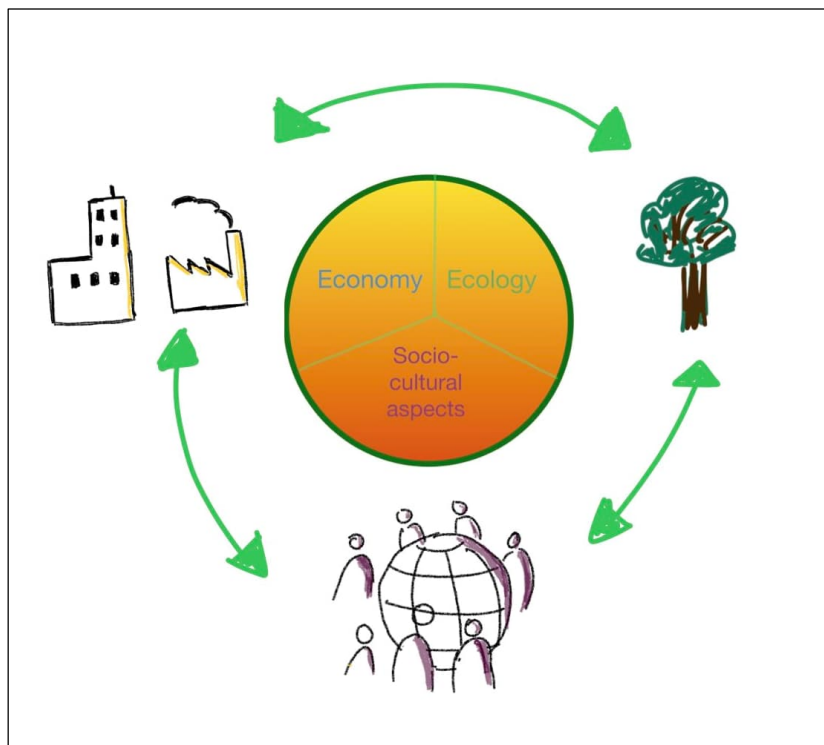
<p>4. Describe how a check valve works.</p> <p>5. Enter the four possible withdrawal types.</p>	
<p>4) Securing knowledge (checking of results and learning progress) incl. feedback/evaluation (by teacher, classmates, internet)</p>	
<p>Solution of situation:</p> <ul style="list-style-type: none"> - Presentation of the group work - Upload the group summaries - Decision on Mr. Meyer's initial situation 	





Attachments

Picture 1



Source: What is sustainability? (o. D.): <https://www.mcgill.ca/sustainability/files/sustainability/what-is-sustainability.pdf>, [online]

Picture: Ilona Wildemann.

Game Content

Content of LearningApp game, created by Ilona Wildemann:

Which aspect belongs to the dimension ecology?

- economic performance
- reduction of pollution
- reduction of debt

Which aspect belongs to the dimension economy?

- promotion of responsible entrepreneurship
- protection of human health
- reduction of pollution

Which aspect belongs to the dimension: socio-cultural aspects?

- fight against poverty
- economic performance
- reduction of debt





Wordlist

Quizlet Wordlist Sustainability: https://quizlet.com/_bhfmtf?x=1qqt&i=5dgo

sustainability	Nachhaltigkeit
sustainable	nachhaltig
climate change	Klimawandel
protection	Schutz
to protect	schützen
ecology	Ökologie
pollution	Verschmutzung
to pollute	verschmutzen
environmentally friendly	umweltfreundlich
natural resources	natürliche Ressourcen
economy	Ökonomie
reduction	Reduzierung
to reduce	reduzieren
to reuse	wiederverwenden
to recycle	recyceln
debt	Schulden
consumption	Konsum, Verbrauch
entrepreneurship	Unternehmertum
assets	Vermögenswerte
economic performance	ökonomische Leistungsfähigkeit
equal rights	Gleichberechtigung
reinforcing inclusion and solidarity	sozialen Zusammenhalt und Solidarität stärken
cultural values	kulturelle Werte
fight against poverty	Armutsbekämpfung
human health	menschliche Gesundheit
education/ training	Bildung/ Ausbildung
equal opportunities	Chancengleichheit
life cycle costs	Lebenszykluskosten
protection of capacity to work and jobs	Sicherung von Erwerbsfähigkeit und Arbeitsplätzen
social cultural aspects	soziokulturelle Aspekte
profit	Gewinn
renewable energies	erneuerbare Energien
fossil fuels	fossile Brennstoffe



Teacher's name: Dominic Schwartz

Topic: "Electric coil on an AC/DC Voltage" (45 Min.)



Aim of lesson: Aim of lesson: Using the practical example of changing an indication light of a rolling gate and the associated functional fault, the students should recognize the differences between the operations of an electric coil on a DC in comparison to an AC voltage.

Description: The students first have to analyze the given circuit. For this purpose they use a simulation tool to get to know the function and also recognize the effects by changing the voltage sources between AC and DC voltage. In the second step, they have to evaluate and interpret the effects on the function of the light in the circuit. In the third step, they compare the results to each other and write them down as a group-answer. On the next step, the students have to go back by applying their results to the initial problem. On the last step, they have to transfer their knowledge of the current lesson to the "real electric coil".

Duration: 45 minutes

1) Introduction into topic (description of (learning situation) and problem/difficulty/challenge)	Attachments / Remarks
<p>Appetizer: Picture of a rolling gate and an indication light on a worksheet.</p> <p>Question: What would you expect, if you compare the behaviour of an electric coil on a DC to an AC voltage?</p> <p>Situation:</p> <ul style="list-style-type: none"> - A service technician changed an indication light X1 (Meldeleuchte) during the regular service interval of a rolling gate (Rolltor). - He had two different voltage sources to choose. Both of them had a voltage of 24V. - As he wanted to check the function of the rolling gate, he noticed that the indication light seemed to shine a little less bright than before. 	<p>Media:</p> <ul style="list-style-type: none"> - Own device or school-tablet / device - TaskCards (digital bulletin board) - Multisim (circuit simulation). <p>Circuit diagram (Multisim circuit): https://www.multisim.com/ created circuit</p>





- He wanted to find out what the problem was and found the circuit diagram (Schaltplan) on the bottom of the control cabinet (Schaltschrank).
- The indication light is in a series connection (Reihenschaltung) to a relay (Relais), which includes an electric coil.
- On the worksheet is a simplified electrical circuit of the circuit diagram shown.

2) Introductory Task(s)

Task 1 Work individually:

Open the following link or scan the QR-Code to get access to the TaskCards-Board (use your own device or the school-tablet).

Task 2 Partner Work:

Split into groups of max. two students.

QR-Code
(Link to the
Taskcards-
Board)

3) Work phase(s) - individual, tandem and/or group work

Task 3 Work in teams:

Process the work orders (Task 1 → 3) on the TaskCards-Board (note your „First Name“ (Vorname) behind or in front of your answers) (15 Min.):

- “What would you as a group expect, if you compare the behaviour of an electric coil on a DC to an AC Voltage?”
- “Follow the link to the simulation (Multisim) and simulate the circuit with the given components and parameters”
- “Write down your results to the given Taskcard on the bottom and present them to the class”

QR-Code to the Multisim-Simulation

Link: https://www.multisim.com/content/EjNZQMuDjGrun-fqfGstcx9/coil_on_dc_ac_voltage/open/





d) "What is the conclusion of the measurement from AC to DC / DC to AC?"

Task 4 Work in teams:

Choose one member of your group, who has to present your results from the Taskcards-Board to the class.

4) Securing knowledge (checking of results and learning progress) incl. feedback/evaluation (by teacher, classmates, internet)

Solution of situation:

Securing the measurement results on the specific TaskCard → "securing results (Plenum)".

Horizon of expectation:

- a) Results of the Measurement: $I_{RMS} = 410,96 \text{ mA (DC)}$; $I_{RMS} = 26,873 \text{ mA (AC)}$
- b) Conclusion: "Because of the AC Voltage and the lower current, there has to be kind of an additional resistance in the circuit" (Students). Teacher: "The electric coil on the AC Voltage operates as an inductive reactance, which inhibits the current".

Verification of learning success:

The students were able to successfully complete the required measurement tasks. The feedback showed that the work assignments were formulated uncomplicated for them to understand. They were able to carry out the measurements in the required time and secure their results on the comment-section on the provided TaskCard.

Possible optimization for the lesson:

One way of optimizing the lesson would be to create a separate TaskCard for each group or individual so that the measurement results on access rights remain hidden for the other groups.

TaskCard





Attachments

Worksheet

Learning-Situation:

A service technician changed an indication light X1 (Meldeleuchte) during the regular service interval of a rolling gate (Rolltor).

He had two different voltage sources to choose. Both of them had a voltage of 24V.

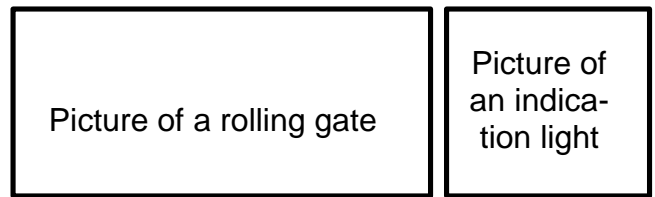
Problem:

As he wanted to check the function of the rolling gate, he noticed that the indication light seemed to shine a little less bright than before.

He wanted to find out what the problem was and found the circuit diagram (Schaltplan) on the bottom of the control cabinet (Schaltschrank).

The indication light is in a series connection (Reihenschaltung) to a relay (Relais), which includes an electric coil.

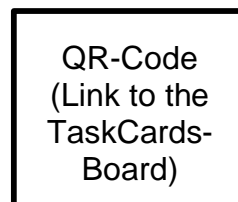
On the right side, you can see a simplified electrical circuit of the circuit diagram.



<https://www.multisim.com/>
| created circuit

Work Order:

1. Open the following link or scan the QR-Code to get access to the TaskCards-Board (use your own device or the school-tablet):



2. Split into groups of max. two students.
3. Process the work orders (Task 1 -> 3) on the TaskCards-Board (note your „First Name“ (Vorname) behind or in front of your answers) (15 Min.).





4. Choose one member of your group, who has to present your results from the TaskCards-Board to the class.

If the link on the TaskCards-Board **doesn't work**, scan the following QR-Code to get to the simulation:

QR-Code to
the Multisim-
Simulation

Link: https://www.multisim.com/content/EjNZQMuDjGrunfqfGstcx9/coil_on_dc_ac_voltage/open/

