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WirelessUP!

UPraising VET skills for innovation in European electrotechnical sector

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WirelessUP! Trainers' Guidebook

Intellectual Output 4

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Lead partner of Intellectual Output 4:

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Country	Partner Institution
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Slovenia	Šolski center Krško-Sevnica
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1 Introduction

In the emerging era of Digital Economy and Industry 4.0 the vocational education and training are lacking behind with delivering relevant offer and skills of new VET professionals. The WirelessUP! project aims at delivering new and innovative learning contents in the sector of electrotechnics. The sector is chosen because it is the sector which has cross-cutting influence and covers the field of building, industry and automatization.

Internet and wireless technology are changing the economy of tomorrow, called digital economy. It will revolutionize every commercial sector, disrupt the workings of virtually every industry, bring with it unprecedented new economic opportunities, put millions of people back to work, and create a more sustainable low-carbon society to mitigate climate change. Hand in hand with the process of digitalization emerges Industry 4.0 which refers to the fourth industrial revolution that creates gaps in productivity and changed people's behaviour throughout the world. Industry 4.0 is the transformation of the whole industrial production through the application of digital technology to the traditional industry. One of the key communication aspects in Industry 4.0 and Digital Economy are sensors. Sensors are embedded into every device and appliance, allowing them to communicate with each other and Internet users, providing up to the moment data on the managing, powering, and moving of economic activity in a smart Digital Europe. Already, 14 billion sensors are attached to resource flows, warehouses, road systems, factory production lines, the electricity transmission grid, offices, homes, stores, and vehicles, continually monitoring their status and performance. By 2030, it is estimated there will be more than 100 trillion sensors connecting the human and natural environment in a globally distributed intelligent network.

2 WirelessUP! – The Project

The WirelessUP! project recognises the shift in the digital economy and Industry 4.0. It thus seeks to develop a new vocational module which will contribute to the further strengthening of key competencies in VET curricula in the electrotechnical sector according to the needs of the Industry 4.0 and Digital Economy. Alongside the module, a new toolkit for VET students and learners will be developed to facilitate the gaining of new skills. The skills benchmarking model in form of local and transnational competitions will be developed to assess and compare the skills of VET students and learners from different countries learning the same module. Through all the involvement of VET students and learner accent will be put on gaining practical skills, as key skills that are directly applicable and usable in the VET expert labour market.

The WirelessUP! project aims at contributing to:

1. smart growth by closing the gap between the set of traditional competences used to predict performance within VET organizations and the new challenges set by the digital economy. Specifically the project will focus on implementation of wireless communication between sensorial technologies within existing VET curricula for smart and sustainable houses and industry.

2. sustainable growth by focusing and developing competencies for energy efficiency solutions in order to turn the digital economy into a knowledge-driven sustainable business, with higher

productivity and higher skilled employees. The project aims at upskilling digital competencies and spreading the digital culture.

3. inclusive growth by providing through VET training “a more skilled workforce, capable of contributing and adjusting to technological change with new patterns of work organisation” (Agenda for New Skills and Jobs).

The project has identified some specific needs that refer to its target groups, namely:

1. VET students and learners – New Wireless-UP! training module for wireless technologies among sensors will be implemented to support professional growth, job opportunities and company competitiveness with a double effect: to generate new jobs and change the existing jobs.

2. VET teachers/trainers – New skills opportunities mean, however, demand for new skilled VET providers, not only among new recruited but also among the present staff.

3. SMEs and Industry - Employers and training providers will have to agree changes to restructure and modernize existing curricula and training pathways as well as to retrain trainers, including professional skills in new technologies as pillars of training courses.

3 Intellectual Output 2: WirelessUP! Training Module

3.1 Methodology

The base for the development of the Intellectual Output 2 WirelessUP! Training Module is the product of Intellectual Output 1 “Recommendations for local implementation of smart systems in VET for industry 4.0”. The aim of the Recommendations is to provide a baseline for implementing an educational framework of the Wireless-UP! training module. The Recommendations provide a first step in the development and implementation of the WirelessUP! educational module. The methodology helps understanding current and future labour market demand, and how it will shape both the need to reskill the current workforce and vocational training for young people and helps to formulate skills development in the electrotechnical sector.

The methodology of the output is set as following:

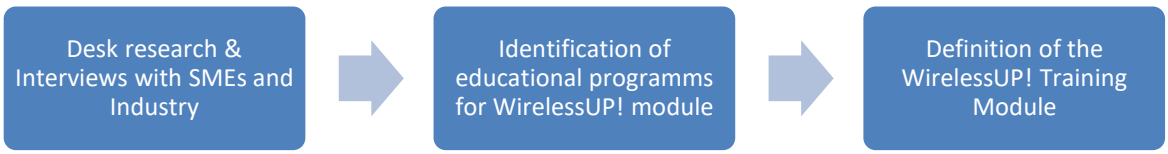

Figure 1: The methodology of the output

At the desk research partners have used a variety of secondary data from internal sources, the internet, libraries, associations, government agencies, published reports as well as national and EU strategies. The desk research included the socio-economic base of each partner country, an overview of the national VET system of partner countries and a definition of a best practice example in VET electrotechnical sector in each partners’ institution. The research has showed the similarities and differences of the VET system and current status in partner countries as well as in the

electrotechnical sector. Furthermore good practice examples showed how factors of supporting innovation or fostering and enhancing competences can improve the VET electrotechnical sector.

Besides defining the socio-economic context and investigating good practice examples, the partners have conducted interviews with relevant SMEs and Industry in the electrotechnical sector. The 14 interviews collected in partner countries provide data for understanding the needs of employers, their status and goals toward Industry 4.0 principles as well as recommendations for changes in the VET electrotechnical sector.

The third step in the development of the Intellectual Output 1 was the identification of the present vocational education and training programs the new WirelessUP! Training Module could be implemented. Following the set methodology, the partners have identified altogether 28 occupations and 39 courses/subjects within the occupations in 5 partner countries which are suitable for implementing the new WirelessUP! Training Module. The Recommendations offer a detailed description of the level, duration and key competences of identified qualifications and for each qualification the level and learning outcomes of identified subjects.

When developing the WirelessUP! Training Module, partners have used the CEDEFOP definition of curricula, namely: “inventory of activities implemented to design, organize and plan an education or training activities, including the definition of learning objectives, content, methods (including assessment) and material, as well as an arrangement for training teachers and trainers”.

The WirelessUP Training Module is designed to be implemented in every European VET educational system due to the involvement of EU instruments of transparency. EQF, ECVET and ESCO tools remove geographical, institutional and sectorial barriers. The Training module is:

- modular as it allows learners to choose from 3 different modules which suite their needs and preferences;
- adoptable in workload to learners’ needs according if the provision is made by a VET school or adult VET institution;
- designed to foster mobility between different training institutions and learning contexts due to the involvement of European instruments of transparency.

3.2 Purpose

The purpose of the WirelessUP! training module is to be the foundational document for the complete WirelessUP! training programme as part of the partners’ goal of modernising the VET electrotechnical sector in accordance with modern technological requests.

As studies have shown we are in the midst of a significant transformation regarding the way we produce products thanks to the digitization of manufacturing. McKinsey defines the Industry 4.0. “as the next phase in the digitization of the manufacturing sector, driven by four disruptions: the astonishing rise in data volumes, computational power, and connectivity, especially new low-power wide-area networks; the emergence of analytics and business-intelligence capabilities; new forms of human-machine interaction such as touch interfaces and augmented-reality systems; and improvements in transferring digital instructions to the physical world, such as advanced robotics

and 3-D printing".[1] This digitalisation encompasses a wide range of communication between human-human, human-robots, robots-robots etc. as well as gaining an immense load of data. Both activities are at a more detailed level based on sensors and their activity. Sensors are and will be embedded into every device and appliance, allowing them to communicate with each other and users, providing up to the moment data on the managing, powering, and moving of economic activity.

At the beginning of 2015 McKinsey has surveyed 300 manufacturing leaders. The results have shown only 48 percent of manufacturers consider themselves ready for Industry 4.0 and 78% of suppliers say they are prepared. The survey the partners have conducted in partner countries in 2018 within the Intellectual Output 1 "Recommendations for local implementation of smart systems in VET for industry 4.0" show similarities. The conclusions of the questionnaire analysis are that the companies and employees are still not fully implementing or are not prepared to fully implement the Industry 4.0 principles.

The focus of the survey conducted by the partners was on the VET education and its connectivity to Industry 4.0. The survey has shown that companies are lacking qualified workforce with up-to-date skills and competences. More specific and especially practical education in technical and vocational schools needs to bridge the gap between real sector needs and VET students as future workers. Up-to-date VET education in the electrotechnical sector can enable the employers to directly engage workers in the process without the expensive and time wasting need for prior in-house training. At the same time VET students can significantly increase employment opportunities. The CEDEFOP analysis states that "growing labour market imbalances have seeped into higher structural unemployment rates, with the consequence of exacerbated concern that skill mismatch is worsening in the EU. Shifts in skill demand and supply have been reflected in the stated inability of employers to fill their vacancies with people that have the right skills."[2]

The WirelessUP! Training Module is the first step in closing the gap between the present VET electrotechnical offer and the needs of Industry 4.0. It offers VET students the possibility to acquire relevant competences in wireless technologies, sensors and actuators.

The project follows the conclusion of the CEDEFOP study stating that "Remaining competitive in the global market requires consistent investment in higher-order ICT skills and their integration within education curricula as a key competence, since they are likely to become the norm in a wide(r) set of future jobs."[3]

3.3 Goal

Analysts predict that new Internet of Things (IoT) products and services will grow exponentially in next years. Also, EU countries will continue to support research and implementation in IoT in the forthcoming years.

In order to enable a fast uptake of the IoT, key issues like identification, privacy and security and semantic interoperability have to be tackled. The interplay with cloud technologies, big data and future networks like 5G have also to be taken into account.

[1] https://www.mckinsey.com/business-functions/operations/our-insights/manufacturings-next-act
[2] Insights into skill shortages and skill mismatch, CEDFOP, 2018, p. 3.
[3] Insights into skill shortages and skill mismatch, CEDFOP, 2018, p.62.

Open and integrated IoT environments will boost the competitiveness of European SMEs and make people's daily life easier. For instance, it will be easier for patients to receive continuous care and for companies to efficiently source components for their products. This will lead to better services, huge savings and a smarter use of resources.

To achieve these promising results, I think it is vital to enhance knowledge of Internet of Things. The data protection legislation and the cybersecurity strategy proposed by the European Commission clearly go in this direction. The Wireless UP module thus has a goal to implement simple mesh networks as a part of IoT and to expose to stakeholders and wider people of specific interest to the progress towards the bright future of the Internet of Things.

Competencies:

- Understand operation and function of IOT sensors and actuators, RF and SPI communication modules
- Understand IoT value chain structure (device, data cloud), application areas and technologies involved
- Explore and learn about the Internet of Things with the help of preparing projects designed for wireless technology
- Install, program, test and adjust various wireless modules and devices into the functional smart system
- Connect functional smart system with smart devices via cloud services

3.4 Purpose of this document

Based on the background context, modularisation and orientation towards learning outcomes were specified from the outset as the key requirements of the Wireless-UP! curriculum under development. A fundamental element was to provide a description of both the curriculum as a whole and the individual modules in the form of learning outcomes and competencies. The learning outcomes form the standard-setting core of the curriculum, which is consistent across all countries and cannot be changed. In this sense, the Wireless-UP! curriculum can also be considered to include a kind of meta competence framework for educators: The learning outcomes defined in the curriculum represent exactly those competences which all educators should possess, no matter in what geographical, institutional or domain-specific context they work.

In addition to the learning outcomes/competencies as the core element, the curriculum should provide support and ideas as to how the learning outcomes can be achieved and how the corresponding competencies can be developed. For this purpose the curriculum should also propose a set of module outlines including:

1. a compilation of topics and questions for self-reflection which will help to achieve the identified learning outcomes
2. a selection of suitable study literature for self-study or use in lessons
3. recommendations on methodological didactic implementation
4. recommendations on the timeframes for the individual modules

Considering the abovementioned, the objective of this document is to develop, test and disseminate a core methods for training of educators and students outside of the university sector which, being in line with the basic principles of Methodology of education in Technical sectors, satisfies international scientific standards and is suitable for use on a transnational scale.

The overarching aim of this document is:

- to enhance professionalisation of trainers by providing a common reference framework

- to support Education providers in the design and implementation of train-the-trainer programmes, and

- to foster knowledge exchange and mutual understanding between educators in Europe.

3.5 Methodological principles of the Wireless-UP! Curriculum

3.5.1 Competency-oriented

As mentioned above, the curriculum is built on the principle of being competency oriented. In doing so, it ties in with a tendency that has long been dominant in the area of education, namely by aiming to be "output" oriented, in line with education policy steering.

Competency is a complex concept. This is a common factor in all current definitions of the term competency. The OECD definition from 2005 summarises it as follows:

“A competency is more than just knowledge and skills. It involves the ability to meet complex demands, by drawing on and mobilising psychosocial resources (including skills and attitudes) in a particular context.” (OECD 2005).

Accordingly, competency encompasses several individual elements (knowledge, skills, views, etc.) as well as the ability to bring these into relation with each other and to apply this appropriately in specific situations. Competency in this sense refers to the ability to act in certain contexts – e.g. the professional context of an adult educator.

The Wireless-UP! Curriculum is thus aimed at such an ability to act, considering the aforementioned elements of competency in the curriculum.

3.5.2 Action-oriented

The Curriculum, with the help of this document, encompasses not only professional skills but also personal and social skills. The application of knowledge relates to the way in which educators deal with the learners or groups of learners. It is also connected with a capacity for Lifelong Learning. The curriculum provides for a mixture of theory and practice. Regarding the implementation of the curriculum, the linking of phases of theoretical knowledge acquisition with phases of practical exercise, trying out and application is an essential prerequisite. Only through this form of exposure will it be possible to fulfil the requirements regarding an educator who is competent and acts professionally.

The ideal form of implementing the curriculum would incorporate real practice as an integral element. This would necessitate the division of taught sequences over a longer period, with practical

phases for the participants between the taught sequences, i.e. divided according to the model of Input – Practical experience – Reflection on practice:

Taught sequence (Input) - Practical experience - Taught sequence (reflection on practice)

In turn, a subsequent input phase could then build on the results of the reflection on practice, creating a type of circular improvement process, as indicated above.

3.5.3 Participant-orientated

Participant orientation is a central principle of education on which the curriculum is also based. The curriculum allows for plenty of freedom in the actual form of implementation. This can be used to adapt the content and methods to the conditions and needs of the students. This already applies for the modules of the core curriculum. Even greater scope for flexibility and individual adjustment is offered by the variable parts of the curriculum (two projects as Part III of Curicculum), which can be freely designed according to the local, target-specific needs.

Participant orientation also encompasses further aspects: relevance and relation to reality of the learning content and methods for the participants, consideration of their experience and existing knowledge as well as a relationship between the teachers and participants based on equality and mutual respect.

During the implementation stage, these principles require, among other things, constructive and motivating communication, flexible organisation of the course and a variety of methods that can consider the different needs and requirements.

3.5.4 Sustainability of learning

Education and learning should enhance participants ability to learn effectively, so that learning results last long and form the basis for future learning. Therefore, Education should have the task to not just teach the content, but also aid the learners to develop metacognition (an ability to reflect on own learning process) and to introduce them to the tools and techniques needed to assist their process of self-organised learning. An important task is to increase the motivation to learn continuously, combined with the skills of identifying, reflecting on and improving their own learning process. It is also a precondition for the ability of successfully applying knowledge and competencies in different settings and to combine them with new knowledge and competencies.

Learning to learn skills and learning to learn effectively are necessary in order to make an learner a lifelong learner.

3.5.5 How to use the e-learning materials

The manual on how to use e-learning materials is available on Moodle platform of each partner Wireless-UP! course as it is Moodle user manual. The user should check in user manual only available operating sections of Wireless-UP! Course or where a need occurs. For additional information user can contact partners through their regular communication channels available on websites.

4 Instructional Methods

"Education is not the learning of facts, but training of the mind to think" Albert Einstein

Howard Gardner's Theory of Multiple Intelligences relate to a person's unique aptitude set of compatibilities and ways they might prefer to demonstrate intellectual abilities. They are set as following:

Table 1: Instructional Methods

Intelligence	Learning style and preferences	Description
LINGUISTIC	Words and language	• written and spoken words • interpretation and explanation of ideas and information via language • understands relationship between communication and meaning
LOGICAL-MATHEMATICAL	Logic and numbers	• analyse problems • detecting patterns • perform mathematical calculations • scientific reasoning and deduction • understands relationship between cause and effect toward a tangible outcome or result
MUSICAL	Music, sound, rhythm	• awareness, appreciation and use of sound • recognition of tonal and rhythmic patterns • understands relationship between sound and feeling
BODY KINESTHETIC	Body movement control	• eye and body coordination • manual dexterity • physical agility and balance
SPACIAL-VISUAL	Spatial-visual Images and space	• interpretation and creation of visual images, pictorial imagination and expression • understands relationships between images and meanings and between space and effect
INTERPERSONAL	Other people's feelings	• ability to relate to others • interpretation of behaviour and communications • understands the relationship between people and their situations, including other people
INTRAPERSONAL	Self-awareness	• one's own needs for and reaction to change, ability to deal with change in the workplace • one's relationship to others and the world • personal cognizance • personal objectivity • the capability to understand oneself

4.1 Instructional methods characteristics

- Which shall be considered by Trainer/Teacher when transferring Wireless-UP! Knowledge to students:

4.1.1 Linguistic-Verbal Intelligence

Characteristics:

- Good at remembering written and spoken information
- Enjoys reading and writing
- Good at debating or giving persuasive speeches
- Able to explain things well
- Often uses humour when telling stories

4.1.2 Logical-Mathematical Intelligence

Characteristics:

- Excellent problem-solving skills
- Enjoys thinking about abstract ideas
- Likes conducting scientific experiments
- Good at solving complex computations

4.1.3 Musical Intelligence

Characteristics:

- Enjoys singing and playing musical instruments
- Recognizes musical patterns and tones easily
- Good at remembering songs and melodies
- Rich understanding of musical structure, rhythm, and notes

4.1.4 Body-Kinesthetic Intelligence

Characteristics:

- Good at dancing and sports
- Enjoys creating things with his or her hands
- Excellent physical coordination
- Tends to remember by doing, rather than hearing or seeing

4.1.5 Visual-Spatial Intelligence

Characteristics:

- Enjoys reading and writing
- Good at putting puzzles together
- Good at interpreting pictures, graphs, and charts
- Enjoys drawing, painting, and the visual arts
- Recognizes patterns easily

4.1.6 Interpersonal Intelligence

Characteristics:

- Good at communicating verbally
- Skilled at nonverbal communication

- Sees situations from different perspectives
- Creates positive relationships with others
- Good at resolving conflict in groups

4.1.7 Intrapersonal Intelligence

Characteristics:

- Good at analysing his or her strengths and weaknesses
- Enjoys analysing theories and ideas
- Excellent self-awareness
- Clearly understands the basis for his or her own motivations and feelings

4.2 Instructional/methodological cards

4.2.1 Approach

The main aim of this tool consists in supporting the development of transversal competences along with the professional ones for the transition to Industry 4.0. and modern Smart technologies as part of our living. On the other side, it is also a training tool embedded in ECVET standard to be used in LLL and/or initial training strategies as a guidance tool, that trainers can use to help participants develop a plan with personal/professional objectives, to accompany job placement, professional development or career change.

The Wireless-UP! Curriculum and toolkit provides background and support material to implement guidance and capacity-building programmes and initiatives for the target groups addressed by the Project.

It helps trainers/teacher:

- Understand the background to the development of the Wireless-UP! model;
- Support participants in the development of effective training;
- Use this guide for different activities, and in various contexts and settings.

These Instructional cards consists of a series of methods and exercises for the capitalisation of professional and transversal competences towards employment and self-employment in electrotechnical and IT sector and is meant to be used in initial and continuing training schemes.

The tool is consistent with the framework defined in the first phase of Wireless-UP! project and it can be used as an instrument complementary/subsequent to the O3 Wireless-UP! Toolkit as it allows for the planning and implementation of tailored educational paths for the development or enhancement of skills and competences defined in O2, assessed as “weaker” or improvable.

The overall results of the several surveys in Europe show that transversal skills, along with the professional ones, are considered very important in modern education and ongoing greening processes, for both high-skilled profiles and low-skilled profiles, and in all learning contexts.

The most important transversal skills for all profiles and learning contexts are skills that refer to the domains of “Attitudes and values at work” and “Social skills and competences”.

Attitudes and values at work make up the “core” of most important skills and competences. Most of all, the abilities relate to deal with challenges and change are considered critical. This result clearly defines the changing working environment towards a greener and in general more sustainable economy, and the consciousness that exponential changes in organization, technology, jobs and economies require a flexible and resilient attitude at all levels.

On the other hand, the most important social skills and competences refer to two main categories: leadership and abilities to work in group. Of the two categories, the abilities to work as a team and with others (in a leader position or not) mostly refer to the skills that find balance (conflict management and compromise) and assertive ways (constructive criticism) to achieve a common work objective.

All in all, all these skills cannot be easily taught or developed unless they are embedded in practice. So, practical, experiential and work/context-related support activities are required.

So, the opinions obtained by working experience and unformal conversation with stakeholders helped a lot the development of the Wireless-UP! tools and methods, because the findings and further discussion among partners supported the definition and prioritization of skills and competences to focus on when appraising them. Consequently, partners identified a set of 3 skills and competences deemed as the most relevant and important along with professional skills. All the training activities will refer to one or more of them, which are the following:

1. Creativity
2. Communication
3. Commitment and sustainability

The Wireless-UP! Instructional/methodological cards are thus designed for the individual and group guidance/coaching in the transition to Industry 4.0 (and 5.0) as:

- a blended tool with a mix of ICT and professional support services, using contamination models from different sectors
- a geared tool meant to improve a set of key soft skills through a flexible and dynamic training structure organised in training units;
- a tool which foresees different settings: experiential learning, on-the-job simulations, creativity and problem-solving techniques.

It was developed thanks to great contributions of all partners, by adapting the main ideas and concepts of the so-called quadruple helix to the guidance and training sector. In fact, partners were involved in an activity of recycling, reusing, recreating tools, methods, and activities in order to create a new common framework for guidance and coaching.

ANNEX 1:
Instructional/methodological cards

1 CREATIVITY

CARD 1.1: JUST IMPROVISE!

EXERCISE GROUP

Creativity

INSTRUCTIONAL METHODS CHARATERISTS

Linguistic
Body kinesthetic
Spacial-visual
Interpersonal
Intrapersonal

AIMS

The activity gets its inspiration from the "consume locally" approach and aims at developing creative problem-solving attitudes and approaches, while helping participants to make a best use of close-by and accessible resources.

STEP-BY-STEP

1) The participants receive a problem to solve: this can vary according to the group, but it must be related to creating something (a tower, a frame, a presentation of an idea, a game, a collage, etc.)
2) The challenge is to solve problems using only what is in their pockets, on the table, freely available, left over from another job, or only what is within a very short distance.
3) You can establish a "resource parameter": around the desk, in the room or inside a 2m radius.

TIME

30 min – 1hour

Suitable for *GROUP/INDIVIDUAL* work

Suitable for GROUP/INDIVIDUAL work. (A group activity is usually more effective)

TIPS

If you have a smaller group, you can ask each participant to respond to the challenge individually and set as resource parameter the objects on someone else's desk or in someone else's pockets… as long as you do not interfere with their privacy (close groups can take this approach).

ADAPTATION

You can adapt this activity in asking the participants to create an idea – not an object. In this case, the "close-by resource" is represented by the other peers. You can create groups or some sort of barrier in order to delimit the resource parameter. And, of course, no internet!

CARD 1.2: KEEP IT SHORT, KEEP IT SIMPLE

EXERCISE GROUP

Creativity

INSTRUCTIONAL METHODS CHARATERISTS

Linguistic
Interpersonal
Intrapersonal

AIMS

Problems are often obscured by an overload of information. Clarify and isolate the challenge you face by spending time understanding and defining the problem. Can you simplify it down to 10 words, 5 words, or even 3?

STEP-BY-STEP

1) Try to choose a subject interesting for your group or the person in front of you. You can make the participants debate beforehand and try to "extract" an interesting subject, which would interest everybody, if you are working in groups. Example: A Wireless-UP! Training module, a news, an event (local, personal or global), a decision, a process, etc.
2) Ask the participant(s) to write a story on the selected subject in 6 words. The "story" must not overlook too much information. If you want to adapt to a younger audience, ask them to use their Twitter accounts and therefore impose the 140 character limit.
3) Have them compare "stories" and then see if you can make them even shorter.
4) Discuss: why are there so many unnecessary elements in a communication?

TIME

30 minutes

Suitable for GROUP/INDIVIDUAL work

Suitable for GROUP and INDIVIDUAL work

TIPS

You can create teams and engage them in a competition on who has the shortest and most interesting "story".

ADAPTATION

You can create posters or cards of the "stories" written. A simple white text on a black page would do – or you can have the participants get more creative – after all, an image speaks a thousand words!

CARD 1.3: TOUR FOR AN ALIEN

EXERCISE GROUP

Creativity

INSTRUCTIONAL METHODS CHARATERISTS

Linguistic
Logical-mathematical
Spacial-visual
Intrapersonal

AIMS

This exercise provides an opportunity to think outside the usual way of thinking, but also to question well-known and familiar environment, facts and actions. It encourages questionning and it can provide a good basis for a debate.

STEP-BY-STEP

1) Pretend that you have been assigned the task of conducting a tour for aliens who are visiting earth and observing human life. You're riding along in the alien ship, viewing the landscape below, and you float over a factory building. One of your aliens looks down and becomes very confused, so you tell him that production going on.
2) Try to answer the following questions for him.

1. What is a production?
2. What they are producing?
3. Why there is one giant white cloud above the factory?
4. What is a robot?
5. Why can't robots do all the things?

3) Try to question your way of life – personal, but also as a society. Are the things that you are explaining logical from the alien's point of view? The trainer can use this activity to start a debate.

TIME

30 minutes

Suitable for GROUP and INDIVIDUAL work

Suitable for GROUP and INDIVIDUAL work

ADAPTATION

You can replace the factory with another thing/activity which could prove more suitable for your public: a manifestation, a festival, a war, a marriage…

CARD 1.4: BRAIN WRITING: THE SOLUTION CHAIN

EXERCISE GROUP

Creativity

INSTRUCTIONAL METHODS CHARATERISTS

Interpersonal
Intrapersonal

AIMS

This activity demands for cooperation, support of others, a change of perspective, problem solving skills, all while having participants assume a role of responsibility towards another.

NEEDS

STEP-BY-STEP

1) The activity needs at least 5 players.
2) One of the players writes down on a piece of paper a problem they have, a goal they want to obtain or a situation they need help with.
3) Then, they give the paper to the person sitting at their right. This person writes down a solution for the problem, then passes the paper to the next person and so on.
4) At the end, the first player receives the paper and reads the solutions.
5) The solutions are then debated and the participants see if they apply to the first player or not, and why.
6) All the other participants can start chains by writing a problem on a paper

TIME

1 hour

Suitable for GROUP/INDIVIDUAL work

Suitable for GROUP work (at least 5 persons).

TIPS

It is better if you conduct a single chain at a time, in order to give the participants the occasion and time to actually think of the existing problem.

CARD 1.5: TREE OF LIFE

EXERCISE GROUP

Creativity

INSTRUCTIONAL METHODS CHARATERISTS

Linguistic
Spacial-visual
Intrapersonal

AIMS

The aim of the analyses is:

- *"To explore what I would like to become it is necessary to know what makes me the person I am"*
- *The Tree of life lets the youth play in the creative way with topics of themselves.*
- *It is possible to write down and draw what is important, what crosses the mind in a self-description. Or the youth could even cut pictures from magazines which are related to his/her life and stick them on the tree.*
- *It helps both the youth and the coach to picture the person in an unusual way and opens ways of being creative in the way to think of the inner self and what to become.*

The approach of this tool is to:

- *Find a connection with the youth which goes beyond the usual way of talking and Verbalising the matters concerning the youth*
- *Use the metaphor of the tree to explore the **roots** of a person and to discover what holds him/her, what carries him/her.*
    - *Who could give the youth strength?*
    - *What does he/she feel familiar with?*
- *Explore what is happing at the moment. The **trunks** stand for the thought of what is nurturing the person.*
    - *What is relevant to her/his life at the moment?*
    - *What are the likes and against what do the youth protect him/herself?*
- *Picture with the **crown** what the person would love to harvest during life and how to the bosom. The treetop stand for the future and where he/she wants to be.*

NEEDS

large piece of paper, crayons, (maybe old magazines, scissors and glue).

STEP BY STEP

The tree of life will be drawn on a large sheet of paper.

- Please draw the roots, the trunk and the crown.
- After doing this, add the thoughts you have towards it…

TIME

60 min. ca. (or ca. 180 min if you use magazines, scissors and glue)

Suitable for GROUP/INDIVIDUAL work

both

TARGET GROUP(S)

any

TIPS

A tree stands solid on the ground. The roots are connected with the soil which natures it. This part is well protected and not easily spotted and takes up a big part of the tree.
The trunk lets the energy and nutrients go wherever it is needed and wanted. The trunk is the symbol of strength. Whereas the crown shows the lifelines, shows the humming of bees and singing of birds. The treetop is the part where the results and the fruits can be harvested.

ADAPTATION

The roots represent the values of the youth→ the youth, with the help of the coach, reflects on his/her values and beliefs (a list of values can be used as support)
The trunk represent the skills that the youth already have→ choosing from the transversal skills up to professional electrotechnics skills
The crown represents the skills the youth would like to improve/acquire.

CARD 1.6: GET IT TOGETHER

EXERCISE GROUP

Creativity

INSTRUCTIONAL METHODS CHARATERISTS

Linguistic
Spacial-visual
Intrapersonal
Interpersonal

AIMS

The aim of this exercise is to find out how the group members communicate with each other in challenging situations and it helps to build the team work.

NEEDS

Four or more people
Blindfolds
Colored tape
Assortment of small items

STEP BY STEP

Divide players into two-person teams and blindfold one member. Use the tape to create a circle in the middle of the room and place various items within it. Based on directions given by their partner, the blindfolded member must retrieve specific items from the circle. The partner giving instructions may not enter the circle.
The game becomes complicated and challenging as more and more two-person teams join the fray. When it becomes virtually impossible for teams to communicate and navigate, or once all the objects have been retrieved, the game ends.
Building focus helps team members concentrate on the person they're communicating with despite potential distractions. Try switching the roles within each team after every round so the members can learn more about their own and other's behavior in challenging situations. This game works best in large groups since it increases the game difficulty. The more chaos by the end, the better!

TIME

30 minutes

Suitable for GROUP/INDIVIDUAL work.

Suitable for Groups

TIPS

It is better to match students who have opposite character so that it can help them to understand each others point of view better.

ADAPTATION

Please provide information if this exercise can be modified.

CARD 1.7: VIDEO TUTORIALS

EXERCISE GROUP

Creativity – Communication – Commitment and sustainability

INSTRUCTIONAL METHODS CHARATERISTS

Linguistic
Logical-mathematical
Spacial-visual
Intrapersonal
Interpersonal

AIMS

The students will create video tutorials on how to use the IQRF modules. Thereby, they practice the

NEEDS

IQRF starter kit, cameras (mobile phone), computers, cutting program

STEP BY STEP

The class will have to split up into groups of three to four students. Each group will be provided with one IQRF starter kit and they need devices to film their actions and computers in order to capture their actions on the screen e.g. while programming. Moreover, each group needs a computer with some kind of video editing program.
Each group will be given a specific task that they will have to make their video on. This could be installing the gateway, bonding the nodes, programming commands for the modules, etc. The students then have to capture all their actions on camera or by screen recording and edit the video material to a video tutorial for other users of the IQRF technology. Furthermore, they have to formulate a text explaining what they are doing and capture it for their videos. These videos can be uploaded on the school's online learning platform or even on an internet platform such as YouTube.

TIME

180 minutes (four lessons)

Suitable for GROUP/INDIVIDUAL work.

Group work

TIPS

VLC player is a very useful tool for screen captures. Windows Movie Maker is a free tool for editing videos and it is easy to use.

ADAPTATION

The videos can be put together to one long video. The tasks can be varied randomly from setting up simple networks to executing advanced tasks.

2 COMMUNICATION

CARD 2.1: CROSS THE LINE

EXERCISE GROUP

Communication

INSTRUCTIONAL METHODS CHARATERISTS

Linguistic
Interpersonal
Intrapersonal

AIMS

Recognize diversity within your own group in intercultural workplaces, Introduction of the concept of diversity by using the differences between people in a positive way, Experience the effect of these differences on the adoption of Wireless technologies as part of Industrialization 4.0.

NEEDS

A large room divided in two by a clear line (e.g. with tape or a rope/string). A set of questions about differences in greening level in intercultural workplaces which can be answered with yes or no.

STEP BY STEP

The participants stand at one side of the room. This is the 'no-part' of the room. They will be asked several questions about their smart systems level which may be answered with a yes or a no. After a positive answer they are asked to cross the line.
The first question should be a question that everyone answers positively. A positive and perceptible group cohesion is created because of this. The following questions will show internal differences in the group. Some part of these questions show the differences in adoption of smart technologies within the group. The last question should be a question that stresses the group cohesion again. During the 'game' you can show your respect to the people crossing the line by raising your hand.
Example questions:

1. I dream of a better and smart world.
2. I did not complete Higher education.
3. I live in the city.
4. I grew up on the country side
5. I have smart house.
6. I come from a large family.
7. I use regularly wireless technologies instead of wired ones.
8. I have friends with a different cultural background.
9. I always have enough money to buy fresh food.
10. I think it is important to shake hands when I meet people.
11. My mother worked outside the home during my childhood.
12. I feel guilty about all the waste I have thrown into nature during my life.
13. My home uses green energy.
14. I eat junkfood at least once a week.
15. I have no idea what is meant with smart housing.

16. I enjoy working in my branch.
17. The effects of climate change are being exaggerated by the media.
18. I am not driving in an electric sustainable car.
19. I ride a bike regulary.
20. I eat meat very day.
21. I am looking forward to a drink.
22. Etc.

During the game the leader asks the participant questions to obtain insight in the perceptible differences and the effect of these differences in the workplace.
For example:

- Would like to show respect by raising your hand to the people that crossed the line?
- What is the effect of your position on your daily work?
- How can you use this position positively in your work?
- What does it mean for the interaction and communication with the people across the line?
- How does it feel to stand alone on side of the line?
- ...

TIME

About 60 minutes

Suitable for GROUP/INDIVIDUAL work

Suitable for GROUP work

TIPS

- Everybody should feel save.
- Take your time to reflect and discuss the effects with the group members.

ADAPTATION

- The questions in the exercise can be adapted to different kinds of groups, ages and workplaces.

CARD 2.2: MEET&WIRELESS-UP!

EXERCISE GROUP

Communication

INSTRUCTIONAL METHODS CHARATERISTS

Linguistic
Interpersonal
Intrapersonal
Spacial-visual

AIMS

- To obtain insight in different kinds of workplace/learning environment habits that effect the level of introducing new smart wireless technologies.
- To obtain insight in the way people/companies/schools might clash with fast-emerging Industry 4.0 and the skills needed to obtain it.

NEEDS

A photo camera and pc.

STEP BY STEP

The group gets the following assignment:

1) Collect examples of specific habits in the workplace/learning environment which effect the level of introducing new smart wireless technologies.
2) Replay these habits and put them onto film or photo.
3) Replay two problems or two different opinions about how introducement of smart wireless systems or Industry 4.0 might clash with the current state of the market. Describe what is going wrong and how this might be solved.
4) Develop a presentation or exhibition in which the results of the first three steps are presented and explained.

TIME

About 4 hours.

Suitable for GROUP/INDIVIDUAL work

Suitable for GROUP work

TIPS

- Use your smartphone!

ADAPTATION

- This kind assignment can also be customized for different kind of workplaces and situations. For example: meeting / gathering habits, eating habits, etc.

CARD 2.3: CURIOS JOHN – GAME WITH NAMES

EXERCISE GROUP
Communication

INSTRUCTIONAL METHODS CHARATERISTS
Linguistic
Interpersonal
Intrapersonal

AIMS
Say and hear the names of all participants and, if possible, remember them immediately.

NEEDS

-STEP BY STEP
The first participant presents himself saying his name and a title-adjective that begins with the same letter as the name (e.g..:"I am – curious Charles. ").
The next participant repeats what he heard, and then says his name ("This is curious Charles, and I am energy efficient Paul.").
Third attendant repeats both names with the adjectives he heard, then tells his own, and so on, in a circle.

TIME
15-20 minutes

Suitable for GROUP/INDIVIDUAL work
Suitable for GROUP work

TIPS
This method is quite easy tool to remember names.
If the participants gets confused or doubt in their memory, useful is to encourage and stimulate them. If someone really feels the difficulty, one can whisper forgotten name.

ADAPTATION
If the group is too large (more than 25 people), the circle can be split in half-circle, start the game from beginning.

CARD 2.4: INTERVIEW

EXERCISE GROUP

Communication

INSTRUCTIONAL METHODS CHARATERISTS

Linguistic
Interpersonal
Intrapersonal

AIMS

To initiate introduction of participants

NEEDS

-STEP BY STEP

Students are assigned to work in pairs. They must not know one another. During the interview (or other type of conversation) they learn each other's name, last name, occupation, interest in the seminar theme and other information required by teacher or themselves.
At the meeting, each participant briefly presents his partner.

TIME

10 minutes for pairs, 2 minutes for appearance of one pair

Suitable for GROUP/INDIVIDUAL work

Suitable for GROUP/INDIVIDUAL work

TIPS

Participants usually like they are not expected to focus on the whole group.
In a conversation with a partner participants acquire security and contact between the partners will easily be set up and continued.
Presentation of the participants at the joint meeting serves as a good reason for their first appearance in front of a large group of unfamiliar faces. This is a method of "breaking the ice" because after the interview, participants easily perform in front of large audience.

ADAPTATION

Participants can be group by three. Subject of interview can be interest in topic of the seminar

CARD 2.5: LOOK FORWARD

EXERCISE GROUP

Communication

INSTRUCTIONAL METHODS CHARATERISTS

Linguistic
Logical-mathematical
Interpersonal
Intrapersonal

AIMS

To allow the participants to work in teams and to develop their entrepreneurship. This activity helps them solve problems in creative ways and consider elements from a complex situation in order to find an optimal result.

NEEDS

None

STEP BY STEP

- The participants are separated into equal groups, ideally of more than 3 members;
- The trainer then presents them a fake organisation with an focus on development/implementation/maintenance of wireless smart systems and its activities;
- Each group has to think about the vision of this organisation, regarding not its concrete results, but a “green” pathway to follow in its activities and evolution;
- Then the group has to describe the actions that the organisations could carry out to reach this ideal situation.

TIME

1 hour

Suitable for INDIVIDUAL/GROUP work

Suitable for group work

TIPS

The trainer can start a discussion about the different choices at the end of the exercise.
If there is not enough time available, each group can vote for/select one “green” value and only take into account elements regarding this value throughout the exercise.

ADAPTATION

This exercise can involve choosing a leader of the group.

CARD 2.6: GETTING TO KNOW IQRF

EXERCISE GROUP

Communication

INSTRUCTIONAL METHODS CHARATERISTS

Linguistic
Logical-mathematical
Intrapersonal
Interpersonal

AIMS

The students learn about the IQRF modules theoretically and share their acquired knowledge with their classmates. Moreover, they practice their language skills in English

NEEDS

IQRF instruction manual and Powerpoint (optionally posters)

STEP BY STEP

The class will have to split up into groups of three to four students. Each and every group will get the instruction of one specific IQRF module (e.g. node, gateway, etc.). Then, the students need to create a presentation on their specific module. Within the groups, the students have to figure out who will be responsible for which task (e.g. preparing the Powerpoint presentation, creating a poster, summarising the contents, translating them into their mother language if asked to do so, etc.).
In a third step, the students will have to hold their presentations, showing the other students, what their module is able to do and how to combine it with the other IQRF modules, or how to implement it in projects. The presentations should take about five to ten minutes.

TIME

90 Minutes (two school lessons)

Suitable for GROUP/INDIVIDUAL work.

Group work

TIPS

If accessible, the students can also include the real modules in their presentations.

ADAPTATION

Students could also create tutorials for their class mates showing them how to use the modules practically. Presentations could also be held in the students' mother language. This would improve their mediation skills.

CARD 2.7: CARD PIECES

EXERCISE GROUP

Communication

INSTRUCTIONAL METHODS CHARATERISTS

Linguistic
Intrapersonal
Interpersonal

AIMS

The aim of this exercise is to improve the empathy and communication skills of the students through effective communication

NEEDS

Nine or more people
Playing cards cut into triangles (to make your pieces, cut the cards diagonally and then diagonally again)
Envelopes
Private room

STEP BY STEP

Separate groups of three or four people into at least three teams. Each team will receive an envelope of mixed cut up playing cards. The teams then have 8 to 10 minutes to barter and trade pieces in order to complete their cards. The team with the most completed cards wins. This game works well because it helps people hone their negotiation skills to achieve the most successful outcomes. It also helps with accepting loss and figuring out what could have been improved to achieve the desired outcome.
After the game, talk to your teams about what worked or failed. Did they use empathy to see things from another person's perspective? This helps them tailor their communication more effectively. Were they actively listening to one another? Not everyone expresses themselves the same, so being able to adjust and understand another's communication style is key.

TIME

30 Minutes

Suitable for GROUP/INDIVIDUAL work.

Suitable for Group work

TIPS

The more the group is the more effective the outcome of the game

ADAPTATION

The game can be adapted to VET students and in cards, wireless technology tools can be written so that student can become familiar with them

3 COMMITMENT AND SUSTAINABILITY

CARD 3.1: WALKING YOUR GOAL

EXERCISE GROUP

Commitment and sustainability

INSTRUCTIONAL METHODS CHARATERISTS

Linguistic
Logical-mathematical
Interpersonal
Intrapersonal

AIMS

To identify the goal and professional aim of the youth/adult and the necessary steps to do in order to reach it and how can Wireless-UP! Training module help reaching that goal.

NEEDS

4m of sticky tape to stick on the floor (or a 4 m string to stick on the floor, so it can't move); moderation cards; marker/pen; sticky tape, to fix the cards on the floor

STEP BY STEP

This exercise is useful in one-to-one approaches between the trainer and the youth/adult looking for additional education/progression (e.g. Wireless-UP! Training module).

1. Brain storming: together with the trainer, the youth will discover every single step of his/her goal like: finding the education institution, writing an application, having an interview, learning for the test, learning for the next… getting the results, holding the certificate in the hands, writing the job application, having the interview… and so on.
2. Writing down: every single step will be written on a card.
3. Fixing the cards in the right order: the cards will be put on the floor in order of appearance in the time line.
4. Start from where you are now… and 3-4 m away is the goal, written on a card, stuck on the floor, at the end of the string. In-between every single step will have its place on the floor.
5. Seeing what has to be done: after the brain storming, writing and sticking, the trainer and the youth will look together at the long way to go.
6. Now the youth will start to walk the line: literally the youth will step on the first card and then on the second, the third… and so on.
7. With every card he/she reaches she/he will go into the feeling of the position. How does it feel to be at this point? What I have been doing so far? What did I achieve already? What will come next?
8. After talking the step through with the coach, the youth can do the next step.
9. …until he/she arrives at the goal targeted.

TIME

60-90 minutes

Suitable for *INDIVIDUAL/GROUP* work

Group and individuals

TIPS

It is ideal with individuals but it could be adapted also in groups, such as classes with more students (e.g. at the beginning of the course or at the end, about expectations and goals to achieve).

ADAPTATION

After the process of (self) skills assessment, the youth/adult with the help of a professional identify a profile and use this tool to think about the necessary requirements (transversal skills, technical skills, certificate/training, experience,…) and how does knowledge from Wireless-UP! Training module fits into it.

CARD 3.2: WRITE A LETTER

EXERCISE GROUP

Commitment and sustainability

INSTRUCTIONAL METHODS CHARATERISTS

Linguistic
Logical-mathematical
Interpersonal
Intrapersonal

AIMS

To focus on the sustainability of the person in everyday and professional life and to understand own limits.

NEEDS

paper, pen and pencils, envelope and stamp

STEP BY STEP

The task is to write a letter to oneself.
The aim is to have a very private and personal conversation in writing
The letter will be kept by the trainer and send to the person after he/she finish with Wireless-UP! Training module.
1. The person has some time to write a letter to him/herself with all the thoughts, aims and wishes he/she has at the moment about becoming more sustainable/green/innovative in his/her professional and personal life (what could I do in my everyday life to be more sustainable/green? What changes will I do if I take some innovative elements in my profession? What I won't be able/ I don't want to change?)
2. The letter will be sealed by the person and addressed to him/herself.
3. The coach will give the letter after a Wireless-UP! Training module time to him/her.

TIME

30 minutes

Suitable for *INDIVIDUAL/GROUP* work

individual

TIPS

When you write the letter be realistic and think about small actions.
Focus students more on wireless and smart technologies.

ADAPTATIONS

-

CARD 3.3: FOUR CORNERS

EXERCISE GROUP

Commitment and sustainability

INSTRUCTIONAL METHODS CHARATERISTS

Linguistic
Logical-mathematical
Interpersonal
Intrapersonal

AIMS

Acquaintance, specifying expectations, introduction to the content side of the workshop.

NEEDS

Large room or garden in square format. Prepared questions, suitable for discussion in groups and connected with the theme of the education; each question should have four possible answers.

STEP BY STEP

At the beginning the group stands in the middle of the room.
The lecturer briefly explains the conditions of the game: the four corners of the room corresponding to four answers to these questions.
This raises the first question and four possible answers. "Why am I here? I am here because"….. or "For me a Wireless and SMART technologies in electrotechnics are:….."
Corner 1: ... topic whic is needed in my professional development;
Corner 2: ... I want to meet colleagues working at the same field of work as me;
Corner 3: ... It was recommended to me by someone;
Corner 4: ... I want to learn a lot.
Each student goes to the corner (which could represent 4 elements: fire, water, air and earth) where the answer which best fits his situation. If he/she feels two answers acceptable, he/she must choose the one which is, in his opinion, more accurate.
After choosing corners, all participants should be gathered again in the middle of the room. This raises the next question and four possible answers. Some questions: "Wireless-UP! Module will be very successful if ... "The biggest advantage of the wireless/smart systems is ...".

TIME

15-60 minutes

Suitable for *INDIVIDUAL/GROUP* work

Suitable for INDIVIDUAL/GROUP work

TIPS

Initially it is better to ask general questions. After it can be connected with the theme of the education, as well as to the problems that can be solved.
This method is good for a first contact with the content of the subject when there

is no need to know all the details.
Responding to questions, the participants reveal their quality.

ADAPTATION

CARD 3.4: RECORDING OF EXPECTATIONS

EXERCISE GROUP

Commitment and sustainability

INSTRUCTIONAL METHODS CHARATERISTS

Linguistic
Interpersonal
Intrapersonal

LEARNING OUTCOMES

Write your expectations so that they can be compared after the realization of seminar

MATERIALS AND RESOURCES NEEDED

Blank papers, envelops

STEP BY STEP

Each participant writes expectations for the education on his paper according to the information
given at the beginning. The possibility to sign or not is up to participants, but in the end one will
have to recognize the handwriting so he/she could compare what was at the beginning and how
education completed at the end.
All documents are collected in an envelope and closed and kept until the end of the seminar.

TIME

15 minutes

Suitable for *INDIVIDUAL/GROUP* work

Suitable for INDIVIDUAL work

TIPS

To be used during Wireless-UP! Training module or green job-related courses

ADAPTATION

CARD 3.5: STIMULUS PACKAGE

EXERCISE GROUP

Commitment and sustainability

INSTRUCTIONAL METHODS CHARATERISTS

Linguistic
Interpersonal
Intrapersonal
Spacial-visual
Musical

LEARNING OUTCOMES

Understand your position and build a personal interest. Become familiar with the expectations of participants. Agree with them.

NEEDS

Posters with unfinished phrases, a lot of markers.

STEP BY STEP

On the walls, on tables and on the floor spread posters with incomplete phrases.
For example: "In wireless technologies I am most interested in .."; "After tomorrow, I will leave home with a sense of satisfaction, if ... "; "I do not want to feel..."
If possible, let them hear quiet and soothing music.
Participants is proposed, after visiting all the rooms, to immediately rethink and complete started statement on posters.
For fifteen minutes the group will gather and review the posters.
Statements should be read out loud, and if necessary, the precise questions should be asked.
Students can complete their statements themselves or remain anonymous.

TIME

30-45 minutes (10-15 minutes for individual work 20 minutes for group work).

Suitable for *INDIVIDUAL/GROUP* work

Suitable for INDIVIDUAL/GROUP work

TIPS

Anonymity helps to express what participants would otherwise prefer to keep secret. If the anonymity is necessary, you must ensure that all markers are the same colour, so that the written declarations is not detected by colour.
The expectations and wishes, expressed in this activitiy, can be taken into account when planning classes or, they could be simply dismissed so they have no influence on the course. If students are asked for their interests, and it is no longer a subject of conversation, participants can feel like people who are not taken seriously. Therefore, if you do not have opportunities to take into account the wishes participants and their interests, do not ask certain questions.

ADAPTATION

Instead of unfinished phrases, we can give green symbols, drawings, schemes.