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REFERENCE FRAMEWORK FOR LEARNING TO LEARN COMPETENCE FOR IVET TEACHERS AND TRAINERS - First Version (April 2024)

ERASMUS+ PROGRAMME - KA2 COOPERATION PARTNERSHIP PROJECT
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Authors

This draft “Reference framework for Learning to Learn competence for IVET teachers and trainers” (april 2024) was produced by all the project partners: ISRE (Francesco Majorana and Paola Ottolini), SCF (Caterina Aimè and Rita Festi), ANFA (Louise Boissenin and Rafaëlla Rivera), SPOK (Mats Landgren and Gregor Merten) and BIC (Maja Krajnik and Boštian Ozimek). The framework was validated also by the associated partner IVECO (Elisa Galfrè, Alessandra Chinicò, Stefania Molinaro). Project number 2023-1-IT01-KA220-VET-00015667 - Learn to Learn competence for IVET trainers/teachers which was funded with support from the European Commission.

The last version of the Framework will be validated after the experimentation of the learning program with teachers and trainers

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LEARNING TO LEARN

LIFECOMP COMPETENCE DESCRIPTORS

The LifeComp conceptual model builds on the aforementioned three areas which are clearly outlined by the 2018 Council Recommendation. As shown in the Table 1, each competence has three descriptors which are outlined using the ‘awareness, understanding, action’ model, suggested by experts for depicting different facets of deployment. The order in which the descriptors are presented does not imply a sequence in the acquisition process or a hierarchy. In other words, every competence has different dimensions, which individuals can develop at different levels. The proposed set of competences has been identified and validated by experts and stakeholders in iterative consultations¹.

TABLE 1

COMPETENCES	L1 Growth mindset Belief in one’s and others’ potential to continuously learn and progress	L2 Critical thinking Assessment of information and arguments to support reasoned conclusions and develop innovative solutions	L3 Managing learning The planning, organising, monitoring and reviewing of one’s own learning
Awareness	L1.1 Awareness of and confidence in one’s own and others’ abilities to learn, improve and achieve with work and dedication	L2.1 Awareness of potential biases in the data and one’s personal limitations, while collecting valid and reliable information and ideas from diverse and reputable sources	L3.1 Awareness of one’s own learning interests, processes and preferred strategies, including learning needs and required support
Understanding	L1.2 Understanding that learning is a lifelong process that requires openness, curiosity and determination	L2.2 Comparing, analysing, assessing, and synthesising data, information, ideas, and media messages in order to draw logical conclusions	L3.2 Planning and implementing learning goals, strategies, resources and processes
Action	L1.3 Reflecting on other people’s feedback as well as on successful and unsuccessful experiences to continue developing one’s potential	L2.3 Developing creative ideas, synthesising and combining concepts and information from different sources in view of solving problems	L3.3 Reflecting on and assessing purposes, processes and outcomes of learning and knowledge construction, establishing relationships across domains

¹ LifeComp p.21

LEARNING TO LEARN

FRAMEWORK FOR IVET TEACHERS/TRAINERS

Starting from the Lifecomp and from the Analysis report on literature, practices and experiences in partner countries on learning to learn competence, we propose a framework with the following characteristics:

- be feasible and sustainable for the project;
- as the target of the framework are trainers, we develop a single level of indicators, namely advanced;
- indicators can be expressed as knowledges, skills and attitudes;
- the specific of the automotive and food sectors will be expressed with examples of activities, with a guided collection of experiences related to how this competence has been operationally put into action by the trainers of the two sectors

If the training units are preceded by an evaluation act, then we can keep in mind that each “descriptor” (awareness, understanding and action) can be articulated by thinking about the following dimensions:

- my learning
- the learning of my colleagues
- the image of the student: can today’s student learn and learn to learn?
- the image of teaching: is the training and educational activity that trainers propose capable of making today’s students learn and developing their ability in learn to learn?
- the image of the VET center: is the center able to find the organizational solutions that allow today’s trainers and students to learn and learn to learn?

Focus on dual system

The **dual system** has indeed some special features, especially regarding the organisation of learning compared to school based VET-organizations. Normally one (smaller) part of the VET-training takes place in a school based learning environment (theory at school) and one (larger) part takes place in a work based environment (practical, client oriented-learning in the company). Above all the latter is special, because learning and teaching here is not only determined by a curricular structure, but as a result of different client’s wishes, orders, etc.. We have identified three aspects regarding the indicators in the tables below, mainly in table 4: **L3 Managing learning** where the dual system needs special attention.

- L3 Managing learning (The planning, organizing, monitoring and reviewing of one’s own learning)
- L3.2 Planning and implementing learning goals, strategies, resources and processes
- L3.3 Reflecting on and assessing purposes, processes and outcomes of learning and knowledge construction, establishing relationships across domains

An example: A car mechanic student and his trainer must learn/teach how to change the car wheels if the clients on this given day order this in the company, and cannot on that day only learn/teach how to change, for example, car lamps, even if this would be an important learning goal for this student at that day. That means that *flexibility* is as important as f. ex. *planning* in a dual system learning environment. Everything in the curriculum for car mechanic students within the dual system must of course be learned/taught within the VET, only the implementation must be allowed to be more spontaneous. Therefore, also the learning/teaching of the practical skills within the dual system must thus be allowed to be different from a curriculum based learning process. This means that f. ex. *planning, organising, monitoring and reviewing of one’s own learning or assessing purposes, processes and outcomes of learning and knowledge construction* is defined and implemented differently, often at different times, in the dual system, compared to learning/teaching within a fixed structure (curriculum).

/01

Growth mindset



TABLE 2

COMPETENCE	L1 Growth mindset Belief in one's and others' potential to continuously learn and progress	Indicators
Awareness	L1.1 Awareness of and confidence in one's own and others' abilities to learn, improve and achieve with work and dedication	L1.1.1 One thinks that ones own professional competences can improve through learning
		L1.1.2 One thinks that students' learning skills can improve
		L 1.1.3. One thinks that a non-judgmental climate (of the trainer towards students and colleagues and among peers) favors the increase in learning skills
		L1.1.4 One thinks that colleagues' professional skills can improve through learning
Understanding	L1.2 Understanding that learning is a lifelong process that requires openness, curiosity and determination	L1.2.1 One states that student behaviour is worsening
		L1.2.2 One states that students' learning abilities are deteriorating
		L1.2.3 Constantly one looks for training activities that adapt to the variable characteristics of the students
		L1.2.4 One searches for information to better understand students
		L1.2.5 One listens to colleagues' opinions even if they are different from his/her own
Action	L1.3 Reflecting on other people's feedback as well as on successful and unsuccessful experiences to continue developing one's potential	L 1.3.1 One also compares himself /herself with colleagues who think differently
		L1.3.2 One reflects on one's professional practice in relation to the failures achieved
		L 1.3.3. One analyzes successful training activities and identifies their causes

/02

Critical thinking



TABLE 3

<p>COMPETENCE</p>	<p>L2 Critical thinking Assessment of information and arguments to support reasoned conclusions and develop innovative solutions</p>	<p>Indicators</p>
<p>Awareness</p>	<p>L2.1 Awareness of potential biases in the data and one's personal limitations, while collecting valid and reliable information and ideas from diverse and reputable sources</p>	<p>L2.1.1. One is aware of the elements to consider in order to repute the sources reliable for preparing the teaching activity</p>
		<p>L2.1.1. One is aware of the cognitive processes that guide one's learning process (e.g. the tendency to seek information that confirms one's starting idea - cognitive bias)</p>
		<p>L2.1.3. One is aware of the cognitive and emotional processes that they activates to interpret student behavior (e.g. the cognitive and emotional processes through which I label a student as "sly")</p>
		<p>L2.1.4. One recognizes the characteristics of each student and the class group that could influence the success of the training activities (problem setting)</p>
		<p>L2.1.5. One identifies which teaching resources are available in the VET Center to organize training activities (problem setting)</p>
		<p>L2.1.6. One is able to realize the missing of ones own technical skills in relation to sector innovations</p>
<p>Understanding</p>	<p>L2.2 Comparing, analysing, assessing, and synthesising data, information, ideas, and media messages in order to draw logical conclusions</p>	<p>L2.2.1. One knows how to select the necessary and most suitable sources, in relation to the specific learning need of the learner and aims (e.g. the trainer provides students with the materials necessary to learn without multiplying the sources; the trainer is capable of identifying the most significant self-updating sources)</p>
		<p>L2.2.2. One knows one or more source verification methods (e.g. fact checking)</p>
		<p>L2.2.3. One is aware about chances and risks on uses AI in teaching and learning processes</p>
		<p>L2.2.4. One knows how to change ones own teaching methodologies starting from new evidence that supports greater effectiveness</p>
<p>Action</p>	<p>L2.3 Developing creative ideas, synthesising and combining concepts and information from different sources in view of solving problems</p>	<p>L2.3.1. One collaborates with other professionals to plan innovative teaching activities aimed at students (e.g. participates in projects that require classroom experimentation)</p>
		<p>L2.3.2. One collaborates with other professionals, to imagine creative solutions to increase the training capacity of VET Centers (e.g. participates in self-evaluation and improvement processes)</p>
		<p>L2.3.3. One applies proper methodologies to encourage creative thinking and problems solving approach inside the learning environment</p>
		<p>L2.3.4. In the work process, one accepts errors as something to be valued in a continuous improvement perspective</p>

/03

Managing learning



TABLE 4

COMPETENCE	L3 Managing learning The planning, organising, monitoring and reviewing of one's own learning	Indicators
Awareness	L3.1 Awareness of one's own learning interests, processes and preferred strategies, including learning needs and required support	L3.1.1. One recognizes one's preferred learning styles
		L3.1.2. One recognizes one's learning needs, reflecting on one's mistakes and successes
		L3.1.3. One identifies significant moments (that have resulted in a turning point) in one's learning experiences
		L3.1.4. One examines the styles, beliefs, dispositions and emotions that influence one's learning process
Understanding	L3.2 Planning and implementing learning goals, strategies, resources and processes	L3.2.1. One is able to plan their own professional growth process
		L3.2.2. One participates in training and professional development activities aimed at satisfying one's learning needs
		L3.2.3. One participates in training and professional development activities useful to the educational community
		L3.2.4. Starting from one's own teaching discipline, one supports the development of different transversal competences (e.g. through teaching activities connected to one's own discipline it allows students to identify their own values, their own learning strategies...)
Action	L3.3 Reflecting on and assessing purposes, processes and outcomes of learning and knowledge construction, establishing relationships across domains	L3.3.1. One reflects and evaluates ones own experiences and teaching practices to improve ones own teaching processes
		L3.3.2. One takes an exploratory approach that creates continuous links between different areas of knowledge
		L3.3.3. One knows how to transfer and apply the same learning strategy in different areas of knowledge

ANCHORING INDICATORS

For each of the three competences and for each descriptors of the model (awareness, understanding and action), the framework presents indicators.

What are indicators? What is their meaning in this framework? They indicate actions or thoughts which, on a semantic level, contribute to the empirical translation of the descriptors. The latter is appropriate if it is capable of guiding both the macro- and micro-planning of training activities and (and consequently) evaluation ones. The indicators, therefore, should be strongly correlated with learning outcomes.

The definition of the indicators can always be perfected and a stimulus to their revision and improvement arises precisely from their use.

They, the indicators, are expressed largely using ordinary language. As is known, this is largely ambiguous. **To increase the probability that the interpretation of the indicators is shared, that the same meaning is attributed to them by different users, it is appropriate to present anchors².**

The anchors are paradigmatic examples that illustrate the meaning of the indicators on an analogical level. **Each anchor takes the form of a learning experience³ about learning to learn.**

They are real. In fact, we asked some trainers for each partner to tell a learning experience (relating to learning to learn) that they consider particularly significant in their professional life.

These experiences should represent the substance of our framework, the three competencies, descriptors and indicators. They refer to the automotive and food sectors. For completeness, we have also added an experiences relating to the cultural area (mathematics).

Below we present four of them. We did not select them because they are better than the others or because they show a greater ability in learning to learn competence. Very simply we chose them because within them **there is an explicit reference to a greater number of the indicators that appear in the framework.**

In terms functional to the framework, for the moment we have identified in the stories the text that explicitly refers to the three competences of learning to learn: **green for Growth Mindset, pink for Critical Thinking and blue for Managing Learning.** In the next WPs, if the work is considered functional to the objectives, the level of analysis could be increased. That is, we could identify in the experiences the texts that are explicitly associated with the indicators (as in the examples we have already produced).

² Castoldi M., *Valutare e certificare le competenze*, Carocci, Roma 20162; Id., *Compiti autentici. Un nuovo modo di insegnare e apprendere*, De Agostini, Novara 2018.

³ Carr M., *Le storie di apprendimento*, Junior – Spaggiari, Parma 2012.

EXPERIENCE 1

AUTOMOTIVE SECTOR – SCF ITALY

Detailed description of the ineffective training activity in the automotive sector you were involved in:

Let me preface this episode by saying that it happened several years ago: I ran a workshop and had also recently started teaching. I had prepared the teaching setting in the workshop with a car already secured on the bridge. The activity goal was to change the brake pads. The first task assigned was to remove the wheels: I gave outline instructions on the operations to be carried out safely, then I would give more precise step-by-step instructions for the next stages of the work to be done. The first task assigned seemed clear and simple to me, within everyone's reach. I asked the pupils to divide into four groups (each group of 5/6 pupils) with the task of removing one wheel for each group.

After a while I saw that some had managed to remove the wheels, but to my amazement I realised that not all of them had done so, one group in particular still had the wheel untouched with even the rim cover in place. I was angry and upset. I asked why they hadn't removed the wheel and they answered they couldn't see the bolts to unscrew. I was very astonished that they had no idea they had to remove the rim cover (they were first-timers, but it seemed normal to me that guys who have chosen the auto repair course would have an interest and a minimum of knowledge of things that I think anyone knows).

However, I was also very surprised that it did not occur to anyone in that group to look at how the other pupils did it, or to ask someone where they should unscrew.

Description of the change that has occurred in your way of teaching/training

Reflecting on this episode, I realised that I couldn't manage the work, as I would have done in a real workshop, even for simple tasks.

I reflected on the importance of dividing the work into very small phases and checking the progress of the pupils' work step by step. Leave time between phases to check what went wrong, ask for help and give the opportunity to start again if necessary, even several times⁴.

For example, what happened in the episode described can be an opportunity to think about the car and engine blind spots (those areas on which we need to intervene but which are not directly visible)⁵

It is necessary to show a calm attitude so as to give the pupils the opportunity to ask for help without feeling judged, but it is also important to be clear about the rules to be respected and to be firm in enforcing them in order to avoid giving rise to a climate of confusion that is unsuitable for learning⁶.

I also realised that it is important to get to know the pupils well, even to know their experiences outside school. For example, I have seen that boys who grew up in the country with extended families are often more familiar with the use of tools and are used to fixing things or seeing it done (as was normal when I was growing up), but it is no longer as common as it used to be for this to happen. Many boys really have no idea even of the function of simple tools in common use. In the past, those who decided to choose this training path had an interest in the functioning of cars and it was normal for them to have already tried at home on their own to disassemble or fix e.g. the moped, this hardly happens now⁷. For this reason, we also added small training modules in the beginning of the first year in order to get the children used to recognising and using tools or doing small jobs with the fretwork to acquire manual skills⁸.

⁴ L3.1.2 One recognizes one's learning needs, reflecting on one's mistakes and successes

⁵ L3.3.3 One knows how to transfer and apply the same learning strategy in different areas of knowledge

⁶ L1.1.3 One thinks that a non-judgmental climate (of the trainer towards students and colleagues and among peers) favors the increase in learning skills

⁷ L2.1.4 One recognizes the characteristics of each student and the class group that could influence the success of the training activities (problem setting)

⁸ L2.2.4 One knows how to change one's own teaching methodologies starting from new evidence that supports greater effectiveness

Indicate the competences you have acquired or developed

- I learnt not to take the starting level of the pupils for granted, even in relation to skills that appeared basic to me⁹.
- Be careful when creating teams in relation to the assigned task in order to avoid having teams with only fragile components who can't help each other¹⁰.
- Always remind the pupils they can always watch how other classmates are managing the tasks assigned if they don't understand how to do it, or they can ask for the teacher's help. They must also try to find strategies on their own, when they don't succeed right away and observing how others did it is a good starting point¹¹.
- Organise the work in very small steps with breaks between each step to check the work and only move on to the next step when everything is understood¹².
- Give the opportunity to retry a task several times until it is consolidated¹³.

⁹ L2.1.2 One is aware of the cognitive processes that guide one's learning process (e.g. the tendency to seek information that confirms one's starting idea - cognitive bias)

¹⁰ L2.1.4 One recognizes the characteristics of each student and the class group that could influence the success of the training activities (problem setting)

¹¹ L1.1.4 One thinks that colleagues' professional skills can improve through learning (Refers to the relationship between students and not between colleagues)

¹² L2.2.1 e 2.2.4 One knows how to select the necessary and most suitable sources, in relation to the specific learning need of the learner and aims (e.g. the trainer provides students with the materials necessary to learn without multiplying the sources; the trainer is capable of identifying the most significant self-updating sources); One knows how to change one's own teaching methodologies starting from new evidence that supports greater effectiveness

¹³ L2.3.4 In the work process, one accepts errors as something to be valued in a continuous improvement perspective

EXPERIENCE 2

AUTOMOTIVE SECTOR – ANFA FRANCE

Detailed description of the ineffective training activity in the automotive sector you were involved in:

During a full day with the same group class, a so-called “theoretical auto mechanics” course was given in the morning. The entire class was in the classroom, so all students attended the same theoretical content. This course was explained orally, on the basis of a written support with diagrams. A course pack was distributed to all students in the class.

At the end of this theoretical morning, a written summative evaluation on the same theme was carried out. Following this assessment, three “groups” were identified¹⁴.

- “Technical” group, representing around 20% of the class, having largely assimilated all the principles covered in the course.
- “Intermediates”, representing around 50% of the class, having assimilated the fundamentals of the subject covered previously, but have gaps in terms of more advanced elements that require a refresher course.
- “Novices”, a group representing around 30% of the class, having assimilated less than 30% of the topic covered.

In the afternoon, to the same class is given a practical course known as a “workshop”. As the differences were obvious, I decided to group the apprentices by level for the “workshop”. The apprentices will then have to put the morning’s course into practice on real cars in the workshop. Each session requires small groups working on one car per group.

During this course, the small groups were established according to the results of the morning’s assessment. In this way, as a trainer, I imagined that:

- “Technical” group would be driven by the motivation and the strong knowledge of each member of the small group. Thus, each apprentice has the opportunity to improve and excel within his/her group in order to take their learning further.
- “Intermediates” would be autonomous for a large part of the practical work, with the need of few interventions from the trainer regarding complex parts of the practical work in the workshop. The trainer’s interventions would then be grouped together, to answer as many questions as possible from as many apprentices as possible, and to carry out lacks from apprentices.
- “Novices”, who are not self-autonomous in workshop the work, with a need for more intervention from the trainer, which I could provide. “Novices”, being with apprentices of the same level, feel less overwhelmed and isolated from the other apprentices, most of whom have lost confidence in themselves and their abilities.

¹⁴ L1.1.2 One thinks that students’ learning skills can improve

Description of the change that has occurred in your way of teaching/training

The results carried out from this practicum in workshop allowed me to improve my teaching method. Indeed¹⁵:

- "Technical", carried out the practical work perfectly, almost autonomously. Questions were resolved by group reflexion, with little intervention from the trainer¹⁶. However, this group relied on these facilities and lacked drive and motivation.
- "Intermediates", carried out the practical work smoothly, with the necessary interventions from the trainer. As in the first group, there was a lack of drive and motivation. Apprentices satisfied with trainer's explanations, without seeking to be autonomous when facing one or more difficulties, an essential skill in mechanics¹⁷.
- "Novices" carried out the practical work needing a quick review of the course, and any intervention from the trainer. A lack of questioning, and stimulation has been felt.

Group management during workshop work is therefore essential for students' learning. Creating homogeneous groups is qualitative in terms of learning, reflection, autonomy, and team spirit¹⁸. My way of teaching has therefore evolved in terms of setting up the workshops. I'm now careful to mix levels, but also to keep the same groups during the practical sessions, in order to reinforce team spirit and cohesion, as well as confidence¹⁹.

However, it's important to change groups regularly (e.g. monthly) to encourage exchanges and allow everyone to absorb each other's knowledge and learn from each other's lacks.

Indicate the competences you have acquired or developed

- Adapt to students and class levels²⁰.
- Take a step back²¹.
- Experiment with learning methods²².
- Encourage the desire and pleasure of learning²³, while having confidence in one's abilities²⁴.

¹⁵ L3.3.1 One reflects and evaluates ones own experiences and teaching practices to improve ones own teaching processes

¹⁶ L1.3.3 One analyzes successful training activities and identifies their causes

¹⁷ L1.3.2 One reflects on one's professional practice in relation to the failures achieved

¹⁸ L2.1.4 One recognizes the characteristics of each student and the class group that could influence the success of the training activities (problem setting)

¹⁹ L2.2.4 One knows how to change ones own teaching methodologies starting from new evidence that supports greater effectiveness

²⁰ L1.2.3, L2.1.4 Constantly one looks for training activities that adapt to the variable characteristics of the students; One recognizes the characteristics of each student and the class group that could influence the success of the training activities (problem setting)

²¹ L 2.3.4 In the work process, one accepts errors as something to be valued in a continuous improvement perspective

²² L2.2.1 One knows how to select the necessary and most suitable sources, in relation to the specific learning need of the learner and aims (e.g. the trainer provides students with the materials necessary to learn without multiplying the sources; the trainer is capable of identifying the most significant self-updating sources)

²³ L1.1.2 One thinks that students' learning skills can improve

²⁴ L1.2.3 Constantly one looks for training activities that adapt to the variable characteristics of the students

EXPERIENCE 3

FOOD SECTOR – SPOK GERMANY

Detailed description of the ineffective training activity in the automotive sector you were involved in:

The teaching task was to make different kinds of dough in the kitchen with 12 trainees with clear task instructions and beforehand preparation in class. From my point of view, at least back then, everything was clear and structured.

The realisation of this work assignment in the kitchen:

- Part of the group was ill or simply didn't turn up and the rest of the group was very heterogeneous.
- The tasks were distributed and some unrest arose, which I ignored for the time being as there was a clear preparation from my point of view.
- I let the trainees organise themselves into groups, which caused the first minor disagreement among the trainees
- The posts were set up and I assigned the tasks to the respective groups without weighing up the strengths and weaknesses of the individual trainees beforehand (and now disaster took its course!...)
- One group was strong and was able to complete the tasks and requirements independently. The other-group failed completely.
- The order in the kitchen and the implemented hygiene during the day was catastrophic and so was the result of dough making. The result was that the daily goal was not achieved and the trainees were very disappointed and also indirectly questioned my work assignments.

Description of the change that has occurred in your way of teaching/training

I changed my approach/teaching methods for the future

- Smaller teaching units
- Better preparation, keep quantities or recipes smaller (more quality than quantity)
- Composition of small teams by me as trainer (more control)
- Detailed preliminary discussion before cooking
- Short breaks between the processes
- Debriefing and evaluation with the trainees about the quality and scope of the tasks, which means a possibility to reach a positive change for future groups²⁵

I felt that I had simply failed in my demands on the trainees that day. And above all, I asked myself what I had done wrong. At first I didn't see the fault in myself. This realisation only came later, after a few hours! This situation caused me some sleepless nights²⁶ and required me to clearly rethink the size and scope of giving work tasks²⁷. You have to take more and more account of the different performance levels of the groups so that they can support each other and complete the tasks²⁸.

²⁵ L 3.3.1 One reflects and evaluates ones own experiences and teaching practices to improve ones own teaching processes

²⁶ L 1.3.2 One reflects on one's professional practice in relation to the failures achieved

²⁷ L 2.2.4 One knows how to change ones own teaching methodologies starting from new evidence that supports greater effectiveness

²⁸ L 1.2.3 Constantly one looks for training activities that adapt to the variable characteristics of the students

Indicate the competences you have acquired or developed

Above all, I have learnt to adapt my own requirements to the respective needs of the trainees. Both my methodological skills, such as work planning and preparation, and my personal skills, such as changing perspectives and evaluation skills, have improved significantly following this example. And I realised how important internal differentiation is²⁹.

²⁹ L 3.3.1 One reflects and evaluates ones own experiences and teaching practices to improve ones own teaching processes

EXPERIENCE 4

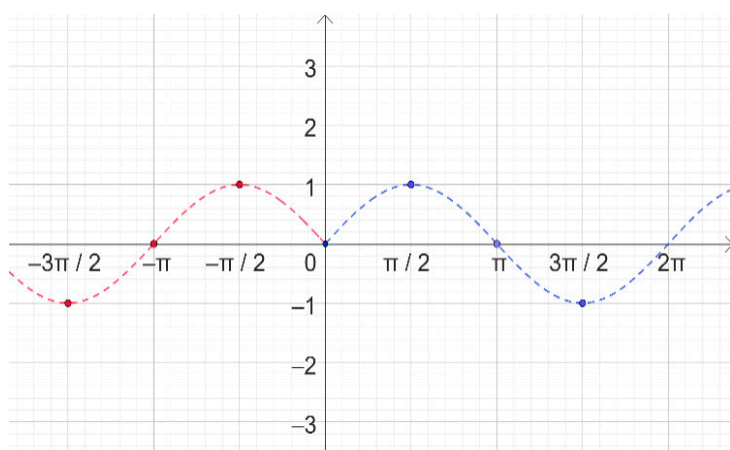
MATHEMATICS – BIC SLOVENIA

Detailed description of the ineffective training activity in the automotive sector you were involved in:

When analyzing graphs of trigonometric functions ($f(x) = \sin(x)$, $f(x) = \cos(x)$, $f(x) = \tan(x)$, and $f(x) = \cot(x)$), the curriculum assumes that students understand and can draw the transformation $f(x) \rightarrow f(|x|)$. The lesson was structured so that we first tabulate the values of the original function and transformed functions, and then plot those calculated values into the coordinate system.

x	0	$\pi/2$	π	$3\pi/2$...
$f(x)$	0	1	0	-1	...
$ x $	$ 0 = 0$	$ \pi/2 = \pi/2$	$ \pi = \pi$	$ -3\pi/2 = 3\pi/2$...
$ f(x) $	0	1	0	-1	...

The tabulated values should lead the students to insight into the connection $f(x) = f(|x|) = f(|-x|)$. Graphically, for example, for $f(x) = \sin(x)$ and $f(|x|) = \sin(|x|)$ or reflection of the function $f(x) = \sin(x)$ on $[0, \infty)$ over the ordinate axis.



$$\sin(x); x \geq 0 \text{ ---}$$

$$\sin(|x|) = \{ \sin(|-x|); x \leq 0 \text{ ---}$$

Despite having prepared pre-made worksheets with tables and pre-drawn coordinate systems for the lesson to optimally develop the concept among students, facilitate faster data recording, and ease graph plotting, the time allocated for calculating values in the table took up a significant amount of time. Most students failed to grasp the connection expected from data analysis. The lesson became increasingly tense, with academically weaker students burdening academically stronger ones with additional questions.

Students struggled with significant differences in individual work pace and grasping the lesson material. The estimated time for mastering the concept was 45 minutes. The students were third-year students in the veterinary technician program.

Description of the change that has occurred in your way of teaching/training

For reflection on a different implementation of the lesson, the desire was for all students to understand the material and for the curriculum content to be covered. One of the goals of this reflection was to ensure greater engagement of students and a better understanding of the subject matter during the lesson³⁰.

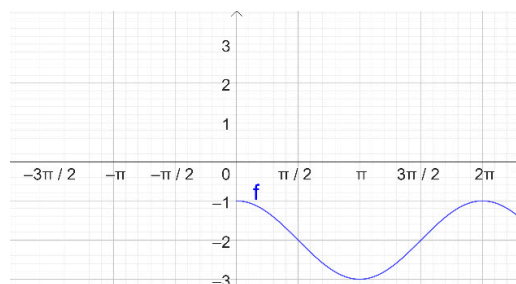
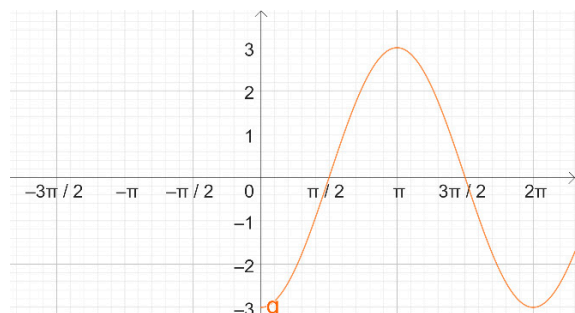
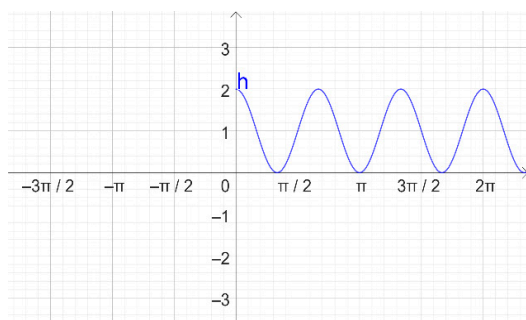
I wanted to encourage students' motivation to understand the given material and their active participation during the lesson³¹.

I contemplated a different approach to achieve the same learning objectives (not only for the given subject matter but in general). The contemplation arose from the perspective of today's generations, their everyday needs, and their use of technology, especially smart screens³².

I modified the treatment of the given subject matter by having students first perform the transformation graphically on a few examples on a worksheet. I assisted them in solving these examples using GeoGebra projection³³.

After the transformations were completed, the next step involved identifying the individual properties of the given functions and then attempting a theoretical or algebraic conclusion that applies to all cases simultaneously. Thus, from the visual to the theoretical, rather than the other way around³⁴.

Here are some examples of functions that students had to transform/mirror across the ordinate axis in the first step of the modified approach to learning the subject matter.



³⁰ L 3.3.1 One reflects and evaluates ones own experiences and teaching practices to improve ones own teaching processes

³¹ L 2.2.4 One knows how to change ones own teaching methodologies starting from new evidence that supports greater effectiveness

³² L 1.2.3 Constantly one looks for training activities that adapt to the variable characteristics of the students

³³ L 1.2.4 One searches for information to better understand students

³⁴ L 2.2.4 One knows how to change ones own teaching methodologies starting from new evidence that supports greater effectiveness

Indicate the competences you have acquired or developed

I believe that by changing the teaching method and altering the technique of acquiring knowledge, I was developing my own competence in creativity and a sort of organizational skill³⁵. I think that merely recognizing that students don't understand the material as outlined in the original curriculum indicates a critical assessment of informally provided feedback, needs, and perspectives of the students³⁶. I also utilized knowledge and skills in the field of ICT technology and incorporated it into the learning process itself (thus, from the visual to the theoretical, rather than the other way around)³⁷.

³⁵ L 3.1.2 One recognizes one's learning needs, reflecting on one's mistakes and successes

³⁶ L 1.1.2 One thinks that students' learning skills can improve

³⁷ L 3.1.2 One recognizes one's learning needs, reflecting on one's mistakes and successes

