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lifeforce

**Development of methodology to convert
BLS skills into suitable educational
activities**

APRIL 2021



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European University Cyprus, Cyprus

Hellenic Society of Emergency Prehospital Care, Greece

Italian Resuscitation Council, Italy

KIDS SAVE LIVES - Τα Παιδιά Σώζουν Ζωές, Greece

University Hospital Cologne, Germany

University of Thessaly, Greece

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April 2021



Learning Initiative For Elementary school Fun Oriented Resuscitation Coaching Europewide

Intellectual Output 2

Development of methodology to convert BLS
skills into suitable educational activities

April 2021



KA2 - Cooperation for Innovation and the Exchange of Good Practices

Strategic Partnerships for school education

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Introduction

1. Development of the L.I.F.E.F.O.R.C.E. algorithm

Simon R. Finke, Katharina Zajackowski, Nadine Rott, Hannes Ecker, Bernd W. Böttiger

The following work contains recommendations for a Basic Life Support (BLS) – Training Algorithm for School children aged 6-10 years. The goal of this chapter was to break down the ERC algorithm for BLS into simple steps. The following BLS-Items were evaluated by explaining the different steps, presenting the relevant literature and giving a recommendation for teaching:

1. Chain of Survival
2. Safety
3. Check for Response
4. Check for Breathing
5. Call for Help
6. CPR
7. Ventilation
8. AED-Deployment
9. Recovery Position
10. Other First Aid Topics

2. Criteria to evaluate the L.I.F.E.F.O.R.C.E. algorithm against ERC guidelines, by the Italian Resuscitation Council and the European University Cyprus.

An independent assessment of compliance of L.I.F.E.F.O.R.C.E algorithm has been carried out by each of the aforementioned partners. Following is a list of criteria to evaluate the algorithm against ERC guidelines:

- General adequacy with respect to the target (age issues)



- Step definition (number of steps and internal organization)
- Difficulty and adaptation to age levels
- Adaptation to school environment and pupils with special needs
- Completeness
- Prerequisites
- Compliance with the ERC guidelines

3. Theoretical framework and educational methodology for pupil training

Botonaki Angeliki

Based on the transnational overview of nursery and primary school educational systems (IO1) in European countries, we develop the theoretical framework for the development of Educational Methodology to pre-train children in resuscitation and other aspects of first Aid, the expansion of methodology to cover special learning groups and the classification of selected skills into distinct difficulty levels specifically tailored to the development of children aged 6-10 years. Pedagogy, which lies at the heart of the Lifeforce program, aims to connect the BLS-Algorithm with the most avant-garde and effective ways of learning to ensure the operational qualification and the success of this project.

The use of music in L.I.F.E.F.O.R.C.E: Methodology and tools

Adamopoulou Christiana & Etmektsoglou Ioanna

The use of music in L.I.F.E.F.O.R.C.E pre-training educational material aims in fostering a wide range of skills that elementary students need to develop as part of their preparation for future training in CPR. Abilities like critical thinking, creativity, collaboration, communication, flexibility, adaptability, and initiative need to be developed and acquired throughout the pre-training. Music is a stimulus that may influence factors related to learning ranging from attracting students' interest to supporting the memorization of BLS key concepts.



This report consists of two main sections. The first section presents selected findings from research carried in the fields of music psychology, neuroscience, music education and music therapy concerning the specific features of the music and songs that the authors consider important for designing a music activities tool kit for the new, adapted L.I.F.E.F.O.R.C.E. algorithm. Research findings with considerable relevance to the present program are that a) songs may facilitate verbatim text recall [3] when melody is simple and easy to learn and the song is characterized by symmetry in the melodic contour and when the music material is characterized by balance between novelty and predictability, b) music training may lead to better tapping performance [4] and therefore children's inherent skills of "keeping the beat" can be maintained and reinforced through listening, accompanying music, and performing easy body percussion activities, c) rhythm is a strong organizer for learning and memory and music provides a temporal scaffolding framework that attracts attention, allows direct anchoring between words and the musical stimulus, thus facilitating learning [2], and finally, d) the harmonic accompaniment functions as a generator of emotional engagement [5, 6] which in turn may facilitate learning.

The second section of the report integrates the theoretical and applied perspectives. Music -as an integral part of the L.I.F.E.F.O.R.C.E program- will be applied in the service of essential perceptual, cognitive and emotionally infused tasks. Some examples related to the perceptual and cognitive tasks which are addressed here, are the facilitating function of music and song in learning and performing the steady heartbeat, in learning basic human anatomy, in memorizing sequential actions such as the steps in BLS, in directing and keeping the attention on relevant auditory information and in making repetition more available and enjoyable. Regarding music's functions in relation to emotions, examples presented in the report include the use of songs as 'containers' for memory and emotions, as an effective tool for the development of empathy in children and as an emotional regulator.

In addition to ensuring that the children will build an accurate and durable memory of the L.I.F.E.F.O.R.C.E materials and skills, the music embedded activities are intended to facilitate access to learning for all students; students



experiencing a wide spectrum of differences and disabilities, making thus the L.I.F.E.F.O.R.C.E training a more inclusive educational paradigm.

The implementation of social-emotional skills on the L.I.F.E.F.O.R.C.E. BLS-algorithm

Douvara Evgenia

Social-emotional skills refer to the abilities that regulate one's thoughts, emotions and behavior and determine how well people adjust to their environment and how much they achieve in their lives [7]. How children express and regulate their emotions often depends on their cultural background, the manifestation of a developmental delay/ disability or their experience of a stressful situation at home/ community. When dealing with stressful situations, like an emergency, several social-emotional skills are activated. After careful research and analysis of the steps of the L.I.F.E.F.O.R.C.E. BLS-algorithm, we came up with the most commonly activated skills. These are the following: Emotional Awareness, Empathy and Self-Regulation. All of them play a significant role in Daniel Goleman's theory of emotional intelligence (1999). Teaching social-emotional skills is crucial not only in cases of offering basic life support, but also when children struggle with adjusting to sensory input due to prenatal stress, early childhood trauma or sensory processing disorder. If a child struggles in managing their emotions, it's hard to open up their brain in order to be able to receive the content that they are trying to learn.

Taxonomy of the selected perceptual and cognitive skills

Douvara Evgenia, Etmektsoglou Sevasti, Klaroumenou Anastasia, Stefanakis Anastasis

From a very young age, children are capable of performing the first step in the "chain of survival", namely, to recognize a cardiac arrest and call for help to activate the Emergency Medical Services (EMS). When training children we need to be aware of the perceptual and cognitive skills they must possess to implement the L.I.F.E.F.O.R.C.E. – B.L.S. algorithm steps. It is also important



to take into consideration the characteristics of their physical and emotional developmental stage.

In this section are presented the perceptual and cognitive skills that are essential for implementation of the L.I.F.E.F.O.R.C.E. – B.L.S. algorithm steps. The skills that have been selected are analyzed into building blocks. Each building block is matched to the corresponding algorithm steps. As shown in the table, some of the skills are found in all steps, while other skills are found in some of the steps.

Classification of selected skills into distinct difficulty levels specifically tailored to the developmental level of children aged 6-10 year

Botonaki Angeliki

During this part of the report, attention will be drowned on the selected skills for the implementation of the Liferforce BLS-Algorithm on children aged 6-10. At first we shall mention some of the goals and objectives of ISCED 0 and ISCED 1 as concluded from IO1, which concur with the classification of the selected skills. The skills will be classified according to the developmental level of the children (based on Developmental Psychology) and also the basic level of each skill that is required in order to fulfill the needs of the Liferforce BLS-Algorithm. Some general developmental thesis which should be taken into consideration for this classification will be mentioned too. To facilitate the comprehension of the classification, a scheme will include all the above information.

Expansion of methodology to cover other taught subjects and special learning groups

Etmektsoglou Sevasti & Botonaki Angeliki

In this part of the report, we will present a variety of ways aiming to facilitate learning for all students and promote inclusiveness. In particular, firstly, we will refer to the appropriate adaptations, accommodations, and modifications for special learning groups. Then, we will focus on ways leading to effective team



work with these groups. Next, we continue with grading and evaluation of students in special education, and finally we give the reasons why children might refuse to use accommodations. Last but not least, we explain how this methodology can be used in order to cover other taught subjects using helpful examples.

4. Pupils' assessment

An Observation checklist of the Algorithm for children (6-10 years old) was created for the evaluation of pupil knowledge before, during and after the pretraining. Among the tools that we used to evaluate pupil knowledge were Bloom's taxonomy - used to evaluate pupils' skills of understanding, remembering, analyzing, creating, and applying the knowledge.

The checklist format was based on the BLS assessment record by the European Resuscitation Council.

5. Theoretical framework and methodology for the preparation of teachers

Etmektsoglou Sevasti, Kalyvas Theodoros, Zagalioti Sophia

Adult education is targeted at individuals who are regarded as adults and aims to improve their technical or professional qualifications, further develop their abilities, enrich their knowledge, or to acquire, refresh and update their knowledge, skills and attitude in a particular field.

Adult learning is a complex process, defined by several factors, such as the characteristics of the learners, their motivation and learning barriers, investigation of the training needs, definition of the training goals and objectives, proper planning, and the relationships among trainers-trainees.

The structure of an adult training program, the training techniques used and its detailed content are influenced by the aforementioned factors. Learning



theories should include learning in the domains of knowledge, skills and attitudes.

Based on the goal and objectives of L.I.F.E.F.O.R.C.E., the multi-theories model of adult learning proposed by Taylor and Hamdy, which utilizes aspects of several adult learning theories, was chosen as an adequate teaching approach and was adapted to the adult learning parameters of L.I.F.E.F.O.R.C.E.

Feedback is an essential part of learning and has four different levels to focus on: feedback about the task, about the processing of the task, about self-regulation and about the self as a person.

Assessment should carefully planned to reflect the content and teaching approach within the curriculum.

Feedback and assessment are healthy parts of effective teaching and successful learning and they should be carefully planned according to the best outcome of the learning



1.0 Suggestions for the L.I.F.E.F.O.R.C.E. BLS-Algorithm for school children (age 6-10 years) (UKK)

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1.1 Introduction and Scope

The following work contains suggested recommendations for a Basic Life Support (BLS) – Training Algorithm for School children aged 6-10 years, created for the L.I.F.E.F.O.R.C.E.-Project which is being developed by the Italian Resuscitation Council (IRC), European University of Cyprus (EUC), Kids Save Lives -Τα Παιδιά Σώζουν Ζωές (KSL), Hellenic Society of Emergency Prehospital Care (EEEEPF), University of Thessaly (UTH) and the University Hospital of Cologne (Department of Anesthesiology and Critical Care).

The main purpose of project L.I.F.E.F.O.R.C.E. is to create the methodology and educational material required to pre-train 1st – 4th grade school children in Basic Life Support, to prepare their trainers to deliver the pre-training and to demonstrate the need of including first aid training in the national curricula of all European countries.

Upon successful completion of the project, 1st – 4th grade school children in Europe will be able to receive pre-training so they can be ready for the Kids Save Lives programs implemented in several European countries.

Ongoing efforts to pursue the inclusion of Basic Life Support / first aid training in the national curricula will be intensified, on the strength of the project's results. When this is achieved, the teachers will be trained to assume the role of trainers, thus providing adequate human resources to apply the project results to all elementary schools in Europe, making it accessible to all school children in the target age group and to their trainers."



The recommendations given here are closely adapted from the official European Resuscitation Council Guidelines on Basic Life Support of 2021 [1].

Note, these recommendations are not meant to contradict or replace these official guidelines but are merely an attempt to isolate the most suitable and reasonable items of the official BLS-Algorithm to this young age group, by reviewing the scientific knowledge available for BLS-training in this age group.

Note further: the following manuscript is still a work in progress, as all project members have to sign-off on them.

1.2 BLS - Items evaluated

The following BLS-Items taken from the official European Resuscitation Council Guidelines on Basic Life Support and First Aid of 2021 [1] were evaluated:

11. Chain of Survival
12. Safety
13. Check for Response
14. Check for Breathing
15. Call for Help
16. CPR
17. Ventilation
18. AED-Deployment
19. Recovery Position
20. Other First Aid Topics

(Note, that *Recovery Position* is one of 20 Pico-Items of *Other First Aid Topics* in the official ERC-Guidelines [1, 8]. We chose to evaluate it separately, which will be clarified later on.)

For every item short background information from the ERC-Guidelines is given, which is followed by a break-down of the item in multiple STEPS (ranging from 1 to 8 steps, depending on the item). The STEPS approach is an educational specification given by the L.I.F.E.F.O.R.C.E.-Project, to facilitate learning for this age group.



We then present the scientific data on training of schoolchildren, acquired through an intensive literature search and review on pubmed (<https://pubmed.ncbi.nlm.nih.gov>).

Based on that, we give a recommendation if and how the item should be practiced. In addition, for each item we differentiate between “should be taught” (focus on theoretical knowledge) and “should be trained” (focus on practical skills).

Also included at the end is a table that addresses possible limitations of certain BLS items for specific groups of learners.

1.2.1 Chain of Survival

From the ERC-Guidelines: „The Chain of Survival summarizes the vital links needed for successful resuscitation.“ „[The] vital links needed for successful resuscitation [are]: 1. Early recognition and call for help to prevent cardiac arrest and to activate the EMS; 2. Early bystander CPR - to slow down the rate of deterioration of the brain and heart, and to buy time to enable defibrillation 3. Early defibrillation - to restore a perfusing rhythm; and 4. Early advanced life support and standardized post-resuscitation care, to restore quality of life. The chain emphasizes the interconnection and the need for all links to be fast and effective in order to optimize the chances of intact survival. Most of these links apply to victims of both primary cardiac and asphyxial arrest“. The guidelines go on: „The contribution of each of the four links diminishes rapidly as patients succumb at each stage and the actual attrition rate results in rapidly decreasing numbers of patients progressing along the chain.“ [9, 10].

This is not a separate Step in the BLS-Algorithm but more an introduction to the audience, in this case, children, that they, by recognizing a cardiac arrest, by calling for help and starting CPR are able to save a life together with others (EMS, doctors etc.)



STEPS:

STEP 1: Early recognition and call for help to prevent cardiac arrest and to activate the EMS.

STEP 2: Early bystander CPR - to slow down the damage of the brain and heart, and to buy time to enable AED and EMS arrival.

STEP 3: Early defibrillation - to restore a heart.

Data on schoolchildren:

Studies on school children show that the chain of survival can be taught to children aged 5-8 [11].

Recommendation:

We recommend training the chain of survival because it highlights the importance of the children's contribution to the rescue of a person's life by being a part of something bigger. For this age-group, there should be a focus on STEP 1 and 2.

Should be taught (theoretically) / focus on knowledge: yes

Should be (practically) trained / focus on skill: no

1.2.2 Safety

Regarding safety the literature tells us „...Highlight the importance of ensuring rescuer, victim and bystander safety“ [1, 9].

STEPS:

STEP 1: Ask yourself: „Is the situation safe for me?“ (e.g. traffic, electricity, fire, shards)

STEP 2: Ask yourself: „Is the situation safe for those around me?“

STEP 3: Ask yourself: „Is the person in need safe?“



Data on schoolchildren:

We could not find any data safety in BLS trainings on schoolchildren.

Recommendation:

Data on school children are not found yet. We recommend to train safety even though; no concrete scientific data exists. The safety of the children/rescuer should be of paramount importance.

Should be taught (theoretically) / focus on knowledge: yes

Should be (practically) trained / focus on skill: yes

1.2.3 Check for Response

Perkins et al. explains „Once cardiac arrest has occurred, early recognition is critical to enable rapid activation of the EMS and prompt initiation of bystander CPR. The key observations are unresponsiveness and not breathing normally“ [9].

STEPS:

STEP 1: Kneel by the side of the victim.

STEP 2: Gently shake/touch shoulders and ask: „Are you alright?“

Data on schoolchildren:

Data on school children show, that after first aid training

- In a group of 228 students ages 6 to 7, 49% correctly assessed the consciousness [12]
- In a group of 10 students ages 4 to 5 7/10 correctly assessed the consciousness [13]
- 77% of 7-14 year old children (n=582) knew how to approach an unconscious patient [14]



Recommendation:

We recommend to train how to check for response because correct assessment of consciousness is possible for children and should be taught.

Should be taught (theoretically) / focus on knowledge: yes

Should be (practically) trained / focus on skill: yes

1.2.4 Check for breathing

Again, taken from the ERC-Guidelines: „The trained provider should assess the collapsed victim rapidly to determine if they are responsive and breathing normally. Open the airway using the head tilt and chin lift technique whilst assessing whether the person is breathing normally. Do not delay assessment by checking for obstructions in the airway. The jaw thrust and finger sweep are no longer recommended for the lay provider. “

The Guideline further stresses: “There should be a differentiation between normal and agonal breathing (and seizure like movements) to prevent a delay in providing CPR” [1, 9].

STEPS:

STEP 1: If the person is not reacting (for example speaking or reacting to you), check for breathing.

STEP 2: Place your hand on the forehead and the fingertips of your other hand under the point of the chin.

STEP 3: Gently tilt the victim’s head backwards, lifting the chin to open the airway.

STEP 4: Place your head over the victim’s head.



STEP 5: LOOK if the chest is moving.

STEP 6: LISTEN with your ear for respiratory sounds.

STEP 7: FEEL the victim's breath on your cheek.

STEP 8: Having looked, listened and felt for up to 10 seconds, ask Yourself "Is this normal breathing OR is it only coughing, moaning, snorting?"

A victim who is barely breathing, or taking infrequent, slow and noisy gaps, is not breathing normally.

[slow, laboured breathing (agonal breathing) should be considered a sign of cardiac arrest!]

Common terms used by lay people to describe agonal breathing include: gasping, barely or occasionally breathing, moaning, sighing, gurgling, noisy, groaning, snorting, heavy or laboured breathing.)

Data on schoolchildren:

Data on school children show, that:

Asses Breathing:

- After first aid training: In a group of 228 students ages 6 to 7, 79% correctly assessed the breathing [12]
- After first aid training: In a group of 10 students ages 4 to 5, 6/10 correctly identified breathing [13]
- After first aid training: 83 % of 7-14 year old children (n = 582) could determine whether the patient did or did not have normal breathing [14]



Airway:

- After first aid training: In a group of 228 students ages 6 to 7, 68% performed a correct airway management with open airway [13]
- After first aid training: In a group of 10 students ages 4-5, 4/10 children performed a correct airway management with open airway [12]
- Correct head tilt and chin lift during artificial ventilation were performed by 69% of 8-18 year olds. [15]

Recommendation:

We recommend to train how to check for breathing because correct assessment of normal breathing is possible for children and should be taught. Challenging will be the differentiation of normal and agonal breathing and seizure like movements.

Should be taught (theoretically) / focus on knowledge: yes

Should be (practically) trained / focus on skill: yes

1.2.5 Call for Help

Important references from the ERC-Guidelines are:

„Lone bystanders with a mobile phone (should) dial EMS, activate the speaker or other hands-free option on the mobile phone and immediately start CPR.”

„112 is the European emergency phone number, available everywhere in the EU, free of charge. It is possible to call 112 from fixed and mobile phones to contact any emergency service.“ „Early contact with the emergency services will facilitate dispatcher assistance in the recognition of cardiac arrest, telephone instruction on how to perform CPR, emergency medical service/first responder dispatch, and on locating and dispatching of an AED.“

„If possible, stay with the victim while calling the emergency services. “



„If the phone has a speaker facility switch it to speaker as this will facilitate continuous dialogue with the dispatcher including (if required) CPR instructions.

“

„Training should include how to activate the speaker phone. Additional bystanders may be used to help call the emergency services“ [9, 16-22].

STEPS:

STEP 1: if the person is unresponsive and/or not breathing, or is breathing abnormally, ask a helper to call the emergency services or call them yourself.

STEP 2: Stay with the victim while calling for help, if possible.

STEP 3: Dial 112.

STEP 4: Activate the speaker function of the phone if possible.

STEP 5: Say your name, your location and what happened, and answer the questions that are asked on the phone.

STEP 6: Stay on the phone, don't hang up.

STEP 7: Send a helper to bring an AED, if applicable. If you are alone, do not leave the victim, but start CPR.

Data on schoolchildren:

The data on children show

- After first aid training: In a group of 228 students ages 6 to 7 77% knew the correct emergency telephone number [12]
- After first aid training: In a group of 10 students ages 4 to 5, 6/10 children knew the correct emergency telephone number [13]



- After first aid training: In a group of 228 students ages 6 to 7 50 % gave correct information for the emergency call [12]
- After first aid training: In a group of 10 students ages 4 to 5 10/10 children gave correct information for the emergency call [13]
- The majority of 7-14 year old children (n = 582) were able to give the correct ambulance phone number and location and type of emergency prior to training; the proportion improved immediately after the course and remained high at 4 months. [14]

Recommendation:

We recommend to train CPR cause alerting EMS is possible for children and should be taught.

Should be taught (theoretically) / focus on knowledge: yes

Should be (practically) trained / focus on skill: yes

1.2.6 Chest Compression

„The immediate initiation of CPR can double or quadruple survival from cardiac arrest.“ „Chest compressions are the key component of effective CPR as the widely available means to provide organ perfusion during cardiac arrest. The effectiveness of chest compressions is dependent on correct hand position and chest compression depth, rate, and degree of chest wall recoil. Any pauses in chest compressions mean pauses in organ perfusion, and consequently need to be minimized to prevent ischaemic injury.“ „...the ERC recommends teaching that chest compressions should be delivered ‘in the centre of the chest’, whilst demonstrating hand position on the lower half of the sternum.“ [9, 22-28]

STEPS:

STEP 1: Kneel by the side of the person

STEP 2: Place the heel of your hand on the center of the victim's chest.

STEP 3: Place the heel of the other hand on top of the first hand and



interlock your fingers.

STEP 4: Keep your arms straight.

STEP 5: Position yourself vertically above the victim's chest and press down on the sternum, 5cm-6cm.

STEP 6: After each compression, release the pressure on the chest, without losing contact between your hands and the sternum.

STEP 7: Repeat at a rate of 100-120 compressions per minute.

Data on schoolchildren:

The data on school children show:

Chest compressions depth:

- Median depth of thoracic compressions applied by the children 10-12 years old was 28.0 mm (IQR: 7.5 mm), thereby not reaching the lower thresholds for depth [29]
- Adequate depth was achieved by no pupils in year 5[...]. The compression depth showed significant association with the pupils' age, weight, and height. [30]
- Mean compression depth increased with age (from 30.7 mm in 10 years old to 42.9 mm in 15 years old) ($p < 0.05$) and had statistical relation to height, weight and BMI. [31]
- In a group of 8-12 year olds the compression quality improved significantly with age regarding the percentage of compressions performed at correct depth, and the median depth. But the percentage of compressions with correct decompression decreased significantly. [32]
- Chest compressions reached the level of excellence (depth of 50-60 mm) in 12-14 years old girls in 1% and by 12-14 year old boys in 23, in 14-16 years old level of excellence was reached in 24% of the girls and



80% of the boys chest compressions. 16-18 years old girls reached an excellence level of 59% and boys of 87% for boys. [33]

- A positive correlation was found between chest compressions and weight >50 kg [33]
- Investigating a group auf 180 children ages 8 to 18 Fleischhackl et al found that: Depth of chest compressions showed a correlation with BMI, body weight, and body height but not with age [15]

Chest compression frequency:

- Children 10-12 years old performed CPR compressions at a median rate of 113.5 compressions/minute (IQR: 33 compressions/min) [29]
- Average compression rate was not related to pupils' age, sex, weight, or height [30]
- Younger children delivered more chest compressions per minute (outside the recommended range) than older children (that performed in the high limit of the recommended range). Mean compression rate ranged from 134.7 min⁻¹ in 12 year olds to 121.5 min⁻¹ in 15 year olds [31].

Recommendation:

We recommend teaching CPR, although with lesser importance in the training of children because adequate CPR is dependent on constitution and generally not feasible for children age 6-10. However, the basics for chest-compressions (depth and frequency) can be taught to children as it lays the foundation for future CPR-training, decreases children's fears/shyness and increases the children's willingness to help others

Should be taught (theoretically) / focus on knowledge: yes

Should be (practically) trained / focus on skill: yes



1.2.7 Ventilation

The ERC-Guidelines state: „The trained provider should assess the collapsed victim rapidly to determine if they are responsive and breathing normally. Open the airway using the head tilt and chin lift technique whilst assessing whether the person is breathing normally.“ „Compression-Ventilation—Ratio of 30:2 compared with any other CV ratio in patients with cardiac arrest [...]remains valid and forms the basis for the ERC guidelines to alternate between providing 30 compressions and 2 ventilations“ „bystanders who are trained, able, and willing to give rescue breaths and chest compressions do so for all adult patients in cardiac arrest“ [1, 9, 34-42].

STEPS:

STEP 1: after 30 compressions, open the airway again, pinch the soft part of the nose closed, using the index finger and thumb of your hand on the victim's forehead. Allow the victim's mouth to open.

STEP 2: Take a normal breath and place your lips around the victim's mouth, making sure that you have an airtight seal.

STEP 3: Blow steadily into the mouth whilst watching for the chest to rise for about 1 second.

STEP 4: Take another breath and repeat it once more (2 breaths in total)!

STEP 5: Continue with chest compressions and rescue breaths at a ratio of 30:2 until help arrives!

Data on schoolchildren:

The data on children show, that:

- 10 to 12 year old were able to perform sufficient insufflation [29]



- In a group of 180 children ages 8-18, the inflated volume during artificial breathing was not significantly affected by body height, age, or gender. [15]
- A group of 258 students between 12 and 14 years conducted mouth-to-mouth ventilation for one minute. 74% of the female students and 73% of the male students reached the predefined satisfactory level of 8 Liters ventilation volume [43].

Recommendation:

Even though, successfully performed in studies, mouth-to-mouth ventilation can be challenging for children as it can be associated with disgust and hesitation. It can delay adequate and prompt continuous chest-compression. We recommend mentioning it in training but teaching a compression-only algorithm. As it can delay adequate and prompt continuous chest-compression.

Should be taught (theoretically) / focus on knowledge: yes

Should be (practically) trained / focus on skill: no

1.2.8 AED-Deployment

Important references are:

„Defibrillation within 3–5 min of collapse can produce survival rates as high as 50–70%. This can be achieved by public access and onsite AEDs. Each minute of delay to defibrillation reduces the probability of survival to discharge by 10–12%. “

„The probability of survival after OHCA can be markedly increased if victims receive immediate CPR and a defibrillator is used. AEDs make it possible for laypeople to attempt defibrillation following cardiac arrest many minutes before professional help arrives; each minute of delay decreases the chance of successful resuscitation by about 3 5%“ [44-48].



STEPS:

STEP 1: Look around you for the AED sign.

STEP 2: If there is a second helper, one of you should get an AED, the other should continue CPR on the victim.

STEP 3: If no AED is available, continue CPR.

Data on schoolchildren:

Data on school children show that:

- Untrained 9 year old children (n = 31) delivered the first shock with a mean time of 59.3 ± 13.6 seconds. Following training the mean time to the first shock improved to 35.2 ± 13.6 seconds [49]
- Prior to the training approximately a third of the 7-14 years old children correctly delivered a safe shock by following the instructions of the AED. After the training > 90% were able to do so [14]
- In a group of 180 student ages 8-18 93% of students deployed the AED correctly [15] - 15 untrained children (6th grade) achieved a mean time to defibrillation using a AED of 90 ± 14 seconds. Electrode placement was appropriate in all subjects and all children remained “clear” during the shock. Compared to EMTs/paramedics with a mean time of 67 ± 10 seconds [50]
- In a group of 1295 6-16 years old untrained children 258 participants (19.9%) were able to perform an effective safe defibrillation in less than 3 minutes. There was a significant correlation between age and time to shock [6 YO (108.3 ± 40.4) vs. 16 YO (64.7 ± 18.6) s] [51]

Recommendation:

We do not recommend teaching children AED deployment. Even though AED-Deployment has been shown to be feasible in children and was shown not to be hazardous, we recommend teaching this topic in an older age group.

At a minimum the AED symbol indicating a device’s location can be taught to children.



Should be taught (theoretically) / focus on knowledge: no

Should be (practically) trained / focus on skill: no

1.2.9 Recovery Position

„For adults and children with a decreased level of responsiveness due to medical illness or nonphysical trauma, who do NOT meet the criteria for the initiation of rescue breathing or chest compressions (CPR), the ERC recommends they be placed into a lateral, side-lying, recovery position. Overall, there is little evidence to suggest an optimal recovery position...“ [8]

STEPS:

STEP 1: If you are certain that the victim is breathing normally but is still unresponsive, place them in the recovery position!

STEP 2: Kneel beside the victim and make sure that both legs are straight.

STEP 3: Place the arm nearest to you out at right angles to the body with the hand palm uppermost.

STEP 4: Bring the far arm across the chest and hold the back of the hand against the victim's cheek nearest to you.

STEP 5: With your other hand, grasp the far leg just above the knee and pull it up, keeping the foot on the ground, keeping the hand pressed against the cheek, pull on the far leg to roll the victim towards you onto their side.

STEP 6: Adjust the upper leg so that both hip and knee are bent at right angles. Tilt the head back to make sure the airway remains open.

STEP 7: Adjust the hand under the cheek if necessary, to keep the head tilted and facing downwards to allow liquid material to drain from the mouth.



STEP 8: Check regularly for normal breathing. Only leave the victim unattended if absolutely necessary, for example to attend to other victims.

Data on schoolchildren:

Data on school children show:

- After first aid training: In a group of 6-7 year olds, 87% performed a correct recovery position. [12]
- After first aid training: In a group of 4-5 year olds, 4/10 children performed a correct recovery position[13]
- In a group of 582 children ages 7-14 only children ages 10 years and older were able to place an adult patient in the recovery position. Following training approximately $\frac{3}{4}$ of the children were able to perform a correct recovery position [14]
- Detection of apnea in recovery position was assessed in a group of 182 children ages 10-12. Performing a head-tilt-chin-lift rather than a recovery position lead to a significantly increased likelihood of detecting apnea and therefore cardiac arrest. [52]

Recommendation:

We do not recommend teaching the recovery position to children. Recovery position can be taught as the way of helping in a situation of unconsciousness with normal breathing. But existing scientific evidence suggest a better detection of apnoea in dorsal position. We recommend not teaching it in this age group.

Should be taught (theoretically) / focus on knowledge: no

Should be (practically) trained / focus on skill: no



The partners of the L.I.F.E.F.O.R.C.E. - Project gave following opinion:

University Hospital Cologne	– should <u>not</u> be taught
IRC	– should <u>not</u> be taught
EUC	– should be taught
KSL	– should be taught
UTH/EEEPF	– no response received

1.2.10 Other First Aid Topics

This Item of the ERC-Guidelines on First Aid describes it as „[...] the initial care provided for an acute illness or injury. The goals of first aid include preserving life, alleviating suffering, preventing further illness or injury and promoting recovery. First aid can be initiated by anyone in any situation, including self” „In total these guidelines include 20 PICO topics, subdivided into eleven medical and nine trauma emergencies“

1. recovery position
2. optimal position for shock victims
3. bronchodilator administration for asthma
4. recognition of stroke
5. early aspirin for chest pain
6. anaphylaxis
7. management of hypoglycemia
8. oral rehydration solutions for treating exertion-related dehydration
9. management of heat stroke by cooling
10. supplement oxygen in acute stroke
11. management of presyncope
12. control of life-threatening bleeding
13. management of open chest wounds
14. cervical spine motion restriction and stabilization
15. recognition of concussion
16. thermal burns
17. dental avulsion



18. compression wrap for closed extremity joint injuries
19. straightening an angulated fracture
20. eye injury from chemical exposure [8]

STEPS:

Not applicable

Data on schoolchildren:

Literature on children is scarce:

- After first aid training the management of bleedings rose significantly. [14]
- There was a positive correlation between age and the knowledge of the correct emergency number, the correct assessment of breathing, the correct recovery position, correct use of the AED and managing severe bleeding. [14] In a group of 8-11 years old the retention of first aid knowledge assessed by a multiple-choice test was higher in the group receiving practical training [53]

Recommendation:

We do not recommend teaching other first aid topics, as it is a very diverse and broad field. We recommend focusing on BLS alone, as the algorithm becomes too complicated, and the core message is lost. Some steps of the BLS algorithm also are important for other First Aid situations, e.g. safety and calling for help are always important in an emergency situation.

Should be taught (theoretically) / focus on knowledge: no

Should be (practically) trained / focus on skill: no



The partners of the L.I.F.E.F.O.R.C.E. - Project gave following opinion regarding First Aid Topics as Part of the L.I.F.E.F.O.R.C.E.-BLS Algorithm:

University Hospital Cologne	Should not be taught
IRC	Foreign Body Obstruction, Stop the Bleeding
EUC	Foreign body obstruction recognition interventions, bleeding, nasal bleeding
KSL	Recovery position, Drowning from a foreign body, Trauma Treatment of bleeding with immediate pressure), recognition heart attack and stroke
UTH	Burns, Heat stroke, dental avulsion, aspirin for chest pain.
EEEEPF	Foreign Body Airway Obstruction, Bleeding control, nose bleeding, Recognition of stroke FAST (Face Arm Speech Time to call – for 4th grade pupils)

As there is no consensus, we suggest debating Other First Aid Topics on the next Intellectual Output. Partners agreed to focus on Airway obstruction as other first aid topic.

1.3.0 Data on school children in general

- „Repeated training improves performance and retention but the format and frequency of repeated training is yet to be fully determined. “
- „Studies performed over a wide time period and looking at a variety of approaches to training schoolchildren in CPR and associated skills show that all training interventions are successful within a short time scale in increasing knowledge and skills of children when tested.

- „Training should start at an early age and be repeated at regular intervals over the school career. Training interventions should be age-appropriate and practical and should both reinforce core ideas and sequentially introduce skills of greater complexity.“ [54]

1.3.1. Limitation for Special Learning Groups

The following table shows possible limitation for the CPR-Items (2-8) for children of special learning groups.

Table 1 - Limitation for Special Learning Groups

	Safety	Check for Responses	Check for Breathing	Call for Help	CP R	Ventilation	AE D
<u>Limitations</u>							
Auditory	x	X	x	X			x
Visual	X	x	x		X	X	x
Kinetic		x	x		x	X	x

Table 1: Possible limitation (auditory, visual and kinetic) for the CPR-Items (2-8) for children of special learning groups.

1.4.0 Attachments

Table 2: Visual Abstracts/inspirations for every STEP of the L.I.F.E.F.O.R.C.E

The visualization of the final algorithm (graphics, layout, etc.) of the IO2 report is completed only during the IO3.



Table 3: Algorithm

The results of the evaluation in chapter 2 are already included here.

Suggestions for the L.I.F.E.F.O.R.C.E. BLS-Algorithm for school children (age 6-10 years)

	DRAG OF SURVIVAL	SAFETY	CHECK FOR RESPONSE	CHECK FOR BREATHING	CALL FOR HELP	CHEST COMPRESSIONS	VENTILATION	AED DEPLOYMENT	FURTHER BODY AWARE OBSTRUCTION
Visual abstract									
	This is not a separate step in the BLS algorithm but more an introduction to the children, that they, by recognizing a cardiac arrest, by calling for help and starting CPR are able to save a life together with others (EMS, doctors etc.)								
STEP 1	Early recognition and call for help to prevent cardiac arrest and to activate the EMS.	Ask yourself: "Is the situation safe for you?" (e.g. traffic, electricity, fire, sharps)	Ask: "Are you all right?"	If the person is not breathing the chest is sunken or rising (in you), start CPR breathing.	If the person is unresponsive and/or conscious? Approach a helper and ask him to call the emergency services (112)	Shout by the side of the person.	Place your hands on the center of the chest (A) and	Count how many helpers are present.	If someone is checking and make the first one aware of the situation.
STEP 2	Early bystander CPR: to slow down the damage of the brain and heart, and to buy time to enable AED and EMS arrival.	Ask yourself: "Is the situation safe for those around you?"	Always head/tilt/neck should not and don't you all right?	To make sure, gently place your hand on the forehead and gently tilt the head back.	... or call the emergency services (112)	Place your hand on the center of the person's chest (A) (Don't press on the body!)	Take a normal breath and place your lips around the person's mouth.	If there are more than two, one of you should get an AED, the other one stays with the victim.	Do their safe picture of EMS include the person to cough.
STEP 3	Early defibrillation - to restore a perfusing rhythm.	Ask yourself: "Is the person in need of safety?"	Always head/tilt/neck should not and don't you all right?	Put your fingertips under the person's chin and gently tilt the chin up.	Call 112 on the telephone.	Place your other hand on the first one and interlock your fingers.	Take a normal breath and repeat it about every 10 seconds.	If an AED is available, or when waiting for one to arrive, continue CPR.	If a person is checking and make the first one aware of the situation.
STEP 4				LOOK if the chest is moving.	Stay with the person while calling for help if possible.	Press your arms straight down, about 5 cm.	Take another breath and repeat it about every 10 seconds.	As soon as the AED arrives, switch it on and place the electrode pads on the victim's chest or the victim.	Do their safe picture of child (keeping 112 away).
STEP 5				FEEL the breathing by touching the person's chest with the other hand.	Answer the questions that are asked on the telephone.	Keep your arms straight!	Don't Breathe continuously again!	Follow the spoken and visual direction given by the AED.	
STEP 6				LISTEN to the breathing.	Activate the speaker function of the phone if you can.	Repeat and repeat on a beat of 100-120/min.		If a check is advised, ensure that neither you nor anyone else is touching the victim.	
STEP 7				Ask yourself: "Is this normal breathing?" (If not CPR breathing, meaning: shallow, irregular, gasping, snoring)	Stay on the phone, don't hang up!	After each compression, release your arms.		Then immediately resume CPR and continue as directed by the AED.	
STEP 8						Keep on doing it until help arrives!			
OUR RECOMMENDATION FOR TRAINING OF AGE 6-11 YEARS	RECOMMENDED	RECOMMENDED	RECOMMENDED	RECOMMENDED	RECOMMENDED	RECOMMENDED/NOT RECOMMENDED WITH CAUTION/NOT RECOMMENDED	NOT RECOMMENDED	NOT RECOMMENDED	RECOMMENDED
meaning	As it highlights the importance of the victim, contributing to the rescue of the person by being a part of the rescue of the victim. For the age group 6-11 years it is based on L.I.F.E.F.O.R.C.E. 1 and 2.	Even though no concrete scientific data exist, the safety of the child/rescuer should be of paramount importance.	Correct assessment of consciousness is possible for children and should be taught.	Correct assessment of normal breathing is possible for children and should be taught. Challenging will be the differentiation of normal or agonal breathing and ensure the rescuer.	Alerting EMS is possible for children and should be taught.	Adequate CPR is dependent on the individual and personal experience. For children age 6-11, the BLS algorithm can be taught. CPR can be performed with slight adjustments. Children's characteristics will increase the children's willingness to help others.	Even though, successfully performed in practice, multiple-rescue resuscitation can be challenging for children as it can be performed with slight adjustments. Children's characteristics will increase the children's willingness to help others, but teaching a compressed only algorithm.	Even though AED-Deployment has been shown to be feasible in children, and not recommended for being the first or only age group, and focus on the first children for the younger audience.	Agreed by the partners of the L.I.F.E.F.O.R.C.E. project to be taught in a simple and clear way.
should be taught (essentially) / focus on knowledge	yes	yes	yes	yes	yes	yes	yes	no	yes
should be practically trained / focus on skill	no	yes	yes	yes	yes	yes	no	no	no
SUITABLE FOR SPECIAL LEARNING GROUPS WITHOUT LIMITATIONS									
Auditory	no	no	no	no	no			no	no
Visual	no	no	no	no	no	no	no	no	no
Kinetic	no	no	no	no	no	no	no	no	no



2.0 Criteria to evaluate the algorithm against ERC guidelines

2.1 Evaluation 1: Italian Resuscitation Council

The evaluation of the algorithm is based on established criteria and keeping in mind the three domains of learning (knowledge, skills, and attitudes) adapted to the specific group of children (6-10 years old).

The assessment criteria are the following:

- general adequacy with respect to the target (age issues);
- steps definition (number of steps and internal organization);
- difficulty and adaptation to age levels (are all ages covered and involved?);
- adaptation to school environment and pupils with special needs;
- completeness (missing issues);
- prerequisites needed;
- compliance to the ERC guidelines.

Three different reviewers gave their comments which were summarized in the present document.

The algorithm represents a valuable and novel approach to describe in a systematic form the learning objectives of BLS teaching for children in the school context. It is based on scientific evidence - where available - and on common practice and experiences.

The algorithm has been broken up in a series of steps according to ERC guidelines. Steps definitions are consistent with guidelines and learning objectives. Every step, to be performed, can demand knowledge, skill, and attitude which have been considered in the final recommendations.

Generally speaking, the specific group of learners is considered to have the potential to improve attitude toward most of the learning objectives, while



knowledge and especially skills should be tailored on the psychomotor competencies. Therefore, when applying evaluation criteria, adequacy and adaptation to the target age were mainly considered. Furthermore, a specific attention was paid toward compliance with current ERC guidelines and completeness in terms of contents to warrant coherence with actual practice.

Balance between completeness of contents and adequacy to children is particularly important when considering which core competencies should be proposed to the learners. In fact, even those steps in which a complete mastery in terms of knowledge, skills and attitudes cannot be achieved, should be included in teaching. Indeed, the earlier these steps are presented to the children in an adequate form, the more likely they will lay the foundation of further learning by the means of familiarization, acceptance, and willingness to perform.

For these reasons, in assessing the algorithm and offering points of improvement, we tried to focus on this balance with the perspective of a continuous learning process. In this school-long lasting approach the development of an attitude to help a victim can precede knowledge and be completed with specific skills as the child grows up.

For instance, in our opinion, recognizing agonal breathing could imply a higher amount of stress for a very young child compared to other steps since this dramatic situation can be confusing and frightening. In a very early phase of learning, emphasis should be placed on less complex aspects of cardiac arrest recognition as unresponsiveness and absence of breathing.

On the other hand, AED presentations should be introduced early in teaching, because the knowledge of its utility can increase the awareness about presence and placement of these devices in the environments attended by the children.

To be more specific and use a step-wise approach, we present the following suggestions according to the above-mentioned criteria (reported in brackets).

1. Chain of Survival

- Introduction: rewording. “The Chain of Survival is not a step of the algorithm but its introduction. It is made to let the children realize that they have an



important role in a team game. They can be part of a chain of actions able to save a life together with others: recognizing a cardiac arrest, calling for help and starting CPR are at least as important as EMS and healthcare professionals”.

- Step 1: delete “prevent cardiac arrest”. In terms of adequacy and adaptation, prevention of cardiac arrest (that means the ability to recognize deterioration signs and symptoms which can precede cardiac arrest onset) is far from what a child can achieve. The task of calling adults or directly EMS in case of an abrupt sickness can be included in the First Aid step (see below) or in the Call for Help step.

- Step 2: replace “the rate of deterioration of” with “the damage to” (adequacy to age issues).

- Step 2: add “to enable AED and EMS arrival” (completeness and connection to guidelines)

- Recommendation/Reasoning: since the concept of defibrillation is included in the Chain and cited in Step 2, we suggest emphasizing the importance of having an AED around (at school, at the park, in the neighborhood). It can facilitate its use when children grow up.

2. Safety

- Recommendation/Reasoning: safety is an important but even a too generically addressed topic (completeness). It is important to identify practical examples of unsafe situations and to give clear suggestions on how to behave (wait for police or firefighters, instructions on possible hazards...). It can be achieved with roleplaying or other group works.

3. Check for response

- Recommendation/Reasoning: response is a too generic concept for children (adaptation and completeness). Clear indications should be provided on which kind of response the victim can provide: movements, cough, moaning...



4. Check for breathing

- Step 4, 5, 6: replace verbs with Look, Listen and Feel (compliance with ERC guidelines)
- Step 7 and Reasoning: describing an agonal breathing to children (and to adults as well) can be emotionally uncomfortable and repulsive (adequacy and adaptation). We should consider rearranging the priorities in this specific group of learners and focus on unresponsiveness rather on abnormal breathing: it can be the main step to make the child call for help and be guided by the dispatcher. Link with seizures management can be recalled here if a classroom plan for epileptic children management is already in place.

5. Call for help

- Step 1: add “if the person is unresponsive and not breathing” (completeness)
- Recommendation/training: specific roleplay and peer to peer activities can be practiced to get familiar with a call to the dispatcher as described in literature (completeness).

6. CPR. Replace with “Chest Compressions”

- Step 1: correct “person’s”
- Step 4: correct “press straight down”
- Step 5: move “don’t press on the belly” to Step 2

7. Ventilation

- not recommended

8. AED Deployment

- Recommendation: AED use is a fundamental step of CPR in terms of survival, and it should be included in teaching (completeness and connection with ERC guidelines). As with chest compression, getting familiar with AED lays the



foundation for future training and behavior. Many studies support the AED training in children as feasible, safe, and effective. Familiarization of children with AED should be recommended and its summon included in the teaching steps. It can be achieved by demonstrating its use and by group activities. It is important to raise awareness of the presence of an AED at school or in other places that children are familiar with or used to attend as parks, neighborhood, stations.

9. Recovery position

- not recommended

10. First Aid

We suggest including two topics in this section (adequacy, completeness, and connection):

- Foreign Body Obstruction: It is more common than cardiac arrest and frequent among children. It can be split in simpler steps according to what a child can actually achieve (call for help, encouraging cough, back bowls).
- Stop the Bleeding: manual compression on bleeding site.



2.2 Evaluation 2: European University Cyprus

1. Chain of Survival

- it is important to focus on the first 3 chains and not on the 4th one. 1st Chain should focus on recognition of cardiac arrest and call for help and not to signs of deterioration. In that case we should delete the phrase to prevent cardiac arrest. AED recognition of signs and ways of how to locate them is important to show. Children are amazing with technology.

2. Safety

- safety is always important and cannot be absent from the teaching of children. we should focus on examples and role play.

3. Check for response

- The instruction to check response, for children should be more clear and specific.

4. Check for breathing

- We should stick to Look, Listen and Feel as the current ERC guidelines.

- For Step 7 regarding agonal breathing, we should prepare a demo video (maybe with cartoons) so make it easier for children to understand. Alternatively, we should focus on unresponsiveness rather on abnormal breathing which should maybe be the only sign for children to call for help. let's keep it simple.

5. Call for help

- they should practice calling for help with simulation and role play as close as could be in real life.



6. CPR. Replace with “Chest Compressions”

- Focus on chest compression only

7. Ventilation

- not recommended

8. AED Deployment

- Children should be taught several ways on how to locate the AED and follow their commands to use them.

9. Recovery position

- not recommended

10. First Aid

- Topics such as foreign body obstruction recognition and interventions may be included. Another topic may be bleeding with focus on how to stop nasal bleeding which is maybe more often in children.

2.3 Evaluation 3: Concerning the internal evaluation by the Italian Resuscitation Council (IRC) and the European University Cyprus

This report is a response to the internal evaluation by the above mentioned partners in a point by point way and shows the revisions made.

2.3.1 Partner - IRC:

1. Chain of survival: “The Chain of Survival is not a step of the algorithm but its introduction.”
agreed
2. Step 1: delete “prevent cardiac arrest”.
agreed and changed accordingly
3. Step 2: replace “the rate of deterioration of” with “the damage to”



agreed and changed accordingly

4. Step 2: add “to enable AED and EMS arrival”

agreed and changed accordingly

5. Safety: identify practical examples of unsafe situations and to give clear suggestions on how to behave (wait for police or firefighters, instructions on possible hazards...)

Agreed. Some examples were included in brackets in the algorithm and should be incorporated in the actual training.

6. Check for response: Clear indications should be provided on which kind of response the victim can provide: movements, cough, moaning.

Agreed, but examples for indications were moved to STEP 7 of check for breathing. In addition, a STEP 1 in Check for Breathing was changed to: “if the person is not reacting (for example speaking or reacting to you), check for breathing”.

7. Check for breathing: Step 4, 5, 6: replace verbs with Look, Listen and Feel

agreed and changed accordingly

8. Step 7 and Reasoning: describing an agonal breathing to children (and to adults as well) can be emotionally uncomfortable and repulsive (adequacy and adaptation)...

We agree. Main focus is the recognition of an unresponsive person. We tried to reduce the description of agonal breathing and only focus on what normal breathing is like. STEP 7 now asked: “...OR is it only coughing, moaning, snorting?”.

9. Call for help - Step 1: add “if the person is unresponsive and not breathing”

was changed to: if the person is unresponsive or not breathing (or not breathing normally)...

10. CPR. Replace with “Chest Compressions”

agreed and changed accordingly



11. Step 1: correct “person’s”

changed accordingly

12.- Step 4: correct “press straight down”

agreed and changed accordingly

13.- Step 5: move “don’t press on the belly” to Step 2

agreed and changed accordingly

14. Recovery position - not recommended

Was removed from the algorithm entirely

15. First Aid Foreign Body Obstruction - Stop the Bleeding:

In the last Intellectual Output (IO3) it was agreed to incorporate foreign body Obstruction in a simple rudimentary “cause-effect” way, in order not to overwhelm children with the amount of information given. Future session may incorporate further “first-aid” topics.

2.3.2 Partner - European University Cyprus:

1. Chain of Survival - it is important to focus on the first 3 chains and not on the 4th one.

The introduction focuses on the first three STEPs.

2. Safety - safety is always important and cannot be absent from the teaching of children. We should focus on examples and role play.

Examples were included.

3. Check for response – The instruction to check response, for children should be more clear and specific.

Examples were included and can be found in STEP 1 of Check for breathing for educational reasons.

4. Check for breathing - We should stick to Look, Listen and Feel as the current ERC guidelines.

Agreed. Changes were made accordingly



5. For Step 7 regarding agonal breathing, we should prepare a demo video (maybe with cartoons) so make it easier for children to understand. Alternatively, we should focus on unresponsiveness rather on abnormal breathing which should maybe be the only sign for children to call for help. Let's keep it simple.

Difficult to incorporate in a table. But as IO3 describes the preparation of educational material, a video can be created then.

6. Call for help - they should practice calling for help with simulation and role play as close as could be in real life.

Again, difficult to incorporate in a table. But can be included in the preparation of educational material, a video can be created then.

7. CPR. Replace with "Chest Compressions"

Agreed. Changes were included.

8. Ventilation - not recommended

As agreed. Ventiation will be taught theoretical but not trained practically

9. AED Deployment - Children should be taught several ways on how to locate the AED and follow their commands to use them.

Training AED deployment is still in debate among the partners. But AED-basics and locating an AED will be taught.

10. Recovery position - not recommended

Was removed from the algorithm entirely

11. First Aid - Topics such as foreign body obstruction recognition and interventions may be included. Another topic may be bleeding with focus on how to stop nasal bleeding which is maybe more often in children.

In the last Intellectual Output (IO3) it was agreed to incorporate foreign body Obstruction in a simple rudimentary "cause-effect" way, in order not to overwhelm children with the amount of information given. Future session may incorporate further "first-aid" topics.



3. Theoretical framework and methodology for school children

3.1 Development of Educational Methodology introducing an innovative, scientifically backed approach to pre-train school children in resuscitation and other aspects of first Aid

Angeliki Botonaki, Preschool teacher

The completion of IO1 Transnational overview of nursery and primary school educational systems in European countries has set the ground for the creation of methodology in IO2 of the Lifeforce project.

3.1.1 Theoretical Framework

In this part of the report, we will present the children's cognitive development for the age group of 6-10 along with the basic pedagogical theories which will outline our pedagogical framework.

In General

To begin with, we should have in mind some general information about children's cognitive development, such as the following [55]:

- Development occurs in waves followed by periods of calm
- Each developmental stage is built on the previous
- Stages are used only as guides, each child has its own rhythm of development
- Development takes place simultaneously in many development areas
- Development takes place unevenly
- Development is a result of sensorial-perceptual maturation's interaction with the psycho-social environment of each child
- 90% of the brain development is completed up to 5 years old

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5-7 years old

At first, we will focus on the cognitive development of **children aged 6** (preschoolers), who are considered to be at the *end* of the pre-occupational stage (2-6), according to Piaget. Being in the pre-occupational stage, in general, means to think at a symbolic level but not yet use cognitive operations [56].

The following characteristics represent some of the basic features of the children ending the pre-occupational stage of Piaget, aged around 6. This is argued to be a transitional age stage (5-7) as children are prepared/about to enter the concrete operational stage, where logical thought prevails (but is used only to physical objects) [57].

So, at this age stage (5-7), children:

Cognitive Abilities

- Begin to distinguish the mental from the physical reality (the “possible” compared to the “here and now”). Their specific thought is on the threshold of turning into more logical.
- Begin to discriminate the cause-effect relation from the social rules
- Can pay attention to the verbal guidelines and follow them quite accurately, at least while participating in familiar activities to them
- Use actions, images or words to represent objects and facts (symbolic representation). Symbolic representation helps children to become more sensitive in other’s emotions and cultivate more socio-centric thought (compared to self-centered)

Cognitive Limitations

- Have more self-centered speech, meaning that they focus mainly on their own perceptions, assuming that the other’s perceptions are the same as theirs (displaying difficulty in understanding the other’s

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perceptions). This begins to change though, as they are at a transitional phase.

- Cannot focus on more than one side of a problem each time. Thus, they can classify objects based on just one characteristic (such as color, shape, etc.)
- Cannot easily see the reversibility of a change, they tend to believe that things cannot go back to their former situation and that relationships happen one-way (“I have a sister but my sister doesn’t have one”).
- Cannot carry out lots of basic logical reasoning, compared to older children
- Immature understanding of time, space and sequence

Memory and Cognitive development

- Have a difficulty in recalling long-range memories as they haven’t acquired yet the ability of the conscious use of repetition (metacognition).
- Can organize and remember a sequence of actions or describe steps they have practiced even after just one single time of practice. In other words, they develop scenarios for routine facts. Scenarios constitute a memory aid which helps the children remember the sequence of events.

We also remark that:

Linguistic development

- Brown’s Medium Length of Utterance measured in morphemes (MLU, used as a benchmark to assess grammatical development) is increasing constantly (throughout this and the next stages)
- As part of their conversational skills, children develop the pragmatics, meaning the use of appropriate communication in social situations (knowing what to say, how to say it, and when to say it)

Body and motor development



- Gross motor skills are improved
- Rapid fine mobility skills improvement
- Begin to understand concepts as “my left is your right”, across, diagonally, between, next to, wide, narrow, fold, push, stretch, pull, perspective, time as days, months, seasons, past.

7-8 years old

The next age stage we will examine is **7-8 years old children**, who attend the first and second grade of primary school. According to Piaget, they have entered the concrete operational stage (7-11) which is characterized by logical operations, limited to objects and relationships that they can see or imagine in a specific way. They do not theorize abstract ideas, thoughts or relationships until they reach the next stage (formal operational), at about 11-12 years. Learning becomes easier and more effective [58].

So, children at this age stage (7-8):

- Present a greater reduction of self-centeredness
- Have more flexible and also reversible thought
- Begin to make assumptions and predictions of what will happen on specific situations
- Understand and use more the cause-effect relation
- Are encouraged to problem solving
- Memory's processes are improved (repetition, organizing, semantic processing, visual images, recalling and use of scenarios) and metacognition as well (the ability to think how to think).
- Begin to acquire an internal representation of space and a better understanding of time and sequence
- Can remember up to three commands at once

In general, every aspect of the previous mentioned characteristics of the pre-occupational stage appears improved.



8-10 years old

Moving to the **8-10 age stage** (children who attend the third and fourth class of primary school), while still at the concrete operational stage, what distinguishes is the rapid improvement of memory, attention and metacognition skills of children and, in a minor way, of every other cognitive aspect as well [57].

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Basic Pedagogical Theories

Pedagogy is the study of the theory and practice of education. There are several pedagogical approaches depending on the pedagogical principles, the educational goals and objectives, the teaching-learning style, materials and methods, the needs and requirements of the students and the teacher's role as well [59]. Our pedagogical framework in Lifeforce and one of the major pedagogical theories is constructivism. Constructivism is an educational theory about people actively constructing their own knowledge which underlines that reality is based on the learner's experiences [60].

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To be more precise, we will mention the constructivism influencers on whose opinions we support our framework and we will report on a few educational ways to implement constructivism.

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Starting with J. Piaget, he focused particularly on thinking, reasoning and problem solving, emphasizing the way these processes develop by age. He was interested in the "schemes", in other words the structures of mind which deal with how the physical and social world functions [58]. Piaget argues that children give different explanations of reality depending on the cognitive stage they are at. His theory of cognitive development suggests that children move through four different stages of mental development:

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First stage (0-2) is called the sensorimotor stage during which children experience the world through senses and actions. Second stage (2-6) is known

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as the pre-operational, when children represent things with words and images using intuitive rather than logical reasoning. Third stage (7-11) or the concrete operational, underlines the time period when children think logically about concrete events and finally fourth stage (11 through adulthood) is when abstract reasoning develops [55].

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L. Vygotsky states that full cognitive development requires social interaction. He posits that the learning process will proceed more effectively as a result of students engaging in with peers that are more knowledgeable or adults. This model of learning is also known as Zone of Proximal Development (ZPD). The ZPD refers to the difference between what students can do without help and what they can achieve with guidance and encouragement from a skilled partner. Children seek to understand the actions or instructions provided by the tutor then internalize the information, using it to guide or regulate their own performance (self-regulation) [57].

The ZPD has become synonymous in the literature with the term scaffolding. However scaffolding was introduced later on by Wood, Bruner and Ross (1976) [61].

Scaffolding refers to the number of the activities provided by the educator, or more competent peer, to support the students as they are led through the zone of proximal development. It is a key feature of effective teaching, where the level of help is adjusted in response to the learner's level of performance. Support is withdrawn when it becomes unnecessary, in the same way as a scaffold is removed from a building during construction. The students will then be able to complete the task again on their own [62].

It is noteworthy that the terms cooperative learning, scaffolding and guided learning all have the same meaning within the literature.



Scaffolding in action

Effective ways of implementing scaffolding in the classroom could be modeling a skill, providing hints or cues, and adapting material or activity [63].

Some guidelines for scaffolding instruction that might also be used are to:

- Assess the learner's current knowledge and experience for the academic content.
- Relate content to what students already understand or can do.
- Break a task into small, more manageable tasks with opportunities for intermittent feedback.
- Use verbal cues and prompts to assist students [64].

Scaffolding's positive effect is not only that it produces immediate results, but it also instills the skills that will lead to independent problem solving in the future.

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J. Dewey believes that the child should desire to learn and be active in the learning process. According to him, learning derives from action-knowledge and experiences should have meaning and importance to the children. With his method of progressive learning, he emphasizes on learning by doing, problem solving and critical thinking, group work and development of social skills, social responsibility and community service and service learning projects. It could be acknowledged that Dewey contributed the idea that schools had to bring real world problems into the school curriculum [65].

Constructivism in action

Below, we will report on some methods and key-factors through which constructivism can be actualized in the classroom:

Prior knowledge. According to constructivists, prior knowledge is a determinant constitute of the learning process. It is quite often that while in problem solving, people use any similarities found between existing knowledge



and a new problem to remind them of what they already know [66]. This emphasizes the interaction of old and new knowledge. In a nutshell, only when learners code, process, and construct their unique understandings, based on their previous experiences, it can be real and meaningful learning.

Therefore, teaching should take students' previous knowledge and experience as the growth point of new knowledge, and encourage them to generate new knowledge from the former. After all, when information is not connected with a learner's prior knowledge, it is quickly forgotten [67].

To be more practical, there is the constructivist learning cycle that helps students to build knowledge off of the previous step, which is defined by the 5 E's: Engage, Explore, Explain, Elaborate and Evaluate [66].

Real and authentic problems. Giving real and authentic problems, like the Lifeforce BLS-Algorithm, stimulates the active participation of learners in problem solving and critical thinking. In order to provide relevant information for solving the problem but also to create a realistic context, rich and realistic video context could be provided [68].

Cognitive conflict. Piaget, based on Dewey's "opposed responses" of the mind, has set the cognitive conflict or the internal experience of opposing contractions as definitely central in cognitive development [69].

This was later developed into the equilibration model describing inner self-regulations [70].

In a nutshell, cognitive conflict (or disequilibrium) is a mediating step, the moment when a child realizes that s/he holds two contradictory perspectives about a situation and they both cannot be true. It is the moment that s/he picks up and holds on to the knowledge that has utterly been constructed by her/himself [71].

When working with cognitive conflict in classrooms, negotiation might also occur between students, as this process involves discussion and attentive

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listening, realizing the points of views of others, and comparing personal meanings [72].

The teacher's role. In learning, students are the subject of teaching. Without students' initiative participation, the learning is meaningless. In teaching, teachers are the subject of teaching [73]. Teachers' goal is to inspire and guide students to learn knowledge effectively. Consequently, teachers should create a favorable teaching environment for students based on their initiatives and interaction in teaching, on exploration learning and cooperative learning and on previous knowledge and experiences as well. Acting this way, students can improve their cognitive ability continuously. Teachers can assist students in acquiring and constructing the positive technique, the affection, the attitude, and the habit in learning [74].

Educational Psychology

Constructivism is considered an integral part of Educational Psychology, a science concerned with how people learn and retain new information, the basic principles of which we will use in our pedagogical framework.

Educational Psychology, focuses on *the interaction of the learning environment with children's thoughts, feelings and actions, self-regulation, the motivation for active participation and the self-construction of knowledge.*

Although cognitive processes used to be of main importance in learning approaches until recently, it is nowadays accepted that **learners have an active role** in forming and controlling their learning and knowledge.

According to Educational Psychology, there is **not only one way of teaching and learning** to be applied to all. This comes as a result of the plurality of factors that are involved in the learning process, such as mental potentiality, prior knowledge, developmental stage and environment.



Main target is defined to be the achievement of effective and consistent learning. We will now take a quick look at the basic components of effective learning.

Basic components of effective learning

To begin with, this requires at least a minimum level of **cognitive skills**, such as information processing, memory (short-term and long-term), concept of sequence, time and space relations, mathematic and linguistic skills, comprehension, descriptive ability, etc. in accordance with a healthy functioning brain. Cognition also depends on the short-term memory, which is of limited space and endurance and differs from learner to learner. People with effective cognition can make an excellent use of their short-term memory capacity. Children's development increases their short-memory capacity and that improves their cognition.

Furthermore, people with effective cognition have a rich **variety of strategies**, such as plan making and action planning and methods, such as repetition and re-consideration.

Meta-cognition and **self-awareness** are considered to be indicators of effective cognition as well. Meta-cognition means to be aware of the strategies that one owns and in which way(s) it is for one's best advantage to use them.

Powerful (self-) **motivation**, **positive self-perception**, **emotional control and recognition**, along with a **rich in stimulations environment** are also necessary and of great importance.

3.1.2 Learning Theories

In this part of the report, we are going to describe the learning theories of our approach. These are Bloom's Taxonomy and Universal Design for Learning (UDL). The basic reasons we chose them are because:



- of the cognitive-critical thinking gradation which satisfies the knowledge gradation in our approach of the BLS concepts in different children age stages.
- there are multiple educational opportunities for different teaching/learning styles in inhomogeneous groups in the context of inclusive learning.
- they are methods which can successfully and effectively be applied in all the curriculum thematics.

3.1.2.1 Bloom's Taxonomy

Bloom's Taxonomy is a pedagogical framework applied in learning and elaborated by Bloom (in 1956 and revised in 2001), which promotes critical thinking and constructive knowledge [75]. It is a multi-tiered model, a pyramid of classification of thinking behaviors that are considered significant in learning and correspond to different cognitive levels of learning. There are six levels of Bloom's Taxonomy: Remembering, Understanding, Applying, Analyzing, Evaluating and Creating [76]. The concept is that each category is based on the previous one and constructs one level higher in complexity of abstraction.

On the left side of the following page, we see the revised version of Bloom's Taxonomy (2001) [75] and on the right side how the Lifeforce BLS-Algorithm could be applied accordingly.



Revised pyramid of Bloom's Taxonomy (2001)

(Armstrong, 2010)

■ **Create:** Compose a free choreography with lyrics to present the steps of the algorithm

■ **Evaluate:** different environments in which the algorithm may occur

■ **Analyze:** Break the steps into smaller parts and examine each part thoroughly

■ **Apply:** the steps of the algorithm by demonstration

■ **Understand:** the steps of the algorithm

■ **Remember:** the steps of the algorithm



To explain the paradigm of the taxonomy above, we shall begin from the basis of the pyramid to define the progression as we will be moving upwards to the top. We should underline that all three suggested teaching approaches and methods (creative movement, drama games, kids yoga & mindfulness) are suitable and will be implied through this learning theory.

On the first scale, children should be able to **remember** and just name the steps of the Algorithm in the right sequence: Safety, Response, Check for breath, Call 112, Circulation.

Then, they should be able to explain the steps of the Algorithm and what is happening in their own words (**understand**).

Next, children should **apply** the steps of the Algorithm by demonstrating them.

We should note that the first three levels of Bloom's Taxonomy (Remember, Understand, Apply) are known to be the **LOTS**, meaning the Lower-Order Thinking Skills, in comparison to the next three levels (Analyze, Evaluate, Create), the **HOTS**, meaning the Higher-Order Thinking Skills. The HOTS differentiate in difficulty from the LOTS and therefore will be adapted accordingly for younger children (6-8) in the planned activities.

Children should then be able to break the steps of the Lifeforce BLS-Algorithm into smaller parts and examine each part by identifying their causes (**analyze**).

Next level, children should be able to **evaluate** different environments in which the algorithm may occur by making the right decisions and justifying their opinions.

Finally, children reach the last level, **creation**, which, in this case could be to compose a free choreography with their own lyrics in order to present the steps of the Algorithm.

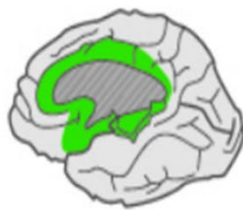
3.1.2.2 UDL (Universal Design for Learning Guidelines)

Our last but not least learning theory to present is UDL, a Universal Design for Learning Guidelines, which began to form by CAST stuff in the late 1990s, aiming for effective ways of inclusive learning. Rose & Meyer developed UDL in education

through their book (2002) and stated that a “one-size-fits-all” curriculum is impossible to connect to a constantly soaring in diversity students’ population [77]. They based UDL on the edge-cutting insights of brain development, learning and digital media [78].

To be more specific, UDL ensures that the three main brain networks of learning, meaning the Networks of Emotions (Affective), Recognition and of Strategy, are activated (as illustrated in the following picture from the left to the right).

Universal Design for Learning Guidelines



Provide Multiple Means of
Engagement
Purposeful, motivated learners



Provide Multiple Means of
Representation
Resourceful, knowledgeable learners



Provide Multiple Means of
Action & Expression
Strategic, goal-directed learners

(CAST, 2011; Meyer, Rose, & Gordon, 2014)

Affective networks answer the “why” of learning, aiming to provide multiple means of engagement to children and control their emotional involvement with learning.

Recognition networks are responsible for the “what” of learning and aim to provide multiple means of representation to the children to help them form their own concepts of knowledge.

Strategic networks are about the “how” of learning and aim to provide multiple means of action and expression to help children plan, execute and watch over their actions (<http://udlresource.ca/2017/12/udl-core-principles-and-the-brain/>)

Our aim is to create alternative versions, which means we recognize that no single option will work for all students. Including the power of digital technology helps to present the content to the students in multiple ways in order to facilitate their learning.

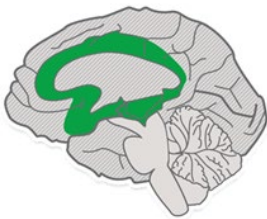
For example, through image, text and video a multiplicity of representations can be provided and by modifying a presentation, using size and color of text or loudness of sound, more inclusive learning outcomes can be achieved [79].

To actualize this learning theory, we shall see below the options that our lesson will provide with the use the use of our previously described teaching methods (**creative movement, drama games, kids yoga & mindfulness**) and with the use of **digital media** as well. So, according to the UDL's guidelines and depending on which brain's network we activate:

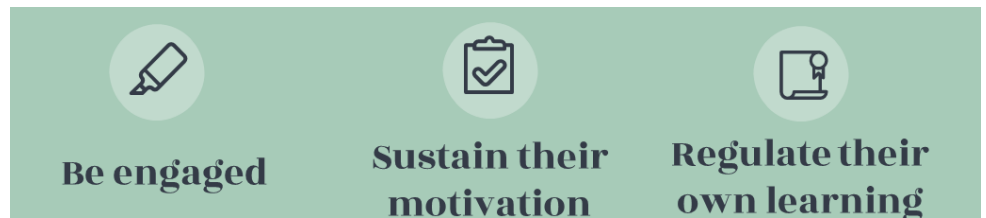
Affective

- Students will be **engaged**, sustain their motivation and regulate their own learning

AFFECTIVE NETWORKS:
THE **WHY** OF LEARNING



(Cast.org)



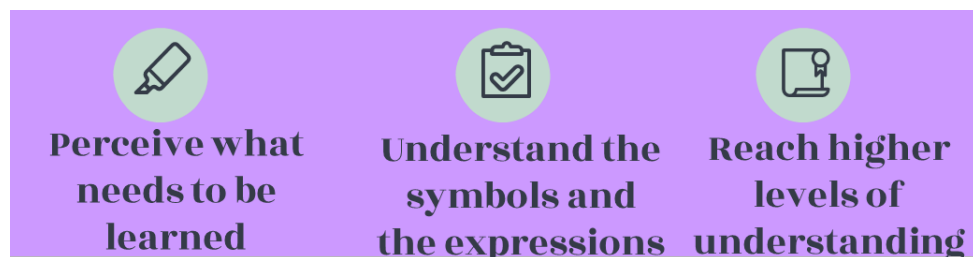
Recognition

- Students will perceive what needs to be learned, **understand** the symbols & the expressions and reach higher levels of understanding.

RECOGNITION NETWORKS:
THE **WHAT** OF LEARNING



(Cast.org)



Strategic

- Students will respond physically, **express** themselves fluently and act **strategically**.

STRATEGIC NETWORKS:
THE **HOW** OF LEARNING



(Cast.org)

Our goal is to activate all three brain networks (affective, recognizing and strategic) and succeed in an **inclusive** and **transformative** learning for all children.

3.1.3 Educational Methodology

In the second part of the report we will present the Educational Methodology along with the Learning Theories that will be used, introducing an innovative approach to pre-train school children in resuscitation and other aspects of first Aid.

In addition to the teaching methods that are being analyzed in the other chapters of this overview, we have chosen to teach the algorithm through Creative Movement, Drama Game and Kids Yoga & Mindfulness, Music, and Social and Emotional awareness, which we strongly believe are extremely useful, suitable and effective means. Music, and Social and Emotional awareness will be analyzed in separate chapters.

3.1.3.1 Creative Movement

Creative movement is a combination of kinetic and verbal activities and is considered to be part of holistic learning. Holistic learning is a method that uses both the body and mind as a way for understanding [80]. Especially, in the Lifeforce BIS-Algorithm that training includes both theory and practice, children should involve both their mind and



their body in order to understand or construct their knowledge and also get fully and evenly trained in every required level.

Through multiple social, cooperative and didactic movement games, children use movement of their body to express, construct and create a variety of educational contents. The approach of creative movement stimulates them to communicate, create and learn.

Contemporary researches on the brain stress the use of kinesthetic learning, including **embodiment**, as a basic aspect of cognitive development. Embodiment means that the brain is in a body which is set aside in a physical and social environment [81]. This is congruent with Dewey's view, who supports that learning appears when the body and mind intersect and become engaged [82].

Every child should have access to multivariable approaches and the capacity to learn in many different ways. Bodily-kinesthetic intelligence is unfortunately one of the most undervalued in schools although it is recognized as one of our multiple intelligences [83].

Constructing knowledge

In this kinesthetic level of learning, children **construct their own knowledge** as they become familiar with making use of their observations and experiences as their own solid knowledge basement. This way, they learn how to depend on themselves and increase their self-esteem on constructing knowledge, which can be transmitted to other learning circumstances as well [84].

It is also recommended as an innovative way of **making more complicated and less comprehensible concepts and ideas easier for the children to understand**. In addition to this, the pleasant way that playing and moving makes the children feel, leads to better academic results and **a longer lasting knowledge** as children are connected with *positive feelings* [85].

Benefits of Creative Movement

In brief, this method's positive effects are obvious in all fields of children's development, the socio-emotional, cognitive and psycho-motor, including children with special needs (particularly with restless and hyper active children).



The benefits of creative movement are multiple and on a great scale. Each moment of creative movement includes investigation, expression, creativity and communication.

Creative movement helps children to:

- Activate their bodies and senses
- Engage experientially in exploration and learning
- Comprehend concepts and themes
- Develop and improve their higher-level thinking skills
- Interact, cooperate and collaborate with each other
- Communicate in unique ways and appreciate the expression of others
- Become more receptive to the learning process [86]

Through Creative movement children will become familiar with:

- Space-orientation (developing spatial awareness)
- Body awareness (the ability to recognize the position and movement of body parts in relation to muscles and joints or how conscious and connected children are to their own bodies)
- The beat and the rhythm of the heart
- Recognizing signs of life in the body (for example, shaking of one's foot or arm)
- Recognizing self-building in space and in relation to other children

We should underline that body awareness as well as the other positive effects of creative movement are most crucial to the program as Lifeforce BLS-Algorithm is totally connected with the body and the sense of the body that we aim to cultivate in children brings them closer to the concept of our whole project.

3.1.3.2 Drama games/ Drama-based Pedagogy

Dramatic play is familiar to children as one of the basic ways in which they learn even before attending school. Drama games use ingrained skills (such as imaginative thought, role-play, make-believe) to internalize children's comprehension of subjects and topics through active and fun engagement with their peers [87]. Hence, drama games, besides from being child-friendly, are also an effective way of learning as children express themselves without fear, something that accelerates learning [88].



Drama games include: creative speech (activating dialogue, role-play) movement, dance and imitation. All these teaching tools but especially role-playing and real life BLS scenarios **will have a central part in Lifeforce program**, thus the BLS-Algorithm training will be based on a great scale on these, as they make up of a great pathway to an automatized response for children to a crucial situation. Scenario simulation is also suggested by ERC as an educational way of learning skills to provide high-quality resuscitation [89].

Drama-based pedagogy (DBP) is defined as a compilation of drama-based teaching and learning strategies in a way which **promotes the constructivist learning outcomes** mentioned earlier in this report. In other words, DBP engages students in learning in an active way, uses embodiment (the body and its experiences, in cooperation with the mind), creates a student-centered classroom, emphasizes dialogic meaning-making, helps students construct new ideas or perspectives while interacting with their peers in a collaborative and non-competitive way [90].

All the above concur with the model of constructivism, including Dewey's, Piaget's and Vygotsky's theories which we saw earlier. In particular, DBP agrees with Dewey's belief that students learn better by actively doing rather than listening and that understanding will come out as a product of action. Also with Piaget's theory, regarding learning to be active and authentic and teaching to be "indirect" [91]. Accordingly, with Vygotsky's position, who is arguing that students and teachers need to be part of a sociocultural pedagogical approach using problem solving (here, through role-playing) as a way to develop learning and knowledge [92].

DBP **appeals to a wide range of children** and encourages them to take fully part in learning while using several of Gardner's multiple intelligences, meaning engaging their bodies/senses, minds, and emotions [87], which they do by demonstrating and observing in a non-threatening environment [93].

Benefits of DBP

DBP has been proven to have multiple benefits in a learning skills. In accordance to the Lifeforce Algorithm, through drama games:



- Children **engage in active participation in real life scenarios**, by working out confusing, unknown, or new life issues, like BLS. As a result, they prepare for similar situations and become more comfortable with them via role-playing [94].
- Children **develop important cognitive and higher order thinking skills**. Drama games promote advanced thinking strategies, communication, language and cognitive skills (visual and auditory perception, attention, memory, critical thinking and processing speed), such as problem solving, decision making, concentration, taking turns, responsibility, management and organizational skills, creative thinking, descriptive language [91].
- Children **cultivate social and emotional intelligence**. More specifically, they develop empathy and understanding, emotional recognition and regulation, confidence, trust, self-esteem, self-acceptance and acceptance of others, cooperation, coordination [95].
- Children **create knowledge and skills**. Drama games encourage an exchange of knowledge between the students, which is all they need in order to blend their skills and knowledge together [96].

Additionally, through drama games, children begin to realize the significance of shared space, time, attention, information and ideas.

We should note that **communication** as well as **social and emotional intelligence** are mentioned to be of unique importance to perform resuscitation in every given level, according to the ERC [89].

There is a famous quote by Xunzi (Xun Kuang), a Confucian philosopher: "Tell me, and I'll forget. Show me, and I may not remember. Involve me, and I'll understand", which successfully summarizes all that has been said about Drama-Based Pedagogy and learning.

3.1.3.3 Kids Yoga & Mindfulness

Kids Yoga is a form of modern yoga designed for children. It is a holistic system of practices that includes exercises/poses, breaths, philosophy, team spirit and play. Kids yoga is intended to be fun and may include age-appropriate games, animal sounds and creative names for poses [97].



Mindfulness, is closely related to yoga and refers to the art of paying attention with intention. Kids mindfulness, includes age-appropriate fun games which connect children to either of their senses and therefore to the present moment, turning them into conscious and attentive [98].

Kids yoga is a fun way for children to cultivate important cognitive, social-emotional and physical/movement skills in a non-competitive environment. Recent researches have shown positive effects on several factors.

Cognitive

- Attention/Focus/Concentration
- Memory

Mental benefits include cognitive efficiency, specifying in enhanced concentration and memory, increased focus and attentional control, along with stronger mind-body connection [99-102]. Memory and especially working memory is an essential skill for the implementation of the Lifeforce BLS-Algorithm in order to proceed successfully throughout all the algorithm steps. It is necessary so as to remember the sequence of the algorithm steps as well as the information that each step includes. The same applies for attention, as children need to know how to focus, especially when an unexpected OHCA (Out of Hospital Cardiac Arrest) occurs and they are called to correspond in numerous demanding tasks simultaneously and continuously.

Social-Emotional

- Emotional recognition
- Self-regulation
- Body awareness

Social and emotional benefits include an improvement of skills in identifying emotional states of other people and themselves, or in having more awareness of self and others. This, helps significantly the children in order to make the decision to act in urgent situations and not flee from them (Flight). Self/and others awareness, in sequence, promote more positive social interactions and increased skills in problem solving and conflict resolution as well [99, 101].



Furthermore, it is an effective and feasible way to help children develop skills in stress management and emotional regulation. Students learn self-regulation techniques and several skills to de-escalate negative emotions, promote calm, reduce stress, relax and cope with stressful situations [103, 104] so that they act calmly and use their newly-acquired skills without the fear of making mistakes in unexpected and uncomfortable situations.

These skills are used in settings including the classroom, outside and at home when experiencing frustration and upset. Having an inner dialog, is one of the strategies that children have reported to use for calming down and self-soothing [99].

Kids yoga provides valuable tools for learning by assisting children to develop self-awareness, selflessness, compassion, resilience, self-esteem, and to cope with emotional arousal (Fight, Flight, Freeze) and negative thought patterns as well [100, 103, 105].

It also increases children's body awareness and mindfulness, it teaches discipline and reduces impulsivity, and it cultivates greater optimism and a less reactive nature [101, 102].

Physical/Movement

Physical benefits include optimized flexibility, improved balance and coordination, and increased core and body strength through movements [97, 99, 101, 102] so that children will be able to apply automatically and accurately the skills of the Lifeforce BLS-Algorithm.

Last but not least, through the philosophy of yoga, children will internalize useful values for the Lifeforce BLS-Algorithm such as the **respect for the value of life of oneself and others** and the **acceptance of unfortunate situations** that may occur to them, which in sequence leads to **enhancing willingness to perform CPR** and **reinforcing the chain of survival**. These are also mentioned by ERC as key-points in resuscitation education in order to provide high quality resuscitation [89].



Researchers generally recommend an early start on healthy mind-body practices especially during the potential developmental “windows of opportunity”, as such practices lead to forming habits encouraging to learning, health and well-being.

3.1.3.4 The use of music in L.I.F.E.F.O.R.C.E: Methodology and tools

Adamopoulou Christiana & Etmektsoglou Ioanna

Music has always been a popular teaching tool for kindergarten and elementary school teachers. Songs, music mnemonics and activities involving music and movement are only a few examples of how music is used to help children learn in the classroom. There are many reasons for that: Music is a fun activity, it is highly connected with movement -which is vital for learning especially in younger ages- it helps students to focus, concentrate and stay motivated. It is also a group activity that promotes bonding and cooperation.

The use of music in L.I.F.E.F.O.R.C.E pre-training educational material aims in fostering a wide range of skills that elementary students need to develop as part of their preparation for future training in CPR. Abilities like critical thinking, creativity, collaboration, communication, flexibility, adaptability, and initiative need to be developed and acquired throughout the pre-training. Music is a stimulus that may influence factors related to learning [2], ranging from attracting students' interest to supporting the memorisation of BLS key concepts.

This report consists of two main sections. The first section presents selected findings from research carried in the fields of music psychology, neuroscience, music education and music therapy concerning the specific features of the music and songs that the authors consider important for designing a music activities tool kit for the new, adapted L.I.F.E.F.O.R.C.E. algorithm. The second section integrates the theoretical and applied perspectives, by presenting music-driven educational approaches and specific examples in an attempt to illustrate why and how particular music material and activities will be created and/or applied as facilitating agents in the teaching-learning tasks of the L.I.F.E.F.O.R.C.E program. In addition to ensuring that the children will build an accurate and durable memory of the L.I.F.E.F.O.R.C.E materials and skills, the music embedded activities are intended to facilitate access to learning for all



students; students experiencing a wide spectrum of differences and disabilities, making thus the L.I.F.E.F.O.R.C.E training a more inclusive educational paradigm.

Considerations for the Development of Music Material

Music Familiarity

Pleasant music can certainly motivate students to get engaged in the learning process. Children 's musical preferences contribute significantly to the degree of their response to the proposed music material. Music preferences are influenced by many factors related to personal, cultural, and musical variables. Meyers (2012) refers to a broad categorization that includes intrinsic musical qualities and extrinsic qualities [106]. The umbrella of intrinsic qualities involves inherent music characteristics such as structure, melody, and timbre, while the extrinsic qualities include personality, social influence, and emotions. Music taste changes over lifetime, and since music is experienced in an incredibly wide variety of circumstances it is very difficult to isolate the factors that shape personal preferences. It follows from the above, that there are not clear answers concerning the “right” style and repertoire when designing the songs and the activities for elementary students. However, it can be inferred from related literature that there are certain music characteristics that would inform the author’s criteria for the implementation of L.I.F.E.F.O.R.C.E original music material.

Familiarity seems to have an effect in emotional responses to music. Research demonstrates that “familiarity and repetition may increase the liking of a piece of music, thus inducing positive emotions” [107]. A meta-analysis of neuroimaging studies identifying the brain regions involved in the processing of familiar and unfamiliar musical stimuli, revealed that music familiarity had a pattern of activation of motor areas. As Freitas et al. (ibid) point out, motor patterns of activation “could reflect an audio-motor synchronization to the rhythm which is more engaging for familiar tunes, and/or a sing-along response in one's mind, anticipating melodic, harmonic progressions, rhythms, timbres, and lyric events in the familiar songs” [107].

While the expectation of predicted events in music enhances engagement leading to a better synchronization, the complete absence of surprises, precludes learning. Completely predictable events offer no new information, resulting in withdrawal of interest. As Gold et al. (2019) point out “random surprises are equally unhelpful



because they're indecipherable. An intermediate degree of predictability (i.e., a manageable challenge) therefore enhances learning, piquing curiosity and attention in the process” [108].

In sum, a careful balance between novelty and predictability in music material would positively affect the levels of enjoyment and synchronicity resulting in sustained interest and active participation in the classroom.

Melody – Text Integration

A song is a combination of melody and text. Melody (or tune) is the linear succession of musical tones that the listener perceives as a single entity. As already mentioned in previous sections, elementary teachers are familiar with the use of songs to help their students learn new skills and sometimes to reinforce what they have already learned in class [109, 110].

The notion that music can enhance learning and memory was supported mainly by evidence with patient populations with memory deficits including Alzheimer’s Disease, stroke, and aphasia [111, 112]. Research studies also with healthy individuals demonstrate that music can support memory [113, 114]. Despite the positive evidence about the effective use of music to help memory performance, other authors [115] have shown that music might negatively affect memory by attracting patient’s attention away from the task information (such as words to learn or remember).

It is not our aim to go in depth on this debate, nonetheless it would be useful to focus on specific observations deriving from various and divert research data concerning the use of melody as a tool to enhance verbal learning and memory. This kind of observations can promote our understanding on how text-melody integration in songs composed for L.I.F.E.F.O.R.C.E would be more effective in enhancing children ‘s learning and memorizing of new information.

Wallace (1994) was the first who conducted a series of experiments concluding that the use of songs can facilitate verbatim text recall. Wallace reported that songs can facilitate learning and recall of a text compared to a spoken version of the same text. An interested limitation in Wallace’s research is that song facilitates text recall, only if the melody is simple and easy to learn. Also, symmetry in melodic contours seems to affect text recall [3].



In another research study, carried by Kilgour et al. (2000), the authors demonstrated that the recall for sung lyrics was superior to that for spoken lyrics. However, when presentation rate was manipulated so that the durations of the spoken and the sung materials were equal, there was no advantage for sung over spoken lyrics [116].

The effectiveness of using melody as facilitating component in text recall is demonstrated in the research of Ludke et al. (2014) about short-term paired-phrase learning in an unfamiliar language (Hungarian) [117]. In three “listen-and-repeat” listening conditions including a) speaking b) rhythmic speaking and c) singing, participants in the singing condition showed superior overall performance on a collection of Hungarian language tests after a 15-min learning period, as compared with participants in the speaking and rhythmic speaking conditions. The findings of Ludke et al. (ibid) are in line with other studies that have shown that pitch information provides an additional musical cue (different from a prosodic cue) which can support retrieval and recall [118-120]. Yalch (ibid) also suggested that the sung phrases found in advertising jingles might emphasize the phonetic aspects of verbal information more than the semantic aspects, thus leading to more effective verbatim recall [120]. Yalch (ibid) also suggests that melody may help in retaining verbal material in long term memory [120].

In conclusion, the indications from research regarding whether learning verbal material with a melody can provide benefits for learning and memory are strong. However, it is important to note that certain parameters shown in studies presented above should be taken in consideration when composing songs for L.I.F.E.F.O.R.C.E.

Rhythm as Organizer of Time

Rhythm in music is the placement of sounds in time. The word rhythm derives from the Greek word rhein “to flow” and in its most general sense, rhythm occurs in other arts as well as in nature (<https://www.britannica.com/art/rhythm-music>).

In music, rhythm is an indispensable element of a composition. Music unfolds across time and its temporal qualities -pulse, tempo, and rhythmic patterns- that people can perceive seem to have a strong link to movement. The urge to move while listening to music is universal among humans and over the last two decades, research applying a wide spectrum of methodologies can demonstrate how the temporal factors of music “move us” [121].



The ability for beat synchronization (rhythmic entrainment) is inherent to humans and as studies demonstrate it improves with age [122]. Adults can tap along close to a beat better than children. Also, there are strong indications that music experience through the life span is linked with better tapping performance [4]. Therefore, children's inherent skills of "keeping the beat" can be maintained and reinforced through listening, accompanying music, and performing easy body percussion activities.

Literature shows that the use of rhythmic patterns as a mnemonic device is an effective way of retaining information in short-term memory [123] while other studies propose that the inclusion of the melodic component improves verbal recall as mentioned in previous sections [119, 120].

It is not easy to identify which subcomponent of music affects specific forms of learning or memory due to the complex nature of music and the diversity of research paradigms and methods used [2]. However, it is apparent that the temporal qualities of music seem to affect memory performance. According to Thaut et al. (2005), "through the temporal order of music, a structure of units or chunks of learning items emerges that has two advantages for effective learning: (1) the units are separable and manageable in length and (2) the items within the units are interrelated through their temporal position in the melodic-rhythmic pattern." [124]. In other words, music provides a temporal scaffolding framework that attracts attention, allows direct anchoring between words and the musical stimulus, thus facilitating learning [2].

Harmony – Accompaniment

Harmony is one of the three main elements of music. The other two -mentioned above- are melody and rhythm. Harmony is the use of two, three or more notes played simultaneously, named chords. Chords are often used to accompany a melody - tune forming a cohesive whole. The alteration between dissonant and consonant chords, provides music with interest and vitality. There are many ways that a tune can be accompanied: the selection of the chords accompanying a tune can enrich or/and transform the emotional content of the composition.

Sloboda (1991) constructed a list of musical features that produce particular physical responses. He suggested that certain harmonic sequences tended to produce "tears" response to the listeners, while other harmonic sequences (new or unprepared harmonies) tended to produce "shivers" response [125].



It emerges that the harmonic accompaniment and its development in time functions as a generator of emotional engagement [5, 6]. Appropriate use of harmonic sequences in songs and music activities composed for L.I.F.E.F.O.R.C.E. could support the communication of the affect proposed and enhance emotional valence.

Applications of Music in L.I.F.E.F.O.R.C.E

Music will serve several functions in the design and application of L.I.F.E.F.O.R.C.E. It will be used as a medium intended to:

- increase learners' (teachers' and students') motivational level and active participation,
- foster the development of aural perceptual discrimination, specificity and flexibility,
- teach and reinforce the perception and physical simulation (through hand movements) of the steady heartbeat in the right tempo,
- facilitate learning and memory of theoretical and procedural information,
- increase the degree of realism in teaching scenarios and games,
- cultivate empathic emotions towards the victims of the scenarios,
- regulate students' emotions during learning and in real life crises.

In the following sections we will present specific approaches and examples of activities, with the intention to demonstrate ways in which music -as an integral part of the L.I.F.E.F.O.R.C.E program- will be applied in the service of essential perceptual, cognitive and emotionally infused tasks.

Music in the Service of Perceptual and Cognitive Tasks

Keeping the Beat...

One of the most important meaningful sounds that children will focus on during the L.I.F.E.F.O.R.C.E training, is the heartbeat. The identification of the heartbeat, and the discrimination of its regular or irregular nature is a very important task. To accomplish this, the sense of touch as well as that of vision could collaborate with hearing. Young children could be encouraged to 'find' the heartbeat in the human body, starting with



their own body. Music could be a facilitating tool in learning to quickly identify the 'beat'. Several listening, playing, and singing games could reinforce the finding and keeping a steady beat, first with the assistance of an outside stimulus such as a recorded piece of music or a metronome, and later on without the assistance of the outside aural stimulus. The aim here would be for the young child to perceive the possible existence of a heartbeat and also to internalize the stability and appropriate speed of the heartbeat, as a preparatory skill which would be applied in his/her future training in BLS. Working towards this aim, the trainers could select and recommend a number of appropriate, well known and children-liked songs, which are available on video and are performed with the right tempo.

Basic Anatomy

Being able to identify and name accurately the parts and organs of the human body is another skill that is necessary when a child has to describe to First Aid personnel on the phone, the condition of a person who has been seriously injured. Songs could be used as a fun way to refine or consolidate the necessary knowledge about basic human anatomy. This knowledge could even be related to the anatomy of some animals.

Sounds - Music and Serial Recall

An extra level of difficulty is added to learning and memorization when the task to be learned has a sequential nature, something that characterizes many of the L.I.F.E.F.O.R.C.E learning tasks. In these cases, the steps should be rehearsed time after time in the right order so that the learner will be able to eventually built a strong and long lasting procedural memory trace. The steps to be taught could be introduced in a song either in a sequential order as they unfold in time (i.e. a, b, c, d, e...) or additively (i.e. a, ab, abc, abcd, abcde...) with every step being added to the one/s that have preceded it in the correct order. While the first type of song may facilitate the establishment of the sequential memory trace to long term memory, the second might place more emphasis in strengthening the child's working memory when she/he tries to remember what she/he had sung the previous time, to which she/he should add the new step that has to be retrieved from her/his long-term memory.



According to Banbury et al. (2001), “sound appears to have obligatory access to memory” [126] and is being processed at least at a rudimentary level by our brain, even when our attention is not directed on the particular acoustic signal/s. Not only loud but even soft sounds may interfere with our efforts to recall and perform serial tasks. It seems that sounds and music, by being stimuli that develop in time, require for their processing access to brain organizational activities such as seriation, causing thus interference with any other activities involving serial processing. Recalling the steps or sub-steps of the BLS algorithm involves serial processing. Therefore, in real life scenarios, the task of accurate retrieval and performance of the steps in the right order is susceptible to interference from irrelevant sounds such as ambient noise, the voices of bystanders, etc.

The L.I.F.E.F.O.R.C.E program, taking into consideration the potential interference of various non pertinent sounds on the accurate recall and expected actions of the young child, would develop exercises that would simulate sound environments of real accident scenes, asking the children a) to identify all sounds heard in particular examples and distinguish the ones that are relevant from the ones that are irrelevant, and b) to recite, sing, or perform-dramatize the BLS steps/sub-steps, despite the noise that would be intentionally created by other students.

Focused and Sustained Attention, Organisation, Repetition

Learning new and often difficult concepts could be cumbersome for the young learner. Focused and sustained attention is required by the child at all instances of the learning activity, while practice-repetition is necessary so that the information learned would move with accuracy from short-term to long-term memory. Enjoyable music with a clear structure may function as a constant motivator, sustaining attention to the task during the numerous necessary repetitions. At the same time, it may function as a memory facilitator by organizing and keeping information contained in meaningful short chunks and by embedding internal repetitions (i.e. refrain of a song). In the L.I.F.E.F.O.R.C.E program, especially composed or carefully chosen familiar songs--preferably with appropriate accompaniment--could fulfil successfully this important attention capturing, motivating, information structuring and repetition fostering role. An example of a type of knowledge that could be introduced or practiced in



L.I.F.E.F.O.R.C.E through a song is the identification of the right and left side of an injured person, when the child faces the other person's front or his/her back.

Music in the Service of Emotions

Songs as 'Containers' for Memory and Emotions

The retrieval of information is proven to be best when the context of retrieval is the same with that of encoding the information [127]. The real-life accident scene is not the same with the classroom where life-saving skills are learned in the L.I.F.E.F.O.R.C.E program. Just by itself, the difference in the context would not facilitate long term memory in children who have learned in class how to react in accident scenes. A further interference in accessing long-term procedural memories acquired during L.I.F.E.F.O.R.C.E could be attributed to the very strong emotions felt by the child when facing trauma in a real-life scene.

Considering the above, information learned in L.I.F.E.F.O.R.C.E (especially procedural knowledge) should become over-learned and automatized. Needless to say that a song, preferably in connection to movements, could be a very efficient tool for accurate and long lasting memory of the basic steps of the adjusted BLS algorithm as well as their sub-steps. Songs could function as 'melodic containers' which would protect knowledge from interferences from time, context differences and emotions. In a real-life emergency situation therefore, a young child would be more likely to remember under stress the steps he/she would have to take i.e. before making a call for help, if these steps were encoded to memory through a well learned song with movements and not through the mere memorisation of a list of verbal instructions.

Developing Empathy: Music as the 'Virtual' Other

When listening to music, areas of the brain implicated in trait empathy and social cognition seem to be activated [128]. It seems that music could be felt as a 'virtual' person and thus potentially it may change our view of real persons [129]. The development of empathy in children is an important objective of an educational program which aims to teach young children to become actively involved in attempts to protect or help save a life. Empathy is a powerful intrinsic motivator which augments the child's active engagement during learning in school and during real-life situations in community. In the L.I.F.E.F.O.R.C.E program, songs would be selected or



composed with the intention to cultivate children's empathy. Such songs, would describe in the lyrics the physical discomfort and pain as well as the emotions of a person in a traumatic situation (for example a child who has fallen from his/her bicycle, a dog who was hit by a car etc).

Among the musical tools, one which is available as a generator of emotional engagement is harmony; the harmonic accompaniment and its development in time [5, 6]. A harmonic sequence could regulate the emotional state and augment the emotional contagion of the listener. Its powerful effects could be maximized when the accompanying music is being performed at an appropriate tempo and style and by suitable musical instruments (timbre). This type of harmonic accompaniment could be coupled with an empathy raising song or with a story-scenario of injury which will be narrated, dramatized by the children through action and movements, described through images (as in cards) etc.

Music as Emotional Regulator

Music's function as a regulator of emotional states has been researched and reported in the context of every day listening by average people [130, 131] as well as in the context of teaching – learning environments [132]. In L.I.F.E.F.O.R.C.E., learning about systematic ways to help people who have suffered and may face loss of life, even when done through simulations, games and descriptions, may lead to the development of strong emotional states, sometimes negative and at other times positive. Additionally, not all children would necessarily be experiencing the same emotions at the same time. Music in the form of songs and/or instrumental accompaniments could assist in regulating the emotional states of individuals and the group in the classroom a) by 'moving' the overly aroused students to more relaxed states and the overly unresponsive to more aroused emotional states, b) by fostering a more homogeneous, communal group emotional state and c) by creating 'safe' instrumental or vocal musical structures as accompaniments to mind-body exercises of yoga, relaxation and mindfulness.

Conclusion

Music will assume multiple functions in the L.I.F.E.F.O.R.C.E program. The first part of this report presented research evidence regarding the facilitating role of music in



learning and memory. It also identified relevant issues regarding the degree of familiarity, melody-text integration in songs, and the role of rhythm and harmony as they relate to teaching and learning. These issues will inform the writers' decisions in selecting and creating most appropriate music material for the L.I.F.E.F.O.R.C.E program. The second part of the report focussed on more specific approaches and examples of music activities as assistive teaching-learning tools in L.I.F.E.F.O.R.C.E. Music is expected to have a powerful impact on young children's motivation, learning, memory, empathy, and emotional regulation. It would be an important assistive and augmentative tool for teaching the knowledge and skills of L.I.F.E.F.O.R.C.E to all students in inclusive educational contexts of the collaborating European primary schools.

3.1.3.5 The implementation of social-emotional skills on the L.I.F.E.F.O.R.C.E. BLS-algorithm

Douvara Evgenia

Social-emotional skills refer to the abilities that regulate one's thoughts, emotions and behavior and they differ from cognitive abilities, because they mainly concern how people manage their emotions, perceive themselves and engage with others. Social-emotional skills determine how well people adjust to their environment and how much they achieve in their lives. The development of these skills is important not only for the well-being of individuals, but also for wider communities and societies as a whole [7].

Each child comes with a unique set of experiences, abilities and needs. How children express and regulate their emotions often depends on their cultural background, the manifestation of a developmental delay/ disability or their experience of a stressful situation at home/ community. It is quite surprising that according to the analysis of ten education systems, the focus of measures for immigrant students is mainly on academic needs, whereas emotional and support needs are highlighted only in Spain [133].

When children deal with an emergency, they need to observe cues from their bodies (posture, heart rate, breathing), recognize and make sense of their own emotions, but



also those of others. This ability is called **Emotional Awareness**. For example, it's important for children to discriminate if someone is in pain or unconscious, because this observation will affect their behavior while approaching the scene of the incident.

Apart from that, it is crucial to have the capacity to place themselves in another's position, to understand or feel what another person is experiencing from within their frame of reference, which is called **Empathy**. This capacity is essential in order to decide how to act more effectively; so, they might ask the people around the scene to stay away for safety reasons or call an ambulance while starting compressions. Empathy becomes a real challenge for children that manifest impairments in theory of mind skills, such as autistic children.

Furthermore, the child has to self-regulate in order to be able to offer help and basic life support. **Self-regulation** is the ability to express thoughts, feelings and behaviors in socially appropriate ways. Learning to calm down when angry or excited and persisting at difficult tasks, such as dealing with an emergency, are examples of self-regulation. A very interesting and helpful guide comes from Leah Kuypers and it's called *The Zones of Regulation* [134]. Self-regulation is strongly related to well-being [135] and alongside with Emotional Awareness and Empathy plays a significant role in Daniel Goleman's theory of emotional intelligence (1999) [136].

Teaching self-regulation should definitely include fight, flight or freeze (FFF) response, which is activated when people recognize danger. It's a survival response, but it's not a voluntary one. Thus, it's crucial to help children to become aware of that mechanism and avoid blaming themselves about the way their body responds and the way they feel. For example, they need to know that it is completely normal to freeze when they are in shock. In addition, when children better understand what is going on in their body, they can become more interested in learning how to manage their responses in a healthy way and make the shift from 'what is wrong with me' to 'what happens to me'. Another important issue regarding effective handling of stressful situations and children's mental health protection is related to their preparation for possible



unexpected outcomes by encouraging self-assessment, reflection and praising their efforts.

There are some children that struggle with adjusting to sensory input while being in the classroom and show distracted behaviors, outbursts, fidgeting and missed learning opportunities. When a child can't properly process sensory input, there are observable overreactions or underreactions that result in anxiety, insecurities or an urgency to make the sensory system "seem right" by seeking out sensory stimulation or avoiding certain sensations.

For some kids, the system is faulty and transmits false alarms, sending them into full blown fight, flight or freeze mode weekly, daily or even multiple times a day. Often, this faulty alarm system is because of increased cortisol levels due to prenatal stress or early childhood trauma. It can also be due to conditions such as SPD (sensory processing disorder), where sensory triggers cause alarm sensors to sound when no real danger is present. If a child struggles in managing their emotions, it's hard to open up their brain in order to be able to receive the content that they are trying to learn.

To sum up, teaching social-emotional skills helps students to:

- use strategies to adapt to the classroom sensory frenzy and become active learners in the classroom
- cooperate effectively with respect to their different backgrounds, needs and difficulties
- act safely in stressful situations and offer important help in saving lives
- realize early in life that they are part of a chain, but not in the center of the world (egocentric thinking leading to guilt).



3.2 Taxonomy of the selected perceptual and cognitive skills

3.2.1 Perceptual and cognitive skills activated in the L.I.F.E.F.O.R.C.E. – B.L.S. algorithm

Douvara Evgenia, Etmektsoglou Sevasti, Klaroumenou Anastasia, Stefanakis Anastasis

From a very young age, children are capable of performing the first step in the “chain of survival”, namely, to recognize a cardiac arrest and call for help to activate the Emergency Medical Services (EMS). When training children we need to be aware of the perceptual and cognitive skills they must possess to implement the L.I.F.E.F.O.R.C.E. – B.L.S. algorithm steps. It is also important to take into consideration the characteristics of their physical and emotional developmental stage.

The steps of the L.I.F.E.F.O.R.C.E. – B.L.S. algorithm are the following ones:

- safely approach the scene of the incident,
- check for response and breathing,
- call for help and start compression-only Cardiopulmonary Resuscitation (CPR).

Ventilation and the use of automated external defibrillator (AED) will only be taught theoretically and not practically.

The following table illustrates the perceptual and cognitive skills that are essential for implementation of the L.I.F.E.F.O.R.C.E. – B.L.S. algorithm steps.

The skills that have been selected are analyzed into building blocks. Each building block is matched to the corresponding algorithm steps. As shown in the table, some of the skills are found in all steps, while other skills are found in some of the steps.



Table 1. L.I.F.E.F.O.R.C.E. – B.L.S. algorithm skills activated in specific steps.

Skills	Building blocks	Safe approach	Check for response	Check for breathing		Call for help	CPR	Ventilation	AED
				Full	Covid				
Visual perception	Visual discrimination	✓	✓	✓	✓	✓	✓	✓	✓
	Visual figure ground	✓				✓			✓
	Visual attention	✓	✓	✓	✓		✓	✓	
	Visual closure	✓		✓	✓	✓			✓
	Visual-spatial relations	✓				✓			✓
	Visual form constancy					✓			✓
Auditory perception	Auditory discrimination	✓	✓	✓	✓	✓	✓		
	Auditory figure ground	✓	✓	✓	✓	✓	✓		
	Auditory closure	✓	✓			✓			
	Auditory synthesis and analysis								
Attention	Sustained	✓	✓	✓	✓	✓	✓	✓	✓
	Focused	✓	✓	✓	✓	✓	✓	✓	✓
	Divided	✓	✓	✓	✓	✓	✓	✓	
Memory	Working	✓	✓	✓	✓	✓	✓	✓	✓
	Visual	✓	✓	✓	✓	✓	✓	✓	✓
	Semantic	✓				✓	✓		
	Visual sequential			✓	✓	✓	✓	✓	
	Auditory		✓	✓	✓	✓			
	Procedural			✓	✓	✓	✓	✓	
	Auditory sequential					✓		✓	



Critical thinking	Cause-effect	✓	✓	✓	✓	✓	✓	✓	
	Decision making	✓	✓	✓	✓	✓	✓		✓
	Logical reasoning					✓	✓		✓
	Argumentation		✓				✓		✓
	Problem solving					✓	✓		✓
	Compare and contrast	✓	✓	✓	✓			✓	
Orientation	Spatial	✓				✓			✓
	Temporal			✓	✓	✓	✓	✓	✓

As it emerges from the table above, certain skills are activated more frequently, while others do not appear so often. Some building blocks do not appear at all. In the following section we give some basic descriptions of those skills that are most frequently present in the steps of the algorithm.

Visual perception is the ability to perceive our surroundings through the light that enters our eyes. There is a wide range of visual perceptual skills: In this text we present the ones that more frequently activated through the LIFEFORCE BLS algorithm steps and these are: Visual discrimination, Visual figure ground, Visual attention, Visual closure, Visual-spatial relations and Visual form constancy.

The most common building blocks of the visual perceptual skills are the following:

- Visual discrimination is the ability to recognize details in visual images. It allows people to identify and recognize the likeness and differences of shapes/forms, colors and position of objects, people, and printed materials. It is very important through all the steps of the L.I.F.E.F.O.R.C.E. – B.L.S. algorithm.
- Visual figure ground refers to the ability to locate and identify shapes and objects embedded in a busy visual environment. For example, to approach the scene in safety or being observant of visual indications of danger such as a moving car, falling objects etc.



- Visual-spatial relations is the ability to perceive the position of objects in space and to one's own self, (laterality, understanding left and right on one's own body, and directionality, understanding left and right on other objects, good understanding of their body's position within space, a general awkwardness in their movements). When for example following instructions or implementing other steps, the children must know their left and right, or which is a persons right when lying on the ground.

Auditory perception is also important, involving two specific building blocks (auditory discrimination and auditory figure-ground) activated in several steps of the algorithm. Auditory perception skill refers to the ability of the brain to interpret and create a clear impression of sounds. Good auditory skills enable children to distinguish between different pitches, volumes, rhythms and sources of sounds and words, which has amongst others, significant benefits for learning, reading and reading comprehension. More specifically:

- Auditory discrimination is the ability to recognize, compare and distinguish between distinct and separate sounds. For example, it is crucial to be able to distinguish between someone else's normal and heavy (agonal) breathing.
- Auditory figure ground is the ability to filter background conversations and noises to focus on what is important for example when we check for breathing.

When for example we approach a victim of OHCA we use all our sensory perception to identify the environment and the surrounding elements and take incoming information to process and proceed to further steps of recognizing signs of response or breathing, call for help and start CPR.

Auditory processing includes recognizing language, speech, and pitch of sounds. When we think or recall, we visualize the information stored in our long-term memory in the form of image or sound.



Visual and auditory perceptual skills described above, involve the processes of recognizing and interpreting information taken in through the senses of sight and sound.

Cognitive skills form a second group of skills which is necessary to be fostered and developed, since they run several steps of the algorithm. **Cognitive** are the primary skills our brain uses to read, memorize, process, think, learn, reason, pay attention and move the muscles of the body. These skills start to develop from early childhood.

In the following paragraphs we would like to present selected definitions of and examples of the building blocks of the **cognitive** skills that are most prominent through the L.I.F.E.F.O.R.C.E. – B.L.S. algorithm.

The first one is attention. Attention is the ability to concentrate or focus on a particular object, thought, action, and environment. It is the power of fixing the mind on something: careful listening or watching, noticing, being interested or aware, carefully thinking about something so as to be able to take action on it. When there is an incident we need to be alarmed. Distractions are everywhere and the child needs to learn how to focus and pay attention to provide help. As it emerges from the table 1 there are three types of this skill that need to be constantly active through the L.I.F.E.F.O.R.C.E. – B.L.S. algorithm:

- Sustained attention is when you can concentrate on a particular project for a long time and distraction of thoughts or external environmental stimuli can't easily rule over your mind.
- Focused attention is when you focus on a selected project, but you have the tendency to lose focus due to distraction.
- Divided attention is the ability to attend to two or more activities simultaneously. Our attention is divided when we remember information while writing it down or talking to someone. Divided attention is about multitasking.



All the above types of attention play an important role in L.I.F.E.F.O.R.C.E. – B.L.S. algorithm: Sustained attention is necessary to maintain the focus from the moment that the child realizes that someone needs help until the moment that help arrives, focused attention is also important because the child might need to overcome a certain number of stimuli and information that would distract him/her. Finally, the person who provides first aid to the victim needs to preserve a type of divided attention towards several different areas, such as observing the condition of the victim (change in response/breathing), while simultaneously calling for help and providing the required information.

L.I.F.E.F.O.R.C.E. – B.L.S. algorithm also depends on the activation of memory skills. Memory refers to the processes that are used to acquire, store, retain, and later retrieve information. There are three major processes involved in memory: encoding, storage, and retrieval. Human memory involves the ability to both preserve and recover information we have learned or experienced. We have selected to work the following types of memory: Working, Visual, Semantic, Visual sequential, Auditory, Procedural and Auditory sequential memory. In the L.I.F.E.F.O.R.C.E. – B.L.S. algorithm, all the above types are involved in several steps of it:

- Working memory enables you to hang on to information while in the process of using it (remember directions of a project, follow multi-step directions, remember what was just said in a conversation). It is very important throughout the entire L.I.F.E.F.O.R.C.E. – B.L.S. algorithm and in all its steps. The best way to remember is to remember data in a relational way or through repeated actions. We can improve our short-term memory skills by practicing and programming the long-term memory through repeated actions.
- Visual memory is the ability to remember or recall information such as activities, pictures or words that have been viewed in the past (e.g., dialing a phone number, reproducing figures from memory, remembering and recognizing an AED sign).
- Visual sequential memory is used when memorizing telephone numbers, following multi-step directions.



- Auditory memory is the recall or recognition of stimuli existing in the form of sound energy. Remembering the sound of a normal/agonal breathing or the screeching sounds of a vehicle decelerating (during the approach with safety) or the sound of the ambulance siren (which signals that expert help is arriving) are examples of information retrieval from auditory memory.
- Auditory sequential memory is used to facilitate following instructions and memorization of rhymes, songs/ steps that are shown in an activity or in our case the L.I.F.E.F.O.R.C.E. – B.L.S. algorithm steps.
- Semantic memory refers to keeping a mental trace of the meaning of words and concepts.
- Procedural memory is a type of long-term memory involving how to perform different actions and skills, knowledge of subject-specific skills and algorithms, knowledge of subject-specific techniques and methods.

Both steps “call for help” and “CPR” require full memory readiness. When calling for help and applying CPR, there is a lot of information involved that children must remember. When all of this knowledge is properly worked in advance and together with critical thinking (which requires the child to engage in an objective analysis of a topic and evaluate the available information in order to form a judgment), the child is ready and confident to act automatically and without hesitating.

Critical thinking demands a systematic approach to evaluating new information. It encourages us to question and reflect on our own knowledge and on how we arrive at the opinions we have resulting in the decisions we make. Among a number of aspects of critical thinking we have selected the following as the most necessary to be fostered and developed: Cause-effect relation, Decision making, Logical reasoning, Argumentation, Problem solving and Compare and contrast.

More specifically:



- The cause-effect relation affects all aspects of our lives. It pervades our thinking and motivates our rational actions. Knowledge of cause and effect provides the basis for rational decision-making and problem-solving. It is important in all areas.
- Decision making is one of the most important aspects in all steps of the L.I.F.E.F.O.R.C.E. – B.L.S. algorithm.
- Logical reasoning is the essential skill of a human brain to interpret logical sentences or situations. Innovation, rational thinking, argumentation, problem-solving, decision making, and handling many real-life situations require you to have good logical or reasoning skills.
- Comparing and contrasting is an organizational skill used to arrange information in such a way that it can be understood or presented more effectively (making abstract ideas more concrete, and reducing the confusion between related concepts based on their similarities and differences).

At the time of an OHCA incident the decisions must be made fast, we need our senses to be tuned in, our attention to be sharp and our brain to be in action, ready for critical thinking, which will lead to the best decisions.

Lastly, but not of a lesser importance is orientation. Spatial orientation refers to the ability to identify the position or direction of objects or points in space (Benton & Tranel, 1993) and temporal orientation refers to an individual's tendency to connect to the psychological concepts of past, present or future, and it affects personality, motivation, emotion, decision making and stress coping processes. Good sense of orientation is important when calling for help, when it is important to describe in detail the current location and what has happened/is happening (number of victims, their condition, etc.).

As to conclude, the most often encountered skill in the L.I.F.E.F.O.R.C.E. – B.L.S algorithm steps is attention, (sustained, focused, divided) which is found throughout the whole algorithm, along with visual perception and memory (mostly working memory and visual memory). Attention and listening skills are the foundation of language. Without well-developed skills in this area, children will struggle to



understand and respond appropriately. Each of our perceptual-cognitive skills plays an important part in processing new information.

3.2.2 Other skills activated in L.I.F.E.F.O.R.C.E. – BLS algorithm

Apart from the perceptual and cognitive skills that have been presented, we have selected the most often encountered communication, language and social-emotional skills that are required when implementing the whole LIFEFORCE-BLS Algorithm task. These skills coupled with educational work on body awareness and processing speed, complete the learning process of the algorithm and are illustrated in the table below.

The activation of these skills has not been analyzed into building blocks neither have been studied/examined in every step of the L.I.F.E.F.O.R.C.E. – B.L.S algorithm as they were present throughout its steps. This group of skills is listed in the table below:

Table 2. L.I.F.E.F.O.R.C.E. – B.L.S algorithm skills activated in every step.

Skills	Building blocks
Communication skills	Non-verbal
	Conversational
	Close-ended questions Open-ended questions
	Gain attention
	Prosodic features of speech
	Eye contact
Language skills	Semantics
	Descriptive language
	Narrative language
Social – emotional skills	Empathy
	Emotional awareness
	Self-regulation
Body awareness	
Processing speed	Visual processing
	Verbal/auditory processing
	Motor speed

As it is presented in the table above, the following communication skills are important when implementing the L.I.F.E.F.O.R.C.E. – B.L.S algorithm: Non-verbal, Conversational, Close-ended questions and Open-ended questions, Gaining attention, Prosodic features of speech and Eye contact.

Being able to communicate is a very important skill. It requires knowledge of both verbal and non verbal features of the language, vocabulary, good listening skills as well as attention. Conversations are essential for social interaction and support learning and thinking [137]. Communication is everywhere; it can be supported and improved in all activities through good practices by educators and significant others. “Children understand conversation rules -when to talk and when to listen” [137]. They



can also keep conversations going with a range of people in different situations, by making relevant comments or by asking questions. They supply details that they know are important for the listeners and realize when the latter do not fully understand and try to help them [137].

People use language for a range of different reasons, complementing or criticizing, clarifying and negotiating. “Language is the vehicle for learning. It enables understanding and expression of thought, it supports thinking, problem solving and reasoning and it’s accepted as being critical to cognitive development” [137].

“Children become much more able to be selective about what they need to listen to and are able to integrate listening with other tasks. Children are learning new vocabulary all the time - words they need for general learning and topic-specific vocabulary. Understanding how words can be linked by what they mean as well as how they sound and look, can really help children remember new vocabulary” [137]. From early childhood, children are able to use newly learnt words in a specific and appropriate way. Furthermore, growing older, they are capable of using a range of words related to time and measurement and a variety of verbs to express their thoughts, as well as describing events and experiences in detail and in the right order [137].

Children have an innate need and strong motivation to connect with others in their environment. If teachers and carers of young children demonstrate that they value all children’s cultures and languages and work towards establishing positive relationships with them, children would be likely to feel safe and secure to proceed with the first important steps of their social and emotional development. This inclusive and sensitive educational environment would affect not only the way children express themselves and manage their own emotions, but also the way they experience the world and form positive relationships with others [138].

In the L.I.F.E.F.O.R.C.E. program, young children would be encouraged to use and further develop their communication and language skills—more specifically Semantics, Descriptive and Narrative language—in order to be able to understand, learn and apply the L.I.F.E.F.O.R.C.E. - BLS information in all steps of the Algorithm.



Social and emotional development involves several interrelated areas of development, including empathy, emotional awareness, and self-regulation.

Empathy is the capacity to understand or feel what another person is experiencing from within their frame of reference, that is, the capacity to place oneself in an other's position.

The L.I.F.E.F.O.R.C.E. program will foster in young children the development of empathy with persons in need; the emerging empathic sensitivity may increase the likelihood of children becoming better aware of the other's need for help in a life-threatening situation.

Emotional awareness “includes the ability to recognize and understand our own feelings and actions and those of other people, and how our own feelings and actions affect ourselves and others” [138]. Educating children about feelings and emotions, their own and those of others, is an important goal of school curricula, which could be approached among other subjects, through the L.I.F.E.F.O.R.C.E. program. Through a developing emotional awareness, young children will become increasingly able and motivated to protect and help themselves and others.

Self-regulation is “the ability to express thoughts, feelings, and behaviors in socially appropriate ways. Learning to calm down when angry or excited and persisting at difficult tasks are examples of self-regulation” [138]. The “Fight, flight or freeze” (FFF) response is activated when we recognize an approaching threat. It's a survival, automatic response [139]. Working on developing self-regulation skills could be useful for young children in their daily actions and interactions and in their sense of well-being. It would also be essential as a preparation for dealing with crises which might trigger the FFT response. Self-regulation is thus very important for the young children throughout the application of the L.I.F.E.F.O.R.C.E.-BLS Algorithm, as it will allow them to perceive accurately, think clearly and remember precisely the steps they have to follow.



The preschool years may be full of opportunities to develop positive social skills, as preschoolers have the natural tendency to engage in pretend play, explore cooperative play, and develop early friendships. Social skills are critical not only for children's current state of development but also for lifelong learning, happiness, and long-term success and well-being [138].

All of these skills play an important role when it comes to teaching children to actively participate in the “chain of survival”. They need to know how to communicate, which vocabulary to use, together with what information to provide when they are expected to take part and help in saving a life in danger. They also need to control their own feelings and emotions in order to act wisely, fast and efficiently.

An integrated approach to mind-body in young children's teaching and learning was deemed of utmost importance in the L.I.F.E.F.O.R.C.E. program, and body awareness was stressed in all steps of the Algorithm, in connection with various perceptual-cognitive and other skills.

“Body awareness” refers to the ability of one being conscious regarding the position of the parts and the movements of one's body. It also refers to the awareness of tension signals of one's body, of the ability to stand firmly on the floor and of one's physical sensations. Body awareness strengthens one's identity and the ability to express oneself. The embodied identity splits in two categories: “living in the body” and “living in relation to others” [140]. Body awareness helps us to understand how to relate to objects and people at home, at school and outdoors” (<https://www.yourtherapysource.com/blog1/2018/09/21/why-is-body-awareness-important-2/>).

Finally, we will refer to Processing Speed:

Processing speed describes how fast information is travelling through the brain. It is the ability to execute simple, repetitive, cognitive tasks in a fast and automated way. Processing speed affects attention, executive functions, memory, academic performance, behaviour and social skills. It requires the capability of fast and simple decision making, combining speed and accuracy, and is divided into three major



categories: visual processing, verbal/auditory processing and motor speed [141]. “Processing Speed” is the speed with which a person executes basic cognitive processes and according to Kail & Ferrer (2007) “consistently predicts performance on a variety of cognitive tasks” [142].

As it relates to learning, memorising, retrieving and synthesising information regarding the L.I.F.E.F.O.R.C.E.-BLS Algorithm, Processing Speed is considered a crucial element, especially when children are faced with unexpected and often traumatic situations. Establishing strong memory traces of the specific steps and sub-steps of the L.I.F.E.F.O.R.C.E.-BLS Algorithm, could contribute to a faster processing speed when reacting to a problem.

Research shows that a strong social and emotional foundation in early childhood powerfully impacts children’s later positive attitudes and behaviors, academic performance, career path, and adult health outcomes [143].

During an OHCA incident, there is a multitude of events (outer and inner) occurring at the same time, and there might be one or more people involved at the time when we call for help and speak with the paramedics. It is very important to teach the children to cope in a situation like this, to be able to provide the correct information, filter the relevant stimuli from the surrounding environment and proceed to action, when at the same time remaining safe, calm, focused and clear minded.



3.3 Classification of selected skills into distinct difficulty levels specifically tailored to the developmental level of children aged 6-10 years

Botonaki Angeliki,

Preschool teacher

To begin with, we will present the skills which we have selected to be of vital importance in the learning process of the algorithm for ages 6-10. These are: Visual perception, Auditory perception, Memory, Attention, Communication skills, Language skills, Critical thinking, (Time and Space) Orientation, Body Awareness, Social-Emotional skills and Processing speed. The selected skills classification will happen in two steps and will be presented with a bottom-up difficulty level.

As a first step for this classification, we have taken into consideration the goals and objectives of ISCED 0 and ISCED 1, as they have occurred from the IO1 Transnational overview of nursery and primary school educational systems in European countries, and have underlined the following.

In **ISCED 0** it is expected from children to:

- Understand what can affect health and well-being
- Develop reflexive skills, observe, explore, compare, build structured thinking, develop decision making, understand emotions and care
- Enable learning of cognitive, social, affective and psychomotor skills

In **ISCED 1** it is expected from children to:

- Learn how to learn
- Develop critical thinking, logical reasoning, problem solving, abstract thinking, capacity for judgment, space/time awareness, health education and language of the body
- Think independently and critically and show creativity
- Achieve cognitive, emotional and psychomotor skills



- Respect their own development level and rhythm

The second step is to evaluate the information drawn from Developmental Psychology, regarding the hierarchy of the selected skills by age. We will take a quick look at the developmental milestones of a child from its birth until we reach the middle childhood age (10 years). We may regard it as a timeline through childhood.

Early childhood age

Visual perception is the first of cognitive skills that a child develops starting from the first days of its life (especially **visual discrimination** and **visual figure ground**). Visual perception's growth stabilizes at **6-7** years of age [144].

Visual memory is the next visual skill that is particularly good at a very early age. **Memory's** functions at the age of **7** almost reach the level of adults' abilities [55] though they meet further significant development during middle childhood, regarding the consciousness of the child. Specifically, children aged **6-7** years old have a memory span of 5 numbers, whereas children aged 8-13 have one of 6 numbers [145]. Additionally, children of **6-7** years of age can remember 1-3 items to do at the same time whereas adults can remember double as that, due to the improved skill of meta-cognition. Working memory, one of the important components of the executive functioning skills or the cognitive control development, is rapidly improved at about 5-8 years of age [146].

Auditory perception is developing almost at the same time, together with the senses of taste, smell and touch.

The sensory-perceptual coordination is being developed at the 1st year of the child [147].

Perceptual learning increases with experience and practice and through stimulation from the environment [148].

Regarding the **Communication skills**, we notice that at this very young stage, **non-verbal communication, eye contact and gaining attention** are the building blocks developing.

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From a linguistic point of view, there is still much to be done.

Social emotions come next, at the age of 1,5-3 years old and in particular empathy, and awkwardness and later on embarrassment, pride and guilt [55].

Automation of gross movements begins at 3 years and of fine movements at 4 years [147].

Laterality of some certain functions of the brain happens rapidly during the **early childhood age (2-6)** and sets in until the beginning of middle childhood. Laterality is the left or right side preference of the body (i.e. hand, foot) over the other, which indicates the primary use of the right or left hemisphere of the brain reversely. Absence of laterality indicates learning disabilities. Laterality is also connected with the children's (space) **orientation** and **mobility** skills, in other words, the ability to move safely and efficiently through any environment [57].

Closely related to the movement sense is the sense of **proprioception** which allows the children to know what position their body parts are without looking at them. It also communicates how much force is needed for one's movements. Proprioception is of unique importance for coordinated movements and **body awareness**. Body awareness regards consciousness and works as an internal body "map" of one's body parts and movements. Poor or impaired proprioception means body awareness and motor planning can't function properly and consequently learning cannot be effective as attention by the child is drawn on the problematic area. Body awareness is also considered to be the basement of motor gross and fine movements' development.

Children's symbolic representation also boosts at the **early childhood age**, which helps them with their social interactions and promotes **empathy** and **emotional awareness** to themselves and others (**Social-Emotional skills**).

Referring to the skill of **Attention**, active imitation is a suggested way to help children focus better at the ages 3-5. It is only at the age of **6-7** that children can focus on the verbal instruction and follow them in order to participate in activities [57].

As **conversational skills** are developing, children begin to acquire the pragmatical linguistic elements, which reflect the environment and the culture. These include the **prosodic features of speech** (intonation, stress, rhythm, etc.) and the social context as well (**Communication skills**).



Middle childhood age

While at the **middle childhood age (7-11)**, children improve even further their gross movements and there is a rapid development of their fine movements, especially at the age 6-7 [57].

Learning becomes more effective, as lots of cognitive, **linguistic (Language)** and perceptual skills grow in maturity.

Logical thought arises as **cause-effect** thinking begins to blossom. Children are now encouraged to **problem solving**. They can also assume and predict what may happen given specific information. All that leads to **Critical thinking** development.

Children are gradually gaining a better internal representation of space and a better understanding of time and sequence as well (**space and time Orientation**). Regarding **space orientation** and the position in space (body awareness & spatial perception), its development completes at 7 to 9 years of age. Spatial relationships improve to approximately 10 years of age [148]. Now, concerning **time orientation**, children have been proven to master that at around 7 years of age. When numerical skills get involved in time orientation though, children need to be 7-8 years old to accomplish relevant tasks (present-time awareness, telling the time on a clock, birthday, life span, duration), and around 9 years old to associate the quantities with a number [149]. Finally, 10 year old children were found capable of estimating the context by evaluating the amount of numbers as small, medium or a lot [149]. Thus, time orientation develops rapidly between 7 and 10 years of age.

Memory's functions are significantly improving during the middle childhood age. They now integrate repetition, organizing, semantic process, visual images, recalling and use of scenarios. **Metacognition** is being remarkably improved. The later term refers to the advanced mental procedures which allow children to observe their thought, knowledge, targets and actions and use them strategically in their advance. Children use their metacognitive abilities in **planning, decision making** and **problem solving**.

Next, some details about memory follow. Middle childhood children have better performance in recognizing (objects or situations they have seen or experienced) rather in recalling (long-term memories). Actually, in the age of 5-7, children's ability

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to recall improves importantly. Most children begin to make conscious efforts to memorize information. They learn control processes, meaning strategies and techniques which improve the memory.

Analytically, the memory procedures mentioned above according to the age stages are [58]:

- Repetition. At the age of 9 children begin to cluster pieces of information in their mind, something that improves their ability not only to keep them in the short-term but also move them in the long-term memory.
- Organizing. Children rarely use organizing strategies (clustering words in categories) spontaneously before the age of 9.
- Semantic process. It includes the use of logical assumptions to re-construct a fact (which 7-year-old children fail to achieve), compared to the simple “uncomplete” and unaltered recalling (most commonly achieved at the age of 11).
- Visual images. Children of early childhood can create images or representations in their minds in order to be taught the memorizing of an unusual event but not in a spontaneous way as older children do.
- Recalling. The older the children are, the more effective recalling gets.
- Scenarios. While children until the age of 4-5 use certain scenarios for familiar activities, during middle childhood, they can “connect” specific scenarios in greater categories.

Lastly, **processing speed** measures the speed of information that is travelling through the brain. Referring to the ability to execute simple, repetitive, cognitive tasks in a fast and automated way, processing speed affects attention, executive functions, memory, academic performance, behavior and social skills [141]. It requires the capability of fast and simple decision making combining speed and accuracy. According to developmental researches, processing speed becomes more rapid with age. In fact, 4-year-olds process information about three times more slowly than adults, while 8-year-olds, twice as slow as adults. Thus, we are concluding that age is associated with speed processing [150].



In brief

To sum up, in early childhood age (here **6-7**), according to the information presented above, children are expected to have acquired **visual** and **auditory** perception at a fine level. Also, **memory** and **communication skills** at a basic level and moving on, **body awareness** and **space & time orientation**. Therefore, there are some skills that children at 6 to 7 years of age have already acquired at a satisfactory level.

In middle childhood age (here **7-10**), children are expected to **improve and develop even further these already acquired skills**. Additionally, they are expected to develop in a higher scale their **attention** along with their **social-emotional** and **language skills**, moving on to **critical thinking** and **processing speed** development.

The Lifeforce BLS-Algorithm activities that will be implemented throughout our 6-10 children's target group will promote all of the above-mentioned skills with the required developmental adaptations in each age. For example, critical thinking which is of a greater difficulty for 6 year old children, as it is mostly developed in middle childhood age, will be also taught to 6 year old children but at a distinctly lower scale of difficulty. All skills will be taught at each age in fully agreement with the developmental stage the children are at.

Representation of classification

In our attempt to represent this classification, we will combine the sequence of the skills' development with the attainment of the basic level of the skills that is necessary in order for the children to accomplish adequately the steps of the Lifeforce BLS-Algorithm. Thus, we suggest the following classification of the selected skills, which concurs with the requirements of the Lifeforce BLS-Algorithm and with both the goals and objectives of the ISCED 0 and ISCED 1 and the contemporary Developmental Psychology's thesis.

In the following timeline scheme, we indicate the developmental stages where the level of each acquired skill meets the requirements of the Lifeforce program. To emphasize that children's selected skills develop about at the same time but in different rhythms in all time periods, we present the time period from 0-6 with all the selected skills included and coexisting, developing in different rhythms, in the scheme below. The

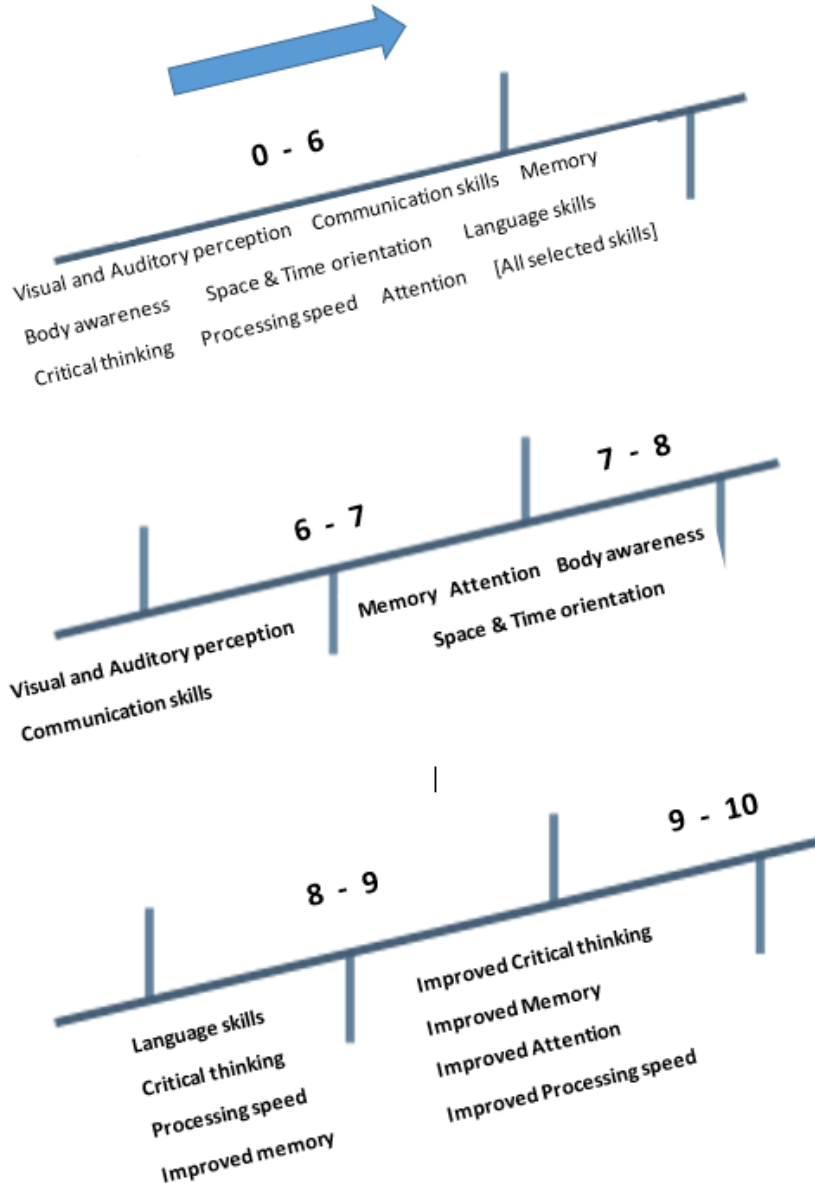


classification that follows then, shows the most important and rapid improvements of specific children's skills in combination with the Lifeforce BLS-Algorithm basic level of skills needed for the implementation of the program, through the timeline of 6-10. This information will be used in order to make the appropriate adaptations in the teaching activities.

We should not forget that:

- Each developmental stage is built on the previous
- Stages are used only as guides
- Each child has its own rhythm of development
- Development takes place **simultaneously** in many development areas and
- Development takes place **unevenly** [55],

as also mentioned in the introduction of our Theoretical Framework.



Classification showing the age stages where the development of selected skills meets the basic requirements of skills of the Lifeforce BLS-Algorithm.



3.4 Expansion of methodology to cover special learning groups and other taught subjects

Etmektsoglou S. & Botonaki A.

3.4.1 Appropriate adaptations, accommodations, and modifications for special learning groups

In the recent years students with disabilities are being educated in the **general education environment** along with their peers without disabilities, using the general curriculum.

The key to success in the classroom lies in having appropriate **adaptations, accommodations, and modifications** made to the instruction and other classroom activities.

Adaptations, accommodations, and modifications need to be **individualized for students**, based upon their needs and their personal learning styles and interests. This allows students to access the general curriculum and other learning materials and activities and to demonstrate what they have learned [151].

Modifications may involve changing the way that material is presented or the way that students respond to show their learning.

Six typical types of adaptations are identified: *input* (such as use of videos, computer, or field trips), *output* (how learners will demonstrate understanding), *size* (the length of the assignment learners will be expected to complete), *time* (how much time learners will have to complete the assignment), *difficulty* (how the complexity of the lesson will be modified), and *level of support* (how much assistance will be provided to learners). Three **additional adaptations** are discussed: *degree of participation* (the extent to which the learner will be actively involved in the task), *modified goals* (adapting outcome expectations), and *substitute curriculum* (when instruction is significantly differentiated to meet a learner's identified goals) [152, 153].



The systematic adaptation of instructional materials and techniques

Clear transitions between activities, creating a non-distracting environment, modifications for *instructional strategies or materials* include allowing the child to dictate ideas, modifying the amount of in-class assignments [153].

Strategies for enhancing *organizational and study skills* include

Limiting choices, distributing discussion questions prior to the lesson for some students, teaching previewing strategies [153].

Adapting textbooks for children with learning disabilities

Highlighting information in the textbook, or providing the student with a high-interest/low-level vocabulary alternative. Pre teaching critical vocabulary and the use of study cards
to help students master the content presented in textbooks [153].

A1. Attention-deficit/hyperactivity disorder (ADHD)

Students with ADHD have difficulty with attention and self-control. At school, that can look like inattention, distractibility, hyperactivity, impulsivity, and disorganization - all of which can get in the way of learning [154].

The accommodations suggested address the student's behavioral concerns, work habits, organizational skills.

Incorporating movement into lessons, and *adaptations to the way the material is presented*, such as developing graphic organizers, and breaking assignments into smaller chunks [154, 155].

- ✓ Classroom environment
- Use flexible seating, preferential seating close to the teacher and/or away from high-traffic areas.
- Designate a quiet work space in the classroom.



- Post a written schedule for each day and let the student know ahead of time about schedule changes.

- ✓ Building organization skills

- Use an assignment notebook
- Color-code materials for each subject.
- Provide an outline of the lesson
- Note-taking strategies, like using graphic organizers and mind-mapping

- ✓ Giving instructions

- Give directions out loud and have the student repeat them.
- Provide a lesson outline that details instructions and assignments.
- Keep instructions simple, clear, and concrete.
- Use pictures and graphs to help create visual interest
- Help the student break long assignments into smaller chunks.

- ✓ Completing tests and assignments

- Understanding to be demonstrated in different ways, like oral reports, posters, and video presentations.
- Provide different ways to respond to test questions, like saying the answers or circling them.
- Minimize the number of questions and problems per worksheet.
- Give extra time and quieter space for work and tests.

- ✓ Managing behavior

- Use a behavior plan with a reward system.
- Use a nonverbal signal to get the student's attention and indicate the need for things like taking a brain break and/or to focus on assigned work.
- Check in frequently to monitor the student's "emotional temperature" or frustration level.

- ✓ Excessive energy

- Transitions incorporate movement – Transition periods (typically five minutes)



between subjects, activities, or periods offer students the chance to both physically and

mentally adjust to a new experience. Songs and games that involve physical movements

- More kinesthetic activities in lessons – All students benefit from increased kinesthetic involvement in activities. Integrating kinesthetic elements into otherwise stationary tasks creates another modality to enhance learning.

- Responding physically (e.g., hand or arm signals, holding up response cards or flags, jumping up, stamping feet) instead of, or along with, verbal responses.

- ✓ Difficulty sustaining attention

- Block out excessive distractions.

- Remove excess materials or utensils. Only the essential items for the task at hand are in front of them.

- Typical self-monitoring strategies, checkmark for being on task, an “X” for not; coloring for that period.

A2. Dyslexia

- Low charts are ideal for explaining procedures.

- Pictograms& graphics help to locate information.

- Avoid abbreviations if possible or provide a glossary of abbreviations and jargon.

- Use short, simple sentences in a direct style and give instructions clearly.

- Avoid long sentences explanations, be concise.

- Avoid text in block capitals because this is much harder to read and white backgrounds.

- Provide handouts giving an overview of main points, well in advance of lectures.

- Vary styles of delivery. Present information visually wherever possible and consider using alternative media.

- Dyslexic students often need points repeating, to ensure that information passes into their long-term memory. Give summaries at beginning and end of lectures and revisit points of learning at intervals [155].



✓ Classroom materials and routines

- Use large-print text for worksheets.
- Provide extra time for reading and writing.
- Give the student multiple opportunities to read the same text. Use reading buddies during worktime (as appropriate).
- Pre-teach new concepts and vocabulary.
- Provide a glossary of content-related terms.
- Use visual or audio support to help the student understand written materials in the lecture.
- Post visual schedules and also read them out loud.

✓ Giving instructions

- Give step-by-step directions and read written instructions out loud.
- Simplify directions using key words for the most important ideas.
- Highlight key words and ideas on worksheets for the student to read first.
- Check in frequently to make sure the student understands and can repeat the directions.
- Show examples of correct and completed work to serve as a model.
- Help the student break assignments into smaller steps.
- Give self-monitoring checklists and guiding questions for reading comprehension.
- Arrange worksheet problems from easiest to hardest.

✓ Completing tests and assignments

- Allow understanding to be demonstrated in different ways, like oral reports, posters, and video presentations.
- Provide sentence starters that show how to begin a written response.
- Provide extended time for taking tests.
- Provide a quiet room for taking tests, if needed.

A3. Visual Impairment

- Materials in large print or Braille.
- Audio materials recorded via computer.



- Captioning course videos.
- Enlarged or tactile drawings.
- Tactile demonstrations incorporated into instruction for understanding concepts.
- Use email for class notes and other teaching materials instead of printed documents for blind students (they can be converted in audio information through screen reading software) [155].

✓ Classroom Materials and Routines

- Post visual schedules, but also say them out loud.
- Describe visual presentations aloud and/or provide narration.
- Build in time to summarize the important information from each lesson.
- Use a reading guide strip or a blank index card to block out other lines of text while reading.
- Provide a highlighter to use to highlight information while reading.
- Provide wide-ruled paper and darken or highlight lines and margins to help form letters in the right space.
- Provide colored glue sticks to use on white paper.

✓ Giving Instructions

- Say directions and assignments out loud.
- Clearly space words on a page.
- Write directions in a different color from the rest of an assignment (or highlight them). Include simple diagrams or images to help clarify written directions.
- Use highlighting or sticky-note flags to draw attention to important information on worksheets.
- Allow time for the student to ask questions about directions.

✓ Completing Tests and Assignments

- Allow the student to submit answers on a separate sheet of paper rather than on fitting them into small spaces.
- Reduce visual distractions by folding a test or using blank pieces of paper to cover up part of the page.



- Provide extended time on tests.

A4. Difficulty processing visual information

- Explain order/ meaning of sequence of items/ steps. Making meaning accessible will help students to better process information. Knowing the order of steps in a sequence gives students a heads-up so they have a little more control over the situation and are more likely to respond appropriately.
- Color-coding or numbering for organizing information.
Conceptually, allows the learner to clearly understand the sequence of events or items or to know that each item is distinct.
- Graphic organizers help describe, compare, or contrast concepts or ideas in more concrete and understandable ways.
- Colored transparency overlay. Certain colors of transparent overlays help “calm” the print so that it is easier to read.
- Verbal with visual transmitting is one way to create to aid understanding.
- Arrows can visually communicate a great deal about order, direction, importance, or the other important facets of given items.
- Symbols can shorten visual information, making it much more accessible to some learners.

A5. Hearing Impairment

- Printed and video materials offered before classes with captioning (involves synchronizing text with audio content of a video presentation).
- Facing student for lip reading.
- Reinforce spoken information with visual aids.
- When possible, provide the student with lecture notes, lists of new technical terms and printed transcripts of audio-visual materials.
- Do not hesitate to communicate with the student in writing when conveying important information.
- On line video materials with subtitles [156].



✓ Classroom Seating, Materials, and Routines

- Provide a quiet area for independent work.
- Let the student sit near the teacher and away from auditory distractions, like doors and windows.
- Check in frequently to make sure the student understands the work.
- Give extra time for testing.

✓ Giving Instructions and Assignments

- Give step-by-step instructions, and have the student repeat them.
- Use attention-getting phrases like “This is important to know because....”
- Decide with the student on a nonverbal signal to show that a key point is being made.
- Say directions, assignments, and schedules out loud, and rephrase as needed.
- Repeat key information throughout the lesson, and rephrase as needed.
- Use visual tools, images, and gestures to enhance and support spoken lessons.
- Break down classwork instructions into short, written steps.
- Highlight key words and ideas on worksheets.

✓ Introducing New Concepts/Lessons

- Speak clearly and slowly when presenting new information.
- Give material on a new concept to the student before it's taught to the whole class
- Give a list of or highlight key vocabulary and concepts for upcoming lessons.
- Give a short review or connection to a previous lesson before teaching something new.
- Give the student an outline of the lesson.
- Grade based on the student's completion of the lesson goal.

A6. Difficulty learning by listening

- Use flash cards
- Have the student close his eyes and try to visualize the information
- Teach the use of acronyms to help visualize lists



- When giving directions to the class, leave a pause between each step so student can carry out the process in his mind
- Be concise with verbal information

A7. Classroom accommodations for executive functioning issues

Students with executive functioning issues often have trouble planning, managing time, and organizing. Accommodations can help them work around these challenges and thrive in the classroom

- ✓ Classroom planning, schedules, and routines
- Post schedules, directions, and expectations, make sure the student sees them.
 - ✓ Giving instructions and assignments
 - Give step-by-step instructions and have the student repeat them.
 - Use attention-getting phrases like, "This is important to know because...."
 - Say directions, assignments, and schedules out loud.
 - Check in frequently to make sure the student understands the work.
 - Give simple and concrete written and spoken directions.
 - Grade based on work completed, not points off for work not completed.
 - Let the student use speech-to-text (dictation) technology for writing [157].
 - ✓ Introducing new concepts/lessons
 - Highlight key words and ideas on worksheets.
 - Give a short review or connection to a previous lesson before teaching.
 - Allow different ways to answer questions, like circling or saying them.
 - Give the student an outline of the lesson.
 - Give notice (when possible) about schedule changes.
 - ✓ Building organization and time management habits
 - Use organizers and mind-mapping
 - Use an assignment notebook.
 - Break down big projects into smaller pieces with more deadlines.
 - Provide colored strips to place under sentences or equations when reading.



A8. Classroom accommodations for slow processing speed

Students with slow processing speed can struggle in class in lots of ways. That might be trouble keeping up in class, participating in discussions, or staying focused. It's just that the pace at which they can take in, respond to, and use information may be a little bit slower. Accommodations give them the support they need to show what they know [158].

✓ Giving instructions and assignments

- Check in from time to time to make sure the student understands the lesson.
- Give the student extra time to respond to questions in class.
- Give simple written directions, and speak slowly when giving oral directions. Use graphs and other visual aids and explain out loud what they mean.
- Provide a checklist at the beginning of the assignment with details about how the project will be graded.
- Find ways to engage the student's interest in lengthy assignments. Shorten repetitive assignments.
- Reduce the need for handwriting.
- Grade the student work based on mastery of information rather than on work completed.

✓ Introducing new concepts/lessons

- Give an outline of the lesson or notes for students who don't write fast enough or who have trouble multitasking.
- Use text-to-speech software and books with audio to help the student to see and hear the words at the same time.
- Use multiple means of presentation to reinforce new concepts.

✓ Addressing trouble with focus

- Use nonverbal signals to engage a student who seems to be losing focus.
- Provide a quiet space for tests so the student can talk through the questions without disrupting others.



- Give extended time for tests.
- Encourage the student to email questions or concerns later if it's hard to come up with them during class. Offer a chance to improve grades by letting the student correct test answers and explain the process used to correct them.
- Reduce distractions by using blank pieces of paper to cover all but one of the questions on a worksheet.
 - ✓ Building organization and time management habits
- Break down big assignments into smaller pieces with more deadlines.
- Show what a completed project looks like before the student begins.
- Establish clear starting points for tasks.

A9. Memory problems

- Vocabulary strategy a proven method for remembering new, difficult vocabulary words can make a huge difference.
- Mnemonic devices that aid memory and include acronyms for remembering lists, songs for remembering steps or ideas, or visual imagery to recall sequence of events in a story.
- Chunking – Students will remember more easily if the sets or lists of items are short (3–7 entries) and if they are related in some meaningful way.
- Lots of environmental print – Labels placed around a classroom can provide sufficient scaffolding
- Prepared lists and instructions of key terms or sets of written directions for them to refer to as needed.
- Multiple modalities. Memory is aided when more than one modality is engaged. Always to engage two or more modalities (visual, auditory, tactile or touch, kinesthetic or muscle movement, taste, smell) during instruction.
- Check for understanding. Students responding to questions designed to quickly check their understanding of a given point or lesson will tend to put more effort into learning and remembering new information.



- Smaller steps. Students perform better when they have fewer steps to complete.

A10. Speech problems

- Communication board – Students can communicate through the use of a simple visual or electronic communication board.
- Cards to indicate objects, ideas, or actions as a way to communicate when speech is not fully effective.
- Allow enough time provides the student the chance to be part of the discussion.
- Use visual supports. Pictures, symbols, graphic organizers of ideas, manipulatives, and real objects are all ways in which to aid communication.
- Speech routines that involve repeating certain phrases to provide important practice for students with speech issues.

A11. Expressive language problems

- Sentence parts to sequence. Cards or strips of paper that feature individual words or phrases of a sentence.
- Modeling and requiring complete and varied sentences to gain clarity about what a sentence is and how to produce a grammatical one to improves their verbal skills.
- Word walls or banks. Numerous descriptions of words and how they might be created as a “scaffold” for essential learning for language, reading, and writing. Their general accessibility helps students to find particular words when they need them.
- Repetitive structures of new input knowledge help students to be better prepared to participate.

3.4.2 Teamwork with special learning groups

Is a form of cooperative learning which aims to develop student’s knowledge, generic skills, communication skills, collaborative skills, critical thinking skills and attitudes.



In inclusive classes that use cooperative learning, students articulate their thoughts more freely, receive confirming and constructive feedback, engage in questioning techniques, receive additional practice on skills, and have increased opportunities to respond.

Students with disabilities are more likely to be at instructional level and have positive learning outcomes when explanations and models are provided by their peers.

Heterogeneous groups are most widely used for cooperative learning because they naturally support peers assisting peers, improve social acceptance of all types of learners, and can assist with classroom management

Considerations for structuring cooperative groups include group size, clear learning goals, direct instruction of group procedures, mixed-ability groupings, and individual and group accountability.

Higher achieving students can mentor the students who are struggling with a particular skill or concept. At the same time, the students who are more competent with a particular skill deepen their own learning by applying higher level thinking skills while assisting others to achieve.

- ✓ Assigning or asking peers to assist those who need help during any stage of an activity or the day might help a student with challenges to more fully participate.
- ✓ Identifying and assigning low-stress jobs to students with low energy allows them to more fully participate in classroom.
- ✓ Group tasks or assignments, discussions, role play, problem based learning adapted to students with visual impairment needs
- ✓ Identify the best method for communicating. Choose the appropriate way to communicate in groups using a note book and pen, email, text, SMS for hearing Impairment students.
- ✓ Physical environment: arrange the room so that all learners can see each other including students with mobility impairment (using wheelchairs)



- ✓ Consider supplementary video or multimedia presentations as options to field
- ✓ Account for the time and fatigue factors which may arise as the student with mobility

impairment moves between lectures

- ✓ Visual, aural, and tactile demonstrations incorporated into instruction for students

with dyspraxia symptoms

B1. The student has difficulty expressing himself/herself verbally

- To accept an alternate form of information sharing
(written report, artistic creation, exhibit or showcase, map, charade or pantomime Demonstration)
- Ask questions requiring short answers
- Provide a prompt, (beginning the sentence for the student or giving a picture cue)
- Allow body and language expression
- Wait for students to respond
- First ask questions at the information level (giving facts and asking for facts back) then have the student break in gradually by speaking in smaller groups and then in larger groups [159].

B2. The student has difficulty reading written material

- Provide alternative methods for student to contribute to the group, such as role playing or dramatizing
- Allow extra time for reading
- Omit or shortening the reading required
- Put the main ideas on index cards which can easily be organized in a file box and divided by chapters
- Type material for easier reading
- Use larger type



- Be more concrete-using pictures and manipulatives
- Reduce the amount of new ideas
- Provide experience as a frame of reference for new concepts
- State the objective and relating it to previous experiences
- Help the student visualize what is read [159].

B3. The student has difficulty writing legibly

- Use a format requiring little writing
(multiple-choice, true/false, matching)
- Reduce or omit assignments requiring copying [159].

B4. The student has difficulty expressing himself/herself in writing

- Accepting alternate forms of reports
(oral reports, tape of an interview, collage, cartoon, or other art, maps, 3-D materials, showcase exhibits, photographic essay, panel discussion)
- Allow more time
- Shorten the written assignment (preparing an outline or summary)
- Provide a sample of what the finished paper should look like to help him organize the parts of the assignment
- Open-ended stories and oral responses [159].

3.4.3 Grading and evaluation students in special education

Grading adaptations are procedures or strategies that can be used to individualize the grading system for a student with disabilities.

One effect of developing grading adaptations is that students with a history of low or failing grades may be motivated to follow a personalized grading plan that has been developed to meet the student's particular strengths and needs.



Individualized education program (IEP) grading, student self-comparison, pass/fail, mastery level/criterion systems checklists and descriptive grading are types of grading adaptations that can be used to assign student grades.

C1. Effective grading adaptations

- ✓ Prioritize content and related assignments
- ✓ Base part of grade on the processes that the student uses to complete work or the effort that the student puts forth
- ✓ Incorporate progress on IEP objectives into the student's grade
- ✓ Incorporate improvement measures into the student's grade
- ✓ Change scales or weights

C2. Evaluation

Dyslexia

- 25 % extra time to be awarded to allow for slower speeds of reading and writing
- Alternate different evaluation methods: multiple choice, essay, etc.
- Non-written assessment
- Grade the student on the content that needs to be mastered, not on things like spelling or reading fluency
- Provide different ways to respond to test questions, like saying the answers or circling an answer instead of filling in the blank.

Visual Impairment

- Provide extra time (aprox. 25%-50% additional time)
(examination papers may need to be enlarged or Brailled, with tactile diagrams, maps, etc.)
- Some may need a reader, an oral examination with the examiner, audiotaped questions, or large print papers.
- Allow oral reporting instead of written responses.
- Provide a quiet room for tests if needed.



Hearing Impairment

- Provide extra time (aprox. 25%-50% additional time)
- Use visual aids (i.e. writing on the board, slides, OHPs).
- Give written instructions.
- Break down test instructions into short, written steps [156].

Mobility Impairment

- A reader or an oral evaluation
- Alternate different evaluation methods: multiple choice, essay, on line evaluation etc
- For an oral evaluation allow extra time for the student to listen to and refine or edit responses.
- For some students the combination of written and oral evaluation will be most appropriate.
- Some students with a mobility disability may need rest breaks.

Dyspraxia

- Provide extra time (aprox. 25%-50% additional time) for students who have reduced writing speed

Attention-deficit/hyperactivity disorder (ADHD)

- Frequent short quizzes, rather than one long test at the end of each unit.
- Give credit for work done instead of taking away points for late
- Grade for content, not for neatness.

3.4.4 Kids Might Refuse to Use Accommodations

It's not uncommon for kids to refuse to use accommodations, and there are many reasons why. There are lots of reasons kids may refuse to use accommodations, from feeling ashamed to just not needing them [157].

- They don't want to stand out or feel different.



Kids have a powerful need to feel like they fit in and belong. An accommodation can be another reminder of how they're different from their classmates. Some kids prefer to tough it out or struggle with an assignment, rather than stand out from the crowd.

- They're worried about how other

A classroom accommodation may be hard to understand for their classmates who don't use accommodations. That means some kids worry that their peers are going to say "no fair!" or make fun of them for using accommodations in class. Even one negative comment from a classmate can make your child reluctant to use an accommodation.

- They think they're doing something wrong.

Kids have accommodations in place that work well, they may start doing better. And that can be confusing. It might feel like the accommodation is doing the work for them, which can feel wrong. They may not yet understand that the accommodation is a tool that helps them show knowledge or get their work done.

- They don't believe or understand how it will help.

It's important that kids have a say in choosing accommodations.

Without child's buy-in, accommodations might not get used. Knowing why extra time on tests is an option or how a fidget is supposed to help is key in getting child to use an accommodation. It's also important to give child a few weeks to get comfortable with it.

- They don't want to ask to use it (or they forget to ask).

Ideally, accommodations are readily available or built in to lessons, so it's easy for kids to use them.

Rather than draw attention to themselves by pointing out the need or asking permission to use it, some kids will just go without. Or kids may just forget to ask if no one reminds them.

- Self-advocacy is an important skill for kids who learn and think differently.

It helps them ask for what they need-including accommodations. But not all kids know how to ask. They may not have the skills or the words to ask to use an accommodation. And kids who are shy about self-advocating or who don't want to look like they're correcting the teacher might opt to just not use their accommodation, rather than speak up.

- They don't want to admit they need help.



As kids get older, they may become more aware of how learning differences impact them in school. That awareness might make them feel emotions like shame. Kids may also want to "prove" to everyone that they don't need help. If they're not yet comfortable talking about their challenges or asking for help, they may refuse to use accommodations.

- They don't need it in this class or lesson.

Not all accommodations are necessary in all classes or lessons. Just because an accommodation is available for all classes doesn't mean kids need to use it in all classes.

- It isn't helpful or doesn't work.

Kids who don't see the benefits of an accommodation may refuse to use it. They also might not know how to suggest something else that might work better.

Just keep in mind that there isn't always one solution. One place to start is by asking open-ended questions to start a conversation with child.

3.4.5 Expansion of methodology to cover other taught subjects

The typical curriculum, usually centered on printed materials, is designed for a homogeneous group of students and is not able to meet different learner needs.

The educators, must provide learning opportunities in the general-education curriculum that are inclusive and effective for all students, such as the teaching methods we are suggesting for the Lifeforce BLS-Algorithm, which are: drama-based Pedagogy through drama games, creative movement and kids yoga and mindfulness.

Additionally, the Universal Design for Learning, UDL, offers options for how information is presented, how students respond or demonstrate their knowledge and skills, and how students are engaged in learning.

Examples

Example 1. Skill: Visual figure-ground

Refers to the ability to locate and identify shapes and objects embedded in a busy visual environment, or the ability to attend to one activity without being distracted by other surrounding stimuli.



Stage of algorithm: Safety approach

Expansion: Learning difficulties:

- May have difficulty attending to a word on a printed page due to his/her inability to block out other words around it
- Difficulty copying from the board and may omit segments of words
- Difficulty recognizing misformed letters and uneven spacing,
- Over attend to details and miss “big picture”,

Adjusting: (history, literature)

- Keep their desk clear of distractions
- Don't have a worksheet cluttered with “cute” decorations
- Exercises to locate letter-numbers on a background, count letters and numbers, locate words in text, cryptograms.
- Use of words/texts from history and literature and information from the internet

Example 2. Skill: Visual Memory

The ability to remember for immediate recall the characteristics of a given object or form

Stage of algorithm: Check for breathing, call for help.

Expansion: Learning difficulties:

- Children with poor visual memory may struggle with comprehension.
- They often subvocalize as they read because they must rely on auditory input to help them compensate.
- They may have difficulty remembering what a word looks like or fail to recognize the same word on a different page.
- May have problems reproducing figures (letters, numbers, shapes or symbols) from memory

Adjusting: (the following activities can be applied in spelling and reading tasks)



- Try to draw letters/words with their eyes closed to remember the shape of them.
- Use bendable things to form letters, shapes and words (because feeling a word can help them visualize [see] the word).
- Make verbal descriptions of the letters/words (m and n have humps, in the word “duck” there are two letters after u, the letters c and k)
- If they can use a word processor, have them use spell check to help find misspelled words.

Example 3. Skill: Auditory perception (i.e. Auditory sequential memory)

Auditory perception refers to the ability of the brain to interpret and create a clear impression of sounds. Auditory perception is important and necessary for child’s language development, which is part of his overall cognitive development.

Auditory sequential memory is the ability to store a series of information in the order it was heard and later recall it, to facilitate following instructions and memorization of rhymes, songs etc.

Stage of algorithm: the steps of each stage of algorithm

Expansion: Auditory Processing Disorder (i.e Difficulties with auditory sequencing)

- May include confusing numbers like 93 for 39 and confusing lists and sequences.
- May not be able to complete a series of tasks in the right order.
- He or she may fail to be able to do so even when appearing to have heard and understood the directions.
- Difficulty following oral directions.
- Asking for repetition a lot.
- Missing things in conversations.

Adjusting: (the following activities can be applied in history and geography subjects, in sentence expanding, and dictation)



- Use Phonemic Awareness Activities (identify rhymes, manipulating sounds in words by adding, deleting, or substituting, separate syllables)
- Teach with multisensory instruction (having student hear it, say it, touch it, and move it during every lesson)
- Use a lot of practice and repetition (requires overlearning to achieve mastery)
- Work on listening comprehension skills (ask student a lot of questions like, “What happened first, next, then, last?” Teach him/her these transition words in telling a story and writing one too)



4.0 Pupils' assessment

4.1 Theoretical framework

One of the key concepts chosen to create the tools and the assessment perspective is the one of competences. To understand the impact of competences as a concept, we should start with some definitions.

Competences are a combination of knowledge ("composed of the concepts, facts and figures, ideas and theories which are already established and support the understanding of a certain area or subject), skills ("defined as the ability to carry out processes and use the existing knowledge to achieve results") and attitudes (the disposition and mindset to act or react to ideas, persons or situations). To have a better idea on the European engagement in this field, see the following resource: <https://kivinen.files.wordpress.com/2018/09/key-competences-for-lifelong-learning-en.pdf>.

Competence is the "ability to cope with a task, or a set of tasks, managing to set in motion and orchestrate their own internal resources, cognitive, emotional and volitional, and to use the available external resources in a coherent and fruitful way". Knowledge, ability, disposition (attitude) are, then, the key elements [160].

Le Boterf highlights **three dimensions** related to the exercise of a competence: the ability to mobilize their knowledge in response to a certain task, the willingness to invest the best of its resources in facing the task, the sensitivity to the resources and constraints that the operational context inevitably poses. Le Boterf (2010) gives the following tripartition: to know how to act, to want to act, to be able to act [161].

By competence, we understand good performance in diverse, authentic contexts based on the integration and activation of knowledge, rules and standards, techniques, procedures, abilities and skills, attitudes and values.

This concept fits very well with the aims and content of the project: when something



happens, in fact, I need to set my resources, use my knowledge and organize all the external resources I can arrange coherently.

Competences meet children, adolescents and adults: they vary for sure in complexity, but they work in the same way. We are “competent” if we are able to act well in a certain situation, in this perspective to be competent does not mean solely to know something or to have some notions about some topics, but also to put knowledge into practice in a given context.

The European Union has identified 8 Key Competences that enable every citizen to adapt to changes of society, to working life, to study and to learn new things. So, using competence as a guiding element is part of the process the EU started many years ago, affecting teachers’ work and students’ school-life. It is, then, important to use this framework, as it speaks the language of schools and the way teachers work with pupils and students. This means to support a better understanding of our project, to welcome activities and to understand the connection between the project on BLS and the usual teaching, the different subjects and the different competences teachers try to foster every day.

If we consider the EU LIFEFORCE project, probably the key competence naturally connected is the following: “personal, social and learning to learn competence”. It is “the ability to reflect upon oneself, effectively manage time and information, work with others in a constructive way, remain resilient and manage one’s own learning and career. It includes the ability to cope with uncertainty and complexity, learn to learn, support one’s physical and emotional well-being, to maintain physical and mental health, and to be able to lead a health-conscious, future oriented life, empathize and manage conflict in an inclusive and supportive context” (<https://kivinen.files.wordpress.com/2018/09/key-competences-for-lifelong-learning-en.pdf>).

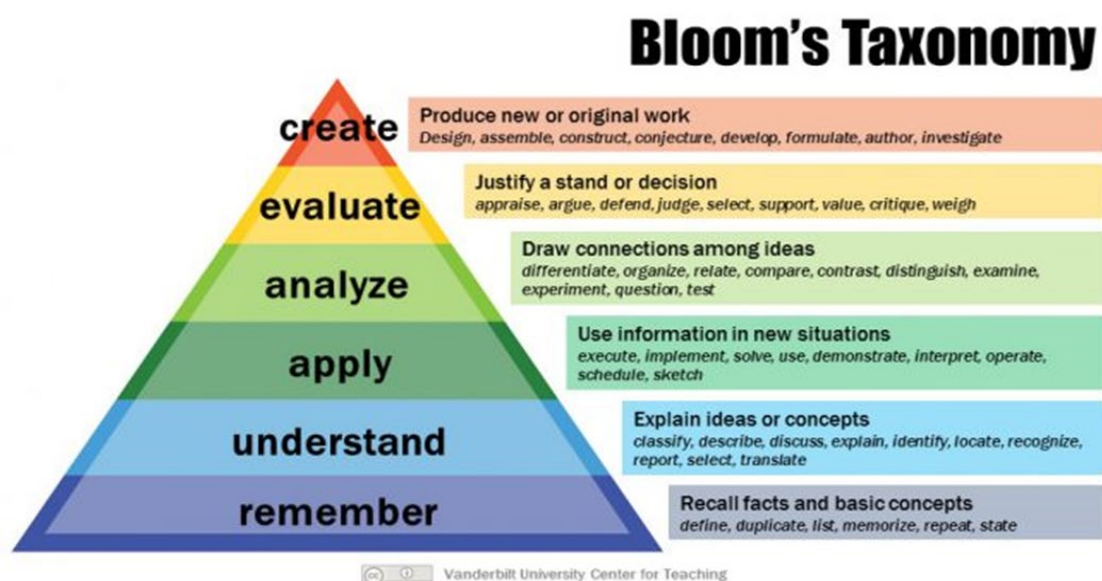
If we move from theory to practice, competence-based design or design based on competence is a strategic way to design training and education activities: it means to use competences (a goal, a final disposition, a behavior) as the starting point of the design process.

If I know where I should arrive, I can better plan the path and what I need to reach it:

if I know what a student has to do/know/act at the end of the activity, I can plan this activity in a more effective way and also assessment is affected. So, in this framework designers and trainers usually start from the end to go back to the origin (the activity/the project), in order to design "backwards".

This process needs little attention: first, we have to make a list of achievements and goals related to the competences (not too many, or the design would be uncontrollable); second, we have to define the assessment criteria (in relation to child performance), third, we can carefully design the most appropriate activities and methods (role playing, demonstration, games, videogames etc.) and produce learning resources.

The second key concept refers to Bloom's taxonomy [75].



Armstrong, P. (2010). Bloom's Taxonomy.

During the evaluation process and the creation of the observation list we used the aforementioned skills of the Bloom's Taxonomy in order to evaluate the level of remembering, understanding, applying, analyzing of the pupils.

The taxonomy has been used also in the questionnaire, as discussed in the paragraph devoted to this specific tool [89, 162-167].



4.2 Tools

4.2.1 Questionnaires

Questionnaires should be delivered as a pre-test (before training) of children's knowledge and as a post-test (after training) to see the deviation after the sessions. The information provided, with the ones collected thanks to the observation checklist, will grant a best idea of what children learned during the training sessions and where, again, we should go back to make the process clear and understandable. These tools will be integrated by the use of drawing (with a common mandate).

The questionnaires are simple and they use images, sounds and videos, as children are too young to have a complex or too formal tool. In this way we also make a connection to the mascot and we make recurrent links to the project items. Images, sounds, colours and videos are, in fact, of great impact and easy to understand in terms of inclusiveness. For 6 yrs old children questions should be provided also by a recorded voice (appearing next to the written text) or in case read by an adult (not suggested). All the questions are in a sort of scenario, besides general questions devoted to general knowledge: a kid is in the park with his/her friends and he/she sees a woman not feeling good. What does he/she do? How does he/she act?

This scenario is easy to grasp and understand, but also ideal as a medium to make questions situated (as said, children need to have a sort of environment to grasp topics and be "in the situation").

There are ordering questions, close-ended questions, there are no open-ended questions as for children's age. We propose a maximum of 3 possible answers for 6-8 year olds and a maximum of 4 possible answers for 8-10 year olds.

In constructing the questions we considered not only the algorithm, but also Bloom's taxonomy; the different levels of the taxonomy recur in the questions:

- Q1 refers to the level *understand*, specifically to the significant verb: identify;
- Q2 and Q8 refer to the level *remember*, specifically to the significant verb: list;
- Q6 and Q7 refer to the level *remember*, specifically to the significant verb: repeat;
- Q3, Q4, Q5, Q9 and Q10 refer to the level *apply*, specifically to the significant verb: execute.



The questions are based on the three verbs at the base of the pyramid; the highest verbs, *analyze and evaluate*, refer to levels that are too high compared to the age groups we are considering.

The two questionnaires are identical in their ludic structure and in the questions; only one characteristic differentiates them: in the questionnaire intended for 8-10 year old children, the items are 4 instead of 3, since children of that age are capable of recalling 4 elements.

4.2.1.1 Questionnaires for children: 6-8 years old

1. You are in the park with your friends, you see a woman lying down. What do you think first, before helping her? Choose the right answer.

Note: The question has three options and - after the answer - the right one will be in green followed by a sound to mark the positive answer

- A I ask myself: is it safe for me? (green)
- B I run faster as I can and go back to play (red)
- C I immediately help without reasoning (red)

2. You are in the park with your friends, you see a woman lying down and you do help her, since it is safe for you. What are the most appropriate actions? Put the images from 1 to 3 (first, second, third action).

Note: The question shows 3 actions with 3 images and - after the answer - a video starts with the correct order (the frame is part of the video). If it is impossible to make videos, the right order of the images from the first step to the last step will be in green followed by a sound to mark the positive answer

Situations explained in the frame (possible answers):

- A Check for breathing (3)
- B Check for response (2)
- C Approach with care (1)



3. What do you do to check if the woman is breathing? Watch the short videos and choose the one corresponding to the correct way to ensure she is conscious.

Note: The question shows 3 very short videos with different actions, the right one will be in green after children's selection and can be accompanied, as usual, by a specific sound to mark the positive answer. If it is impossible to make videos, we can use images and the correct one will be in green followed by a sound to mark the positive answer

Situations explained in the frame (possible answers):

A I clap my hands (red)

B I gently shake the shoulders of the victim and ask her loudly "Are you alright?" (red)

C I use my senses: I see if the chest is moving, I feel the breathing, I hear the breathing, I touch the chest to feel if it is moving or not. (green)

4. The woman in the park is unresponsive and not reacting. What should you do now?

Note: The questionnaire shows 3 actions with 3 images and after the answer a video starts with the correct answer. If it is impossible to make videos, the right image will be in green followed by a sound to mark the positive answer

A. I run away to look for an adult (red)

B. I check if she is breathing normally (green)

C. I rise her legs (red)

5. What number do you call for an emergency (European emergency phone number)?

Note: The question shows the number (no specific graphic needed). The right answer then will be in green followed by a sound to mark the positive answer

A 112 (green)

B 115 (red)

C 118 (red)



6. The woman in the park is unresponsive and not breathing normally. What should you do now?

Note: The questionnaire shows 3 actions with 3 images and after the answer a video starts with the correct answer. If it is impossible to make videos, the right image will be in green followed by a sound to mark the positive answer.

Situations explained in the frame (possible answers):

- A Ask someone to call 112 or take your mobile phone and dial 112, if you have one (green)
- B Start CPR (red)
- C Undo the buttons of the jacket (red)

7. Can the European Emergency Number be dialed even under poor connection?

Note: The question can use colours to make the answers easier especially for 6-7 years old children. The right answer then will be in green followed by a sound to mark the positive answer

- A Yes (green)
- B No (red)

8. What information would you communicate while talking to 112?

Note: The questionnaire shows 3 very short videos with different actions, the right one will be in green after children's selection. If it is impossible to make videos, we can make very short comic stripes or drawing and the right image will be in green followed by a sound to mark the positive answer

- A How old are you? (red)
- B Details of her clothing (red)
- C Tell them who you are, where you are (exact location) and that you have a non-responsive, non-breathing woman. (green)

9. What do you do while you call the 112? Choose the right answer

Note: The questionnaire shows 3 actions with 3 images and after the answer a video starts with the correct answer. If it is impossible to make videos, we can make very



short comic stripes or drawing and the right image will be in green followed by a sound to mark the positive answer

- A I stay with the woman I am helping and activate the speaker function of my phone (green)
- B I move around the park (red)
- C I hang up (red)

10. What actions should be performed as soon as possible to help the woman?

Note: The questionnaire shows 2 actions with 2 images and after the answer a video starts with the correct answer. If it is impossible to make videos, the right image will be in green followed by a sound to mark the positive answer

- A Chest compressions (red)
- B Belly compressions (red)
- C Chest compressions/ventilations and AED (green)

4.2.1.2 Questionnaires for children: 8-10 years old

1. You are in the park with your friends, you see a woman lying down. What do you think first, before helping her? Choose the right answer.

Note: The question has four options and - after the answer - the right one will be in green followed by a sound to mark the positive answer

- A I ask myself: is it safe for me? (green)
- B I run faster as I can and go back to play (red)
- C I immediately help without reasoning (red)
- D I go to the woman and ask how does she feel (red)

2. You are in the park with your friends, you see a woman lying down and you do help her, since it is safe for you. What are the most appropriate actions? Put the images from 1 to 4 (first, second, third, fourth action).



Note: The question shows 4 actions with 4 images and - after the answer - a video starts with the correct order (the frame is part of the video). If it is impossible to make videos, the right order of the images from the first step to the last step will be in green followed by a sound to mark the positive answer

Situations explained in the frame (possible answers):

A Check for breathing (3)

B Check for response (2)

C Approach with care (1)

D Call for help (4)

3. What do you do to check if the woman is breathing? Watch the short videos and choose the one corresponding to the correct way to ensure she is conscious.

Note: The question shows 4 very short videos with different actions, the right one will be in green after children's selection and can be accompanied, as usual, by a specific sound to mark the positive answer. If it is impossible to make videos, we can use images and the correct one will be in green followed by a sound to mark the positive answer

Situations explained in the frame (possible answers):

A I clap my hands (red)

B I gently shake the shoulders of the victim and ask her loudly "Are you alright?" (red)

C I use my senses: I see if the chest is moving, I feel the breathing, I hear the breathing, I touch the chest to feel if it is moving or not. (green)

D I rise her legs (red)

4. The woman in the park is unresponsive and not reacting. What should you do now?

Note: The questionnaire shows 4 actions with 4 images and after the answer a video starts with the correct answer. If it is impossible to make videos, the right image will be in green followed by a sound to mark the positive answer



- A I run away to look for an adult (red)
- B I check if she is breathing normally (green)
- C I rise her legs (red)
- D I gently slap her face (red)

5. What number do you call for an emergency (European emergency phone number)?

Note: The question shows the number (no specific graphic needed). The right answer then will be in green followed by a sound to mark the positive answer

- A 112 (green)
- B 115 (red)
- C 118 (red)
- D 119 (red)

6. The woman in the park is unresponsive and not breathing normally. What should you do now?

Note: The questionnaire shows 4 actions with 4 images and after the answer a video starts with the correct answer. If it is impossible to make videos, the right image will be in green followed by a sound to mark the positive answer.

Situations explained in the frame (possible answers):

- A Ask someone to call 112 or take your mobile phone and dial 112, if you have one (green)
- B Start CPR (red)
- C Undo the buttons of the jacket (red)
- D I wave something close to her face (red)

7. Can the European Emergency Number be dialed even under poor connection?

- A Yes (green)



B No (red)

8. What information would you communicate while talking to 112?

Note: The questionnaire shows 4 very short videos with different actions, the right one will be in green after children's selection. If it is impossible to make videos, we can make very short comic stripes or drawing and the right image will be in green followed by a sound to mark the positive answer

A How old are you? (red)

B Details of her clothing (red)

C Tell them who you are, where you are (exact location) and that you have a non-responsive, non-breathing woman. (green)

D Tell them you are with a non-responsive, non-breathing woman (red)

9. What do you do while you call the 112? Choose the right answer

Note: The questionnaire shows 4 actions with 4 images and after the answer a video starts with the correct answer. If it is impossible to make videos, we can make very short comic stripes or drawing and the right image will be in green followed by a sound to mark the positive answer

A I stay with the woman I am helping and activate the speaker function of my phone (green)

B I move around the park (red)

C I hang up (red)

D I look for help among the people in the vicinity (red)

10. What actions should be performed as soon as possible to help the woman?

Note: The questionnaire shows 4 actions with 4 images and after the answer a video starts with the correct answer. If it is impossible to make videos, the right image will be in green followed by a sound to mark the positive answer

A Chest compressions (red)

B Belly compressions (red)

C Ventilations (red)

D Chest compressions/ventilations and AED (green)

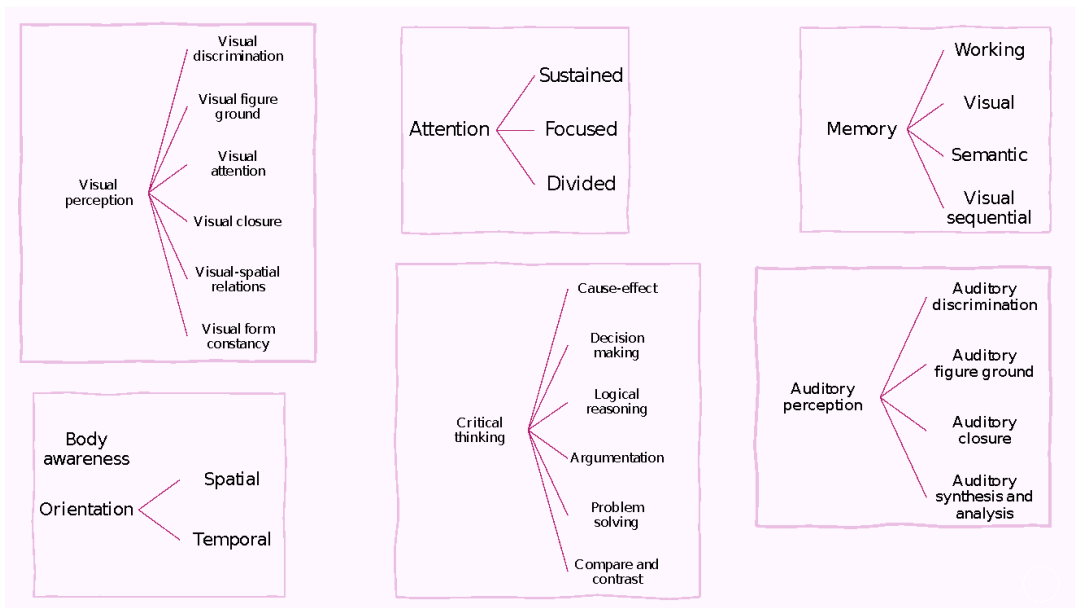
4.2.2 Observation list

Checklist parameter

Practical skills assessment: Algorithm

Cognitive assessment:

- Visual perception
- Auditory perception
- Memory
- Attention
- Critical thinking
- Communication skills
- Orientation
- Body awareness
- Self-regulation
- Language skills



Based on these objectives, the following observation list was created to assess the student's perceptual and cognitive skills [168-172].



SECTION A: INTRODUCTION – CASE SCENARIO COGNITIVE ASSESSMENT

1. Did the pupil understand and repeat the scenario?

- Yes
- No

2. Was the critical situation recognized?

- Yes
- No

3. What was the pupil's response?

- Fight
- Flight
- Freeze

SECTION B: BLS - SKILLS ASSESSMENT

Skill	The candidate	E		A		Comments
		Yes	No	Yes	No	
Safety	Ensures the safety of the:					
	- rescuer					
	- victim					
Check for response	Shouts: "Are you alright?"					
	Shakes gently by the shoulders to establish responsiveness					
Check for breathing	Opens the airway by tilting the head and lifting the chin					
	Looks for chest moving					
	Listens for breathing sounds					
	Feels for exhalation					
Call for help	Describes how to phone emergency services:					
	- Dials 112					
	- Name					
	- Place					
	- States: Unresponsive and non-breathing victim					



	Answers the questions asked by the operator					
	Activates speaker function					
	Stays on phone					
CPR	Kneels by the side of the person					
	Places the hands on the center of the chest with interlocked fingers					
	Keeps the arms straight					
	Rate 100-120/min,					
	Depth 5- cm					
	Releases pressure after each compression					
	Minimizes interruptions in chest compressions until help arrives					

SECTION C: BLS - COGNITIVE ASSESSMENT

Skill	The candidate	E		A		Comments
		Achieved		Achieved		
		Yes	No	Yes	No	
Safety	Assesses if the environment is safe?					
	Understands the spatial arrangement and is well oriented with respect to the risk?					
Check for response	Understands if the victim responds to stimuli (the victim verbalizes, reacts, moves, coughs)?					
	Is able to shake gently the victim by the shoulders?					
	Identifies where the shoulders are?					
Check for breathing	Identifies where the forehead is?					
	Identifies where the chin is?					
	Knows what to look for, listen and feel?					
	Is able to define if the person is breathing normally (is aware of agonal breathing and seizure-like movements)?					



Call for help	Recalls the 112-phone number from memory?					
	Can recall the relevant information (name – place – non breathing victim)?					
	Responds appropriately to the questions of the operator?					
	Understands the instructions given by the operator?					
	Is focused on the call?					
	Is able to follow the instructions and organize the relevant actions (ask for AED, start chest compressions)?					
CPR	Follows appropriately the algorithm steps?					
	Is aware of the importance of starting chest compressions as soon as possible (temporal orientation)?					
	Is aware of how to position the hands on the chest?					
	Is aware of the importance of appropriate depth, rate, recoil and minimizing interruption?					
	Identifies where the chest is and the location of the center of the chest?					

End of the course

6 months after the course

Visual and auditory perception

Memory

Attention

Critical thinking

Communication skills

Orientation

Body awareness

Self-regulation

Language skills

4.2.3 Rubric to assess the specific task “emergency recognition-call for help-manage the call and interact with the victim”

This rubric is intended for peer evaluation (e.g. pupils assess pupils) especially for older children involved in the project (8-10). It has to be delivered to pupils themselves. It is useful to make them aware of performance levels in a specific situation, as it is organized in progressive description of their behaviour from the best response to the weakest one. In this way pupils can understand their responses and how to improve. On the other hand it can be used during the observation and by teachers in order to give more detailed feedback on pupils’ performance (and to explain to them how and where to improve). The first column refers to the algorithm steps in sequence. To have a better view, the rubric is also in the Annexes and in a separate file.

Algorithm steps	Elements of the performance	Levels of the performance (from the highest to the weakest, as in literature)			
		Fully	Partially	With slight difficulties	With someone’s help
Check for response	Interaction with the victim	I speak firmly, I ask "are you alright" and do not lose my temper	I speak lowly, I ask "are you alright", but I get a little nervous	I hesitate to ask "are you alright", and it is clear that I am agitated	As soon as someone reminds me, I ask "are you alright"
Check for breathing	Emergency recognition	I immediately understand and without anyone's help that the person is unresponsive and not breathing normally	I understand that the person is unresponsive and not breathing normally, but it takes some time	I have a little trouble understanding that the person is unresponsive and not breathing normally	I understand that the person is unresponsive and not breathing normally only when someone points it out to me

Call for help	Call for help	I immediately pick up the phone (or ask someone to do it) and call the emergency number 112 autonomously	I immediately pick up the phone (or ask someone to do it), call the emergency number, but I have a little trouble remembering the number	I hesitate to pick up the phone (or ask someone to do it) and to remember and call the number 112	I pick up the phone (or ask someone to do it) as soon as someone asks me and reminds me of the number
	Call managing	I explain clearly and easily what is happening by standing next to the victim and activating the speaker function	I explain what is happening as best I can, but I don't immediately remember to stand near the victim and to activate the speaker function	I have a little trouble explaining what is happening and I don't remember to activate the speaker function	I can only explain what is happening if someone helps me to organize the information I want to give

4.2.4 Teacher's diary

Fill in the diary after the training session. It is recommended that you fill it in close to the session, to provide vivid information. The aim is to give feedback and information on what happened in the session, from teachers' point of view, concerning pupils' behavior.



General information (it depends on GDPR)	
Teacher's name	
Grade (1st, 2nd, 3rd, 4th)	
Pupils' age	
Pupils' number in the class	
Topic of the session	

1. Tell what happened during the session in terms of pupils' reaction (e.g. if they listened and collaborated etc.)

.....

.....

.....

.....

2. What positive aspects did you detect? (e.g. in terms of cognitive aspects, emotional learning etc.)

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.....

.....

3. What difficulties did you observe (e.g. pupils could not follow the training, the training was too demanding, they were tired)?

.....

.....

.....

.....



4.2.5 Drawing

Concerning children, it would be interesting to ask them to make a creative effort after the project and training. Mandate: make a drawing of a practice you learned during the training (e.g. call 112, use senses etc.).

The drawings collected can be analyzed and discussed to mark the best moments and topics, according to children's experience.

4.3 Annexes

4.3.1 Rubric and observation list

		Levels of the performance (from the highest to the weakest)			
Algorithm steps	Elements of the performance	Fully	Partially	With slight difficulties	With someone's help
Check for response	Interaction with the victim	I speak firmly, I ask "are you alright" and do not lose my temper	I speak lowly, I ask "are you alright", but I get a little nervous	I hesitate to ask "are you alright", and it is clear that I am agitated	As soon as someone reminds me, I ask "are you alright"
Check for response / Check for	Emergency recognition	I immediately	I understand that the person is	I have a little trouble understanding	I understand that the person is unresponsive



breathing		understand and without anyone's help that the person is unresponsive and not breathing normally	unresponsive and not breathing normally, but it takes some time	that someone needs my help	and not breathing normally only when someone points it out to me
Call for help	Call for help	I immediately pick up the phone (or ask someone to do it) and call the emergency number 112 autonomously	I immediately pick up the phone (or ask someone to do it), call the emergency number, but I have a little trouble remembering the number	I hesitate to pick up the phone (or ask someone to do it) and to remember and call the number 112	I pick up the phone (or ask someone to do it) as soon as someone asks me and reminds me of the number
	Call managing	I explain clearly and easily what is happening	I explain what is happening as best I can, but I don't	I have a little trouble explaining what is happening and I don't	I can only explain what is happening if someone helps me organize the



		g by standing next to the victim and activating the speaker function	immediately remember to stand near the victim and to activate the speaker function	remember to activate the speaker function	speech
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BLS – Algorithm for children (6-10 years old): Observation Checklist

SECTION A: INTRODUCTION – CASE SCENARIO COGNITIVE ASSESSMENT

1. Is the case scenario clear? Please can you repeat it?
 - Yes
 - No
2. Was the critical situation recognized?
 - Yes
 - No
3. Pupil Response
 - Fight
 - Flight
 - Freeze

SECTION B: BLS - SKILLS ASSESSMENT

Skill	The candidate	E		A		Comments
		Yes	No	Yes	No	
Safety	Ensuring the safety of the: <ul style="list-style-type: none"> - rescuer - victim - bystanders 					
	Shouts: "Are you alright?"					
Check for response	Shakes gently from the shoulders to establish responsiveness					
Check for breathing	Open the airways by head tilting and chin lifting					
	Looks for chest moving					
	Listens for breathing sounds					
Call for help	Feels for air flow					
	Describes how to phone for emergency services: <ul style="list-style-type: none"> - Dials 112 - Name - Place - States: Unresponsive and non-breathing victim 					
	Answers the questions asked by the operator					
	Activates speaker function					
	Stays on phone					
CPR	Kneels by the side of the person					
	Places the hands on the center of the chest with interlocked fingers					
	Keeps the arms straight					
	Rate 100-120/min					
	Releases pressure after each compression					
	Minimizes interruptions in chest compressions until help arrives					

SECTION C: BLS - COGNITIVE ASSESSMENT

Skill	The candidate	E		A		Comments
		Yes	No	Yes	No	
Safety	Assesses if the environment is safe?					
	Understands the spatial arrangement in space and is well oriented with respect to the risk?					
Check for response	Understands if the victim responds to stimuli (the victim verbalizes, reacts, moves, cough)?					
	Is able to shake gently the victim from the shoulders?					
Check for breathing	Identifies where the shoulders are?					
	Identifies where is forehead?					
	Identifies where is chin?					
	Knows what to look, listen and feel for?					
	Is able to define if the person is breathing normally (is aware of agonal breathing and seizure-like movements)?					
Call for help	Recalls the 112-phone number from his memory?					
	Can recall the relevant information (name, place, non breathing)?					
	Responds appropriately to the questions of the operator?					
	Understands the instructions given by the operator?					
CPR	Is it focused on the call?					
	Able to follow the instructions and organize the relevant actions (ask for AED, start chest compressions)?					
	Follows appropriately the algorithm steps?					
	Is aware of the importance of starting chest compressions as soon as possible (temporal orientation)?					
	Is aware of how to position the hands on the chest?					
	Is aware of the importance of appropriate depth, rate, recoil and minimizing interruption?					
	Identify where the chest is and the location of the center of the chest?					

End of the course
6 month after the course

Visual and auditory perception
Memory
Attention
Critical thinking
Communication skills
Orientation
Body awareness
Self regulation
Language skills



5.0 Theoretical framework and methodology for the preparation of teachers

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5.1 Introduction

UNESCO defines Adult education as “education specifically targeted at individuals who are regarded as adults by their society to improve their technical or professional qualifications, further develop their abilities, enrich their knowledge with the purpose to complete a level of formal education, or to acquire, refresh or update their knowledge, skills and competencies in a particular field. This also includes what may be referred to as ‘continuing education’, ‘recurrent education’ or ‘second chance education’” [173]

By the above definition, it is evident that adult education encompasses any learning activity or program, designed to address a learning requirement or interest, which may be implemented at any stage of a person’s life, beyond the age of compulsory education. Therefore, the scope of adult education can include both non-professional and professional education, as well as formal, non-formal and informal learning.

In the past, there has been an assumption that if a person knows very well the subject, then, he will be able to teach it. The primary goals of resuscitation training in non-health workers (ranging from children in different age groups to bystanders and first responders) are to increase cardiopulmonary resuscitation (CPR) rates, effective basic life support (BLS) and automated external defibrillator (AED) use, and timely emergency medical services (EMS) activation for out-of-hospital cardiac arrest. Enhancing willingness to perform CPR as part of the CPR teaching program in this population may have a direct impact on survival rates for out-of hospital cardiac arrest. Furthermore, an essential part of bystander CPR education is the recognition of cardiac arrest (unresponsiveness, not breathing normally), alerting the EMS, and the



performance of BLS (which includes the use of an AED) according to the European Resuscitation Council Guidelines 2021.

In the past decades several different learning styles had developed and by then learners have different learning preferences. There is a debate about whether learning styles are fixed or flexible, and the extent to which they are determined by the context [174]. Some learners prefer to work towards a deep understanding of what they are learning; others prefer to acquire the facts, a term known as surface learning. Sometimes deep understanding is needed, and sometimes it is enough to know “the facts” – the surface. Recognizing the different styles is important, as (most) lectures will appeal more to surface learners and extended project work will appeal more to deep learners. Some subject material actually needs to be known and rapidly recalled, while other material needs to be deeply understood to allow appropriate interventions [175].

According to Knowles et al. there are six assumptions on how a teacher approaches the teaching of adults.

- 1.They need to know the rationale of why they are learning something.
- 2.Adult learners enter the classroom with a fully developed self-concept, which is completely different from the children. That is because the adults assume full responsibility for their own lives.
- 3.They are not blank slates and they come with a wealth of experiences.
- 4.Their readiness to learn is often oriented by the roles and the responsibilities they have.
- 5.Adult learners are motivated to learn when the learning is perceived to be helping them perform tasks and solve problems.
- 6.They are intrinsically motivated to learn.

Adult learners are self-directing because of their developed sense of self, which is being responsible for their own lives and decisions. They know what they want to learn, which is shaped by their needs and experiences. Because learning needs are propelled by internal pressures, adult learners are intrinsically motivated. In short,



Knowles' depiction of adult learners can be seen as those who have developed self-concepts, are experience-rich, and are intrinsically motivated.

Knowles et al. center upon adult learners' characteristics and the teaching and learning processes are built on these characteristics.

Adult learners have the tendency to participate in learning activities in an active way. They need to be treated as responsible people. They are facing the trainers as knowledgeable colleagues rather than as unquestioned experts. Active learning implies that learners are involved in more than listening, less emphasis is placed on transmitting information and more on developing a student's skills and greater emphasis is placed on the student's exploration of his/her own values and attitudes.

The training program must be meaningful and relevant to the adult learners, their lives and their business. They have to very clearly see why and how this is important to them personally and how it applies to their life. If they can't see how they personally can apply the learning to their own life and roles, it is suggested that motivation towards the training intervention will be significantly reduced.

They face obstacles in learning. These obstacles may be related to poor organization of educational activities, they might arise from adult learners social obligations and duties or they might involve internal barriers stemming from the personality of individuals. The internal barriers can be divided into two categories, obstacles related to prior knowledge and values or barriers arising from psychological factors.

Adult learners develop defense mechanisms and resignation. These situations possibly occur when internal barriers impede adult learners to share new insights and redefine previous knowledge, values and habits. The real challenge is the phenomenon of inhomogeneity in the group of adults, in contrast to groups of children. As children belong to the same age group and go through the same stage of development [176]. All the above obstacles can act as catalysts for creative and effective learning or they can be barriers.



When adult learners first enter a new program, they very typically have an initial interview to discuss their goals and motivations for learning, and how they expect they will use new skills in their daily lives. This first meeting may also include a diagnostic assessment to identify learners strengths and any potential barriers to learning (such as a disability), and to place them at an appropriate level. As a follow-up instructors and new learners set out goals for learning in a written document (an individual learning plan or contract).

Adults learn best:

- In a democratic, participatory and collaborative environment where they are actively involved in determining how and what they will learn.
- When they know why they are learning something and the learning goals and objectives are considered realistic and important to them.
- When new information and skills are directly relevant and meaningful to their concerns, needs and interests.
- When the learning environment is physically and psychologically comfortable.
- When their talents are acknowledged and explored in a teaching situation.
- When they are able to engage in practical, problem-based learning activities that allow them to draw on and apply prior knowledge, skills and experience.
- When they are treated like adults and their established opinions, values and beliefs are respected.
- When instructors use a variety of teaching strategies to anticipate and accommodate differing learning styles and comprehension rates of learners.
- By participating in small-group activities that provide an opportunity to share, reflect, and generalize their learning experiences.
- When they receive constructive feedback on how they are doing and the results of their efforts.



- When coaching and other kinds of follow-up support are provided to help them transfer learning into sustainable regular practice.
- When the learning experience is enjoyable and fun.

Motivation in humans is governed by the requirement to satisfy basic needs. These needs can be divided into two categories -primary needs describe basic animal drives like hunger, thirst, sleep and safety while secondary needs are learnt through experience. Examples of secondary needs include the desire for power, and the status that achievement brings.

The motivation to learn is essential if education is to be successful. Nobody outgrows the need to learn or change. If the motivation to learn is self-generated by the candidate, learning will be more meaningful and the resulting change longer lasting. The teaching of those who are not motivated to learn or who find learning difficult is a particular challenge to the teacher.

A challenging but supportive environment where candidates are respected and treated like adults is essential and may prove inherently motivating. Conversely motivation will suffer severely in an environment where learners are not valued, their input is not recognized or where there is no encouragement to take risks and strive for development.

The principles of motivation can be depicted as a five-tier hierarchy. The first two steps are primary needs- physiological and safety requirements. The remaining three are secondary needs and psychologically based- love and belonging, self- esteem and self-actualization. Each of these basic needs or requirements has to be satisfied in turn before the next stage can be approached. Conversely, it is fruitless to attempt to motivate individuals by attending the lower levels of need if these are already met.

Facilitating the process of learning by increasing the motivation of candidates is a complex procedure, but is crucial to the educational environment, providing material appropriate to the candidates' needs, ensuring that instruction is carried out to the



highest standards, and by applying the principles of adult learning that are well established in educational practice.

Children are involved in education with the awareness that they are not yet, but they are learning to be adults, consequently they experience their hierarchical relationship of dependence on the teacher as inconsistent to their own identity. However, for adults, the consequent dependence on the teacher is experienced as contradictory to their identity. Thus, the relationships with the adult educator, although they vary according to the self-awareness and the role that characterizes the two sides, are, in any case, much more complex and contradictory than the relationship between the child and the teacher.

The need of a mix of learning strategies, ranging from teacher-directed to student-directed learning. This implies that there needs to be a “match” between the learner and the teaching styles used. The most important step to clinch such a dynamic relationship is to carry out a needs-assessment of the student/ trainees involved.

Beside these theories three concepts describe how people learn: pedagogy, andragogy, and heutagogy. These concepts focus on the relationship between learner and teacher, which has been described as a continuum.

Pedagogy involves teacher-centred learning: the student is the recipient of what the teacher wants the student to learn.

Andragogy involves student-centred learning: the student and teacher negotiate the learning.

Heutagogy means self-discovery and therefore involves student-led learning: the student determines what they want to learn.

A consequence is that learning becomes visible when teachers see the learning through the eyes of their students. The teachers develop an approach to their teaching which encompasses having the right mindset, being a cooperative and critical planner, being an adaptive learning expert and a receiver of feedback. In the end, the role of teachers is to know their impact and to help students become their own teachers.



5.2 Structure of Adult learning program

Taking into account the communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions, as well as the European Resuscitation Council's analytical guidelines on Cardio Pulmonary Resuscitation, regarding

a) the EU strategy on the Rights of the Child (Every child is entitled to adequate standard of living and equal opportunities, from the first stages of their lives. Every child is entitled to quality healthcare and education to the highest possible level, regardless of their background and place of residence;

b) the action plan on Integration and Inclusion for 2021-2027 (Teachers must be better equipped with the necessary skills and have the resources and support they need to manage multicultural and multilinguistic classes, to the benefit of all children. Create multi-participatory teaching societies, with the participation of schools, health and social services and parents. Provide support to the teachers, so they can develop skills to manage the cultural, religious and linguistic diversity);

c) the basic principles of medical education adopted for the ERC resuscitation courses encapsulate learning theories and teaching strategies to build an educational framework for the different types of learners and approaches to teach resuscitation;

we have modified and defined the program objectives for training the teachers.

5.2.1 Definition of goal and objectives of the program

The goal of the program is to train primary education teachers on:

a) topics regarding the management of life-threatening situations and handling of Out of Hospital Cardiac Arrest as First Responders, in order to increase willingness of trained responders to help victims in a life-threatening situations, improve the initiation of the chain of survival by starting BLS and develop confidence to attempt resuscitation whenever needed to provide help for people in life-threatening situations, and b) the Universal Design of Learning and Bloom's taxonomy, as part of inclusive education so the teachers can a) train children in Basic Life Support applying informal teaching



methods and b) acquire tools so they can expand design of equal learning opportunities to other curriculum subjects, adopted to their class's diversity, in order for the children to develop basic skills and their talents.

The creation of objectives defines the teaching modules and their sequence, as well as the choice of educational techniques to be applied. The objectives are separated in three levels, differentiated according to:

- Objectives regarding **knowledge** to be gained
Knowledge to be received by the trainees and all information which will be registered in their memory for future use.

The primary goals of resuscitation training for non-HCPs are to increase CPR rates, effective BLS and AED use, and timely EMS activation for out-of-hospital cardiac arrest [177].

Another objective is to guide the design of learning environments that are accessible and challenging for all in the design of goals, assessments, methods, and materials that lead to accessible, meaningful, and challenging learning experiences for all [178].

A final objective is to train learners in Bloom's taxonomy (Classification of learning objectives by complexity) as a helpful means to identify higher order questions [75].

- Objectives regarding **skills** to be developed
Skills which the trainees will develop after conclusion of the program, in order to take advantage of the know-how, skills, assets or knowledge which can help them to manage successfully life-threatening situations, as well as new professional challenges in primary education.

- Furthermore, essential objectives of CPR education include the recognition of cardiac arrest (unresponsiveness, not breathing normally), alerting the EMS, and the performance of BLS (which includes the use of an AED) according to the ERC Guidelines.



Learners will also develop skills, such as effective communication, situational awareness, leadership and team collaboration, task management, and decision making [89, 177].

As an added objective, learners will monitor the internal and external environment to set priorities, motivate, and engage learning and behavior, through the affective network of UDL, (Universal Design of learning). They will also sense and perceive information in the environment and transform it into usable knowledge. Learners will also plan, organize, and initiate purposeful actions in the environment through UDL's strategic network [178].

An additional objective is to teach critical thinking, one of the most challenging skills. This is achieved through Bloom's taxonomy and it helps to provide students with enough tools, not only to replicate information, but to construct knowledge [75].

- Objectives regarding **attitudes** to be adopted
Attitudes and values to be adopted by the trainees for the subjects on which they are trained and, in general, the predispositions they will develop, which shall influence their preferences and behavior in connection with their role as first responders in the scene of an emergency, and the application of new teaching approaches in the curriculum subjects, in order to promote inclusive education.

Teachers only need to learn the specific skills of resuscitation that they will subsequently teach to their students as they are already experts in teaching. Including such resuscitation teaching into curricula of teachers' education is highly recommended.

There are three main barriers to be overcome: personal factors (emotional barriers, most often "panic", but also socio-economic factors, and physical factors like "ability to place the patient flat"); CPR knowledge (skill deficits, fear of causing injury or doing something wrong); and procedural issues (communication and language barriers, and recognition of cardiac arrest) [177].



Another objective is to help teachers make learning inclusive and transformative for everyone [178].

Learners will also be required to go beyond knowledge and application and actually see patterns that they can use to analyze a problem [75].

5.2.2 Structure of detailed content

PHASES OF EDUCATION	TEACHING MODULE	THEORETICAL PART	PRACTICE
Pre-course phase	1. Pre-course knowledge test of BLS	Assess prior knowledge of BLS/First aid. (Interactive scenaria/multiple choice-type questionnaire.)	N/A
	2. Pre-course Capability to apply inclusive and informal training to curriculum.	Discussion (buzz groups), questionnaire	N/A
Course phase	1. BLS skills / L.I.F.E.F.O.R.C.E. BLS-algorithm	Introduction (Demo of emergency scenario) Safe approach Check for response Check for breathing	Skills training with instructor feedback for effective BLS and AED use



		<p>Call for help</p> <p>CPR</p> <p>AED</p> <p>Introduction to L.I.F.E.F.O.R.C.E.</p> <p>BLS-algorithm</p>	
	2. Language-communication skills	<p>Non-verbal communication</p> <p>Conversational skills</p> <p>Close-ended questions</p> <p>Open-ended questions</p> <p>Gain attention</p> <p>Prosodic features of speech</p> <p>Eye contact</p> <p>Semantics</p> <p>Descriptive language</p> <p>Narrative language</p>	<p>Workshop (L.I.F.E.F.O.R.C.E. material)</p>
	3. Social-emotional skills	<p>Empathy</p> <p>Emotional awareness</p> <p>Self-regulation</p>	<p>Workshop (L.I.F.E.F.O.R.C.E. material)</p>
	4. Cognitive-perceptual skills	<p>Visual perception</p> <p>Auditory perception</p> <p>Attention</p> <p>Memory</p> <p>Critical thinking</p>	<p>N/A</p>



		Orientation Processing speed	
	5. Learning theories	UDL Bloom's taxonomy	Workshop (L.I.F.E.F.O.R.C.E. material)
	6. Music and education		Workshop (Music, games, songs)
	7. Body awareness	Body expression Drama games Kids yoga and mindfulness	Workshop (Drama games, dance, kids yoga)
	8. Teaching material	Introduction to the Pupil's handbook and Teacher's handbook, brainbox cards	N/A
Post-course phase	1. BLS refresher	Interactive e-learning, video mobile app	N/A
	2. L.I.F.E.F.O.R.C.E. refresher	Interactive e-learning, video mobile app, L.I.F.E.F.O.R.C.E. material	

All teaching modules consist of an introduction, application to LIFEFORCE-BLS algorithm, expansion to other thematic modules and special learning groups.

c. Adult training techniques

By taking into account the legal framework and the internal Operational charter of schools, funding and budget limitations (logistics infrastructure), as well as



the time constraints and the implementation timetable of the program, the following training techniques were selected.

Basic training techniques and the reasons for their selection

TRAINING TECHNIQUE	REASONS FOR SELECTION
Enhanced (interactive presentation) Means: whiteboard, PC, projector, pictures, mannequins, manuals, videos VR CPR	Attention of the participants is ensured through the use of audiovisual material. Vivid and interesting teaching, easier absorption of material. have (various degrees of) experience for different learning styles
Demonstration	Stimulates interest and actively involves the learners to see, hear or touch the relevant training object, repeating the skills (BLS algorithm)
Brainstorming	Motivate the learners to engage in free, spontaneous expression of ideas [179]. Connections are made between new and existing information [180]. Participants rely on their own strength. Team creativity and experience are put to good use [179] which promotes the transformation of certain stereotypical beliefs (inclusive education and informal teaching learning techniques)
Work in groups	Effective when the group of learners shows signs of fatigue. It helps develop familiarity, social skills, autonomy, and it provides opportunities for collaboration. Knowledge stems from problem solving.



	<p>Mistakes are used for didactic purposes. Minimizes state of liminality.</p> <p>Wenger [181, 182], which emphasizes the importance of “communities of practice” in guiding and encouraging the learner.</p> <p>It promotes assumption of responsibility and roles, without the learners exposing themselves.</p> <p>It promotes techniques for managing disagreements and disputes.</p> <p>It develops critical thinking and decision making.</p> <p>It cultivates the ability to respect the experience and knowledge of others.</p>
<p>Simulation (training scenarios)</p>	<p>Realistic representation of a situations, where the trainees think and act just like “real” people would think and act in real situations. Simulation becomes realistic through the use of mannequins. Reflection leads to action and then change. The roles of deliberate practice [183], using reflection and feedback as tools to develop both knowledge, and skills to helping students develop autonomous learning, are independent and self directing</p> <p>Motivation (I learn because I want to)</p> <p>Can be performed by each trainee individually.</p>
<p>Role playing</p>	<p>Real everyday situations are “experienced” inside a protected training environment, which allows trial and practice, and reduces the fear of errors.</p>



	<p>It integrates learning to the demands of their everyday life</p> <p>This technique enhances the development of desired attitudes and skills.</p> <p>It helps analyze problematic or confrontational situations, involving their skills, attitudes, communication and behavior of the trainees.</p> <p>Orientation to learning (Learning will help me deal with the situation in which I find myself) [184]</p> <p>It helps reconsider beliefs and behaviors and possibly leads to a change in attitude.</p>
Practice	<p>It connects theory and praxis.</p> <p>They are concerned with perception and the processing of information because it focuses on developing competences and practising skills in specific context (behaviour in practice: [185])</p> <p>Trainees become more responsible.</p> <p>It increases the self-confidence of trainees through successful handling of difficult problems.</p> <p>High level of guidance (scaffolding)</p> <p>It presents clearly right and wrong actions, alternatives, procedures, etc.</p> <p>Immediate feedback σε real time, reflection in action, [186].</p> <p>On the job training</p> <p>Motivation (I learn because I want to) [184]</p>
Hands-on workshops Music	<p>Allows trainees to co-shape the training material and apply techniques for the adaption and expansion of the material to</p>



<p>Communication-Language skills</p> <p>Social-emotional skills</p> <p>Learning theories</p>	<p>other subjects and to the training needs of their pupils in a disparate class.</p> <p>It promotes the role of the learners' experiences (I have experiences which I value, and you should respect)[184]</p> <p>Motivation (I learn because I want to)</p>
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5.3 Adult learning theories

In the introduction of this chapter, the characteristics of adult learners, their learning barriers, training needs and motivations were explored, and the concepts of pedagogy, andragogy and heutagogy were introduced.

To facilitate the teaching of adults, a wide area of learning theories has been introduced over the past decades, in an attempt to explain how adult learners receive, process, and retain knowledge during learning. These theories stem both from psychological theories of learning and from pragmatic observation. Cognitive, emotional, and environmental influences, as well as prior knowledge and experience, all contribute to the way understanding is achieved or changed and to the way knowledge and skills are retained. Learning occurs in three domains: knowledge, skills and attitudes. Any theories should ideally account for learning in each of these three domains. Based on the degree on which they accomplish this, each of the adult learning theories may be more suitable to certain learning parameters and/or specific learning goals. For instance, in some programs the adult learners already possess university degrees on a graduate and/or postgraduate level and are involved in continuing professional development.

Following is a brief introduction to the most prevalent and widely spread adult learning theories:

a) Instrumental learning theories: These theories focus on individual experience and include the behaviourist, cognitive and experiential learning theories.



- **Behavioural theories.** A stimulus in the environment leads to a change in behaviour [187]. These theories promote standardization of the learning outcome, “clashing” with behavioural theories over who determines the learning outcomes and how these are measured.
- **Cognitive learning theories** focus learning in the mental and psychological processes of the mind, not on behaviour. They are concerned with perception and the processing of information [188-190].

b) Experiential learning theory focuses on developing individual knowledge and limiting the social context. This theory has found application in medical education, because it focuses on developing competences and practising skills in specific context (behaviour in practice: [185])

- **Humanistic theories:** These theories encourage individual development and are more learner-centred.
- **Andragogy.** Malcolm Knowles popularized this concept in 1980. Andragogy is the “art and science of helping adults learn” and Knowles contrasted it with pedagogy, which is the art and science of helping children learn. Knowles and the andragogy theory says that adult learners are different from children in many ways, including:
 - They need to know why they should learn something.
 - They need internal motivation.
 - They want to know how learning will help them specifically.
 - They bring prior knowledge and experience that form a foundation for their learning.
 - They are self-directed and want to take charge of their learning journey.
 - They find the most relevance from task-oriented learning that aligns with their own realities.

Andragogy focuses on giving learners an understanding of why they are doing something, more hands-on experience, and less theoretical instruction. In this



endeavor to explain the motivation for learning, has been criticized for possibly neglecting context and the social mechanism of constructing meaning and knowledge and for not taking other cultures into consideration.

- **Self-directed learning**, which suggests that adults can plan, conduct, and evaluate their own learning, was presented as a formal theory in the 1970s and has been used in a variety of educational settings to help improve adult learning. Learners set goals, determine their educational and/or training needs and implement plans. Self-directed learning can be achieved both inside and outside the classroom, and learners work individually or collaborate among themselves as part of their learning process.
- This theory does not take into serious consideration the social context of learning and may also be underestimating the value of other forms of learning such as collaborative learning.
-
- There has also been a debate whether, in practice, self-directed learning is not directed self-learning [191].

c) Transformative learning theory: Transformative learning theory explores the way in which critical reflection can be used to challenge the learner's beliefs and assumptions about the world around them and about themselves [192-194]. Sometimes transformative learning utilizes dilemmas and situations to challenge the learners' assumptions and principles. Learners then use critical thinking and questioning to evaluate their underlying beliefs and assumptions, and learn from what they realize about themselves in the process. Mezirow saw transformative learning as a rational process, where learners challenge and discuss to expand their understanding.

- Working to change one's underlying beliefs can be rewarding and demanding at the same time.



- The process of perspective transformation includes:
 - i. A disorienting dilemma which is the catalyst/trigger to review own views/perspectives.
 - ii. The context, which includes personal, professional and social factors
 - iii. Critical reflection. Mezirow (1990) identifies different forms of reflection in transformation of meanings, structures, context, process and premise [193].
Premise reflection involves the critical re-examination of long held presuppositions [195].

d) Social theories of learning: The two elements that are crucial to social theories of learning are context and community [196]. These concepts have been developed by Etienne Wenger [182], who emphasises the importance of “communities of practice” in guiding and encouraging the learner. Land and colleagues consider the way that learners enter the community of practice. The way in which a learner’s experience is shaped by their context and community is developed by situativity theory and is discussed by Durning & Artino (2011). Situated cognition theories are based on three main assumptions:

- i. Learning and thinking are social activities
- ii. Thinking and learning are structured by the tools available in specific situations
- iii. Thinking is influenced by the setting in which learning takes place.

e) Motivational models: Any theoretical model that attempts to explain and relates adult learning to an educational theory must have two critical elements – motivation and reflection. One such theory is the self-determination theory [197-199]. The theory recognizes the importance of intrinsic motivation, and considers that three basic needs must be fulfilled to sustain it: Autonomy, Competence, and a feeling of belonging – or “Relatedness”.

- i. One of the issues about learning is that a low expectation of success will result in poor motivation to learn, unless the perceived value of success is overwhelming. This is partly explained by Maslow’s theory of needs



[200], but it probably does not capture the balance between the different competing drives of hopes and expectation of learning as opposed to the time and effort needed to engage with the process.

- ii. The Chain of Response model concerns participation by adults in learning projects [201]. In this model three internal motivating factors are inter-related: self-evaluation, attitude of the learner about education and the importance of goals and expectations. The main external barriers to motivation are life events and transitions, opportunities, and barriers to learning or obtaining information.
- **Reflective models:** The reflection-change models consider that reflection leads to action and then change. Reflective learning [186, 202] has important relevance to medical education, and more widely in society. The role of deliberate practice [183], using reflection and feedback as tools to develop both knowledge and skills is starting to provide very valuable insights for educators helping students develop autonomous learning.
 - **Connectivism theory:** This is a 21st century learning theory based on the idea of learning through communities and networks. Heavily influenced by the rise of the internet and digital platforms, connectivism sees learning as no longer about the individual but about connections with technology and others. It moves away from the cognitive view of internal processing and instead relies on a network of people or technology to store, access and retrieve knowledge. [177].

5.3.1 Multi-theories model by David C. M. Taylor & Hossam Hamdy (2013)

The brief outline of the major learning theories in the previous section demonstrated the multitude of different, yet often overlapping theories about adult learning and the corresponding approaches to it.



In a structured learning environment new knowledge is rather similar to the existing knowledge and allows its relevance to be perceived and to readily build on it. A more challenging condition applies in real life when the relevance of information needs to be demonstrated.

The process of learning something new is not just about acquiring knowledge (surface learning), it includes being able to make sense of it, and hopefully making use of it. But being able to do these things means that you have to acquire an understanding of where things fit. The role of the teacher is to help the learner until things start to make sense.

In this section, a multi-theories model is presented, which encapsulates the different learning theories and can be used to structure, plan and deliver successful learning experiences. This model, which was presented by Taylor and Hamdy comprises five phases in the learning experience, which the learner needs to go through, each having their particular responsibilities. The educator needs to recognize that the learner needs to move through a cycle, in order to truly understand and learn. The learner's role is not only to receive knowledge but also to search, challenge, construct knowledge and change their own perception, views and beliefs.

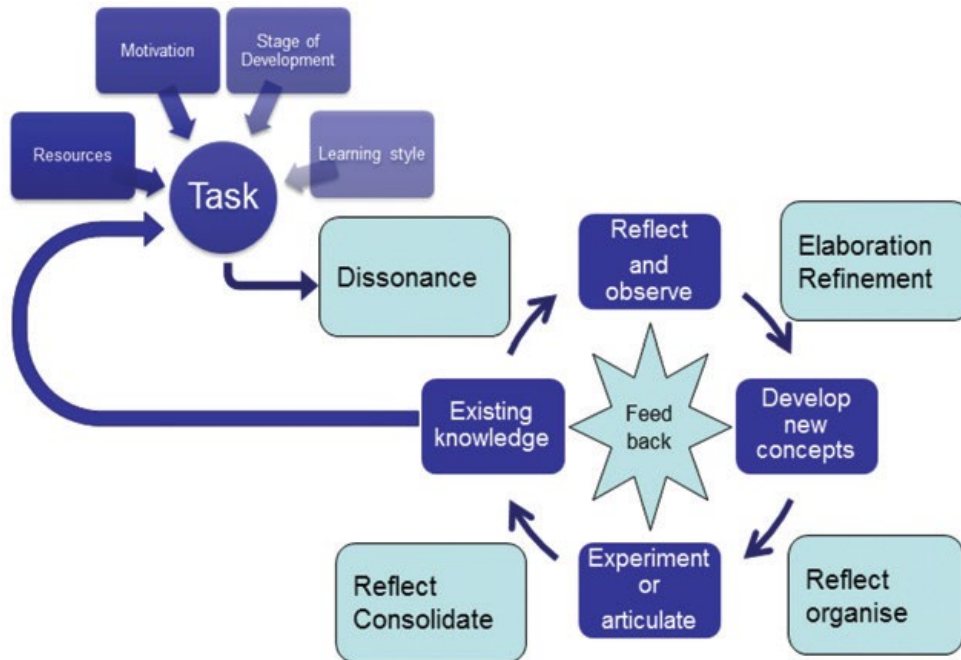


Figure 1. A multi-theories model by Taylor and Hamdy

- The **dissonance** phase exists when the learner's existing knowledge is challenged and found to be incomplete. The challenge can be internal, when a learner is thinking things through, or it can be external, provided by a teacher or patient.
- During the **refinement** phase, the learner seeks out a number of possible explanations or solutions to a problem (elaboration), and through completing tasks, research, reflection and discussion refines the new information into a series of concepts which are, for the learner, new.
- The **organisation** phase is where the learner develops or restructures their ideas to account for the increased information they have acquired. There are at least two elements to this: reflection in action, where the learner tests and re-tests hypotheses to makes sense of the information and the organisation of the information into schemata which (for the learner, at least) make sense.
- The **feedback** phase is arguably the most crucial, as it is where the learner articulates their newly acquired knowledge and tests it against what their peers and teachers believe. The feedback will either reinforce their schema, or oblige the learner to reconsider it in the light of new information.



- During the **consolidation** phase the learner reflects upon the process they have undergone, looking back over the learning cycle and identifying what they have learned from it, both in terms of increasing their knowledge base, but also in terms of the learning process itself (reflection on action).

This model can help in the design of learning activities, whether in one-to-one discussions, small group work, seminars or large lectures. The same principles apply to planning curricula, at short course, module or program level. Whether working with an individual learner, or planning a major program, the educator needs to recognise that the learner needs to move through a cycle, in order to truly understand and learn.

The most appropriate outcome is defined by six considerations:

Consider *how to encourage the learner to articulate what they already know*. This helps the learner anchor the new knowledge to what they already know. It also helps the learner to locate the gaps and uncertainties in their knowledge.

Consider the *learning styles*. If a simple presentation of knowledge is enough, then surface learning is the most appropriate style. If, however the learner is required to understand the knowledge and later elaborate on it, then a deeper learning style is better (discussion, problem-based learning).

Consider the *stage of development of the learner*. Learners need to be comfortable with uncertainty and recognize when they need to know more. Look beyond duality (right/wrong), and look beyond the obvious first impressions.

Consider the *learner's motivation*. Although adults are expected to be self-motivated, they will have competing concerns. The goal is to construct meaning and determine what should be learned, and not to squander the learner's energy and enthusiasm with poorly thought out tasks, or issues that are either trivial or too difficult.

Consider the *resources*. Physical resources and time. (Allow time for preparation, planning, delivery, evaluation and assessment). It is also important that there is sufficient time for the learners to engage with the learning activity and complete any necessary additional work, such as reading, and of course reflecting upon the material and the way in which they have learned.



Finally, consider the *task*. It needs to have learning outcomes which are aligned with the curriculum as a whole and which are specific enough to be reasonably achievable within the allocated time. Attention needs to be paid to the assessment opportunities, and the material covered should be included in the assessment blueprint.



5.3.2 Application of Taylor and Hamdy's Multi-theories model to adult learning in L.I.F.E.F.O.R.C.E.

In this section, it will be shown how Taylor and Hamdy's Multi-theories model will be applied to the adult learning activities of L.I.F.E.F.O.R.C.E., either in conjunction with J H George and Doto's 5-stage approach to BLS training, as modified and used by the European Resuscitation Council, or on its own, to deliver the planned workshops, and to train the teachers on Universal Design of Learning and Bloom's taxonomy.

Dissonance phase

In this phase, the aim is to investigate the learning needs and to assess previous knowledge for each of the learning modules.

These aims will be achieved through conversation, mixed questionnaires (checklists and multiple choice), simulations (For BLS, this corresponds to George and Doto's second stage of real-time demonstration without commentary).

The trainers will then define the training goals, taking into consideration the common ground from the learners' answers.

Refinement phase

During this phase, new knowledge is linked to the existing one. This is achieved through providing the relevant learning experiences (completing tasks, discussion, research and reflection).

The new knowledge will then be refined into a hypothesis.

The basic concepts and skills will be introduced and the learners will practice individual skills (not in the sequence) in different situations and ways. In terms of BLS training, this corresponds to George and Doto's third stage of demonstration (or presentation) of each step with commentary.

Organization phase

In this phase, the hypothesis formed in the previous phase will be tested several times by the learners, who compare their current activities with what they already know (*reflect in action*), and thus be able to construct a "story" which will be meaningful to them.



During this phase, all individual skills will be organized into a sequence (complex task). In terms of BLS, this corresponds to George and Doto's fourth stage of having the learners instruct the trainer how to perform skills in sequence.

This phase encourages critical reflection through discussion with each other informally or in small groups.

Feedback phase

During this phase, the learners practice in sequence the knowledge and skills developed previously. In terms of BLS, this corresponds to George and Doto's fifth stage of having the learners perform skills in sequence themselves (through training scenarios) and receiving feedback from the trainer. By successfully applying the newly gained knowledge and skills, the learners demonstrate that they have truly understood them, instead of simply recalling them. The feedback received either reinforces the learned schemata, or compels the learners to reconsider them.

Consolidation phase

During this phase, the learners think about the learning processes they have used and identify what they have learned (*reflect on action*). This will be achieved through a structured evaluation (questionnaire), where the learners will be presented with the multi-theories learning model used for their training.

Then they will be given the role of trainers who will train other teachers and will be asked to evaluate the learning process and specify which elements they would keep and which they would change. Through this process, learners will also be led to evaluate their personal responsibility for training.

5.4 Feedback- Assessment

Feedback is one of the most powerful influences on learning and achievement. It provides information specifically relating to the task or process of learning that fills a gap between what is understood and what is aimed to be understood [203]. According to Winne and Butler (1994) the feedback is information with which a learner can confirm, add to, overwrite, tune, or restructure information in memory, whether that information is domain knowledge, meta-cognitive knowledge, beliefs about self and



tasks, or cognitive tactics and strategies [204]. The main purpose of feedback is to reduce discrepancies between current understandings and performance and a goal. Effective feedback must answer three major questions asked by a teacher and/or by a student: Where am I going? (What are the goals?), How am I going? (What progress is being made toward the goal?), and Where to next? (What activities need to be undertaken to make better progress?).

There are four levels to focus on a feedback: feedback about the task, about the processing of the task, about self-regulation and about the self as a person. The last one seems to be the least effective, the second and the third are powerful in terms of deep processing and mastery of tasks and the feedback about the task is powerful when the task information subsequently is useful for improving strategy processing or enhancing self-regulation.

The feedback about the task is most common and is often known as corrective feedback. It is aimed to move students from task to processing and then from processing to regulation. Hence, too much feedback only at the task level may encourage students to focus on the immediate goal and not the strategies to attain the goal. It can lead to more trial-and-error strategies and less cognitive effort to develop informal hypotheses about the relationship between the instructions, the feedback, and the intended learning.

The feedback about the processing of the task refers to the surface understanding of learning which involves the acquisition, storing, reproduction, and use of knowledge. It relates to students' strategies for error detection, thus providing oneself with feedback. Such errors may indicate failure and a need to re-strategize, to choose different strategies, to be more effective in applying strategies. Feedback at the process level appears to be more effective than at the task level for enhancing deeper learning.

Self-regulation involves an interplay between commitment, control and confidence. It addresses the way students monitor, direct, and regulate actions toward the learning material. This type of feedback appears to be credible in the early stages of learning, when students need to expend effort to succeed. As skills develop, and success should require less effort, ability feedback may become more credible. It should be used



accompanied with a task, learner's beliefs and their conceptions of learning to be effective in the learning process.

The last one about the self as a person is used more instead of other feedbacks. It mainly contains little task-related information. Praise addressed to students can direct attention away from the task about self, as it has low information value to effective learning. Praise can be counterproductive and have negative consequences on students' self-evaluations of their ability. By praising the related feedback usually dismissed as the students have a high fear of failure and so is ineffective in enhancing learning.

Using feedback in effective learning should evaluate four issues: the timing, the effects of positive and negative feedback, the optimal classroom use of feedback, and the role of assessment in feedback. Immediate error correction during task acquisition (feedback of the task) can result in faster rates of acquisition, whereas immediate error correction during fluency building can detract from the learning (feedback about the processing of the task). Negative feedback is more powerful at the self-level (feedback of the task). Positive feedback increases motivation relative to negative feedback for a task that people "want to do" and decreases motivation relative to negative feedback for a task that people "have to do." Thus, when we are committed to a goal, we are more likely to learn as a function of positive feedback, but when we undertake a task that we are not committed to (and hence have to do), we are more likely to learn as a function of negative feedback. It is likely, however, that this effect is short lived in that it may lead to future task avoidance behavior. The climate of the classroom is critical, particularly if disconfirmation and corrective feedback at any level is to be welcomed and used by the students (and teachers). Typically, students respond only when they are fairly sure that they can respond correctly. Errors, and learning from them, are rarely welcomed. Simply providing more feedback is not the answer, because it is necessary to consider the nature of the feedback, the timing, and how a student "receives" this feedback. Students, too often, view feedback as the responsibility of someone else, usually teachers, whose job it is to provide feedback information by deciding for the students how well they are going, what the goals are, and what to do next. The ways and manner in which individuals interpret feedback information is the key to developing positive and valuable concepts of self-efficacy about learning, which



in turns leads to further learning. Assessment concerns both teacher and students. For students, it means gaining information about how and what they understand and misunderstand, finding directions and strategies that they must take to improve, and seeking assistance to understand the goals of the learning. For teachers, it means devising activities and questions that provide feedback to them about the effectiveness of their teaching, particularly so they know what to do next.

Feedback has increasingly become the focus of good educational practice because of the opportunity it provides for learners to reflect and at the same time receive quality input into aspects of their performance. Its purpose is to help learners achieve autonomy in the target field, acquiring along the way appropriate cognitive, psychomotor and affective characteristics. In order to be effective the process needs to be sensitive, relevant and useful: the challenge is to find the appropriate language to enable this to happen.

Assessment is one of the most challenging aspects of the education process. It typically provokes high emotional responses from both teachers and learners. It is essential that instructors have a basic understanding of assessment methodology and a good understanding of the particular assessment approaches used on courses, so that assessment tools are properly used. This will help increase the reliability of assessments actually reflecting the learner's ability.

The assessment of candidates is a fundamental part of a teacher's role. Its purpose is to facilitate the process of learning and to ensure that high standards are maintained. Assessment should be carefully planned to reflect the content and teaching approach within the curriculum. Getting assessment right facilitates both the candidates' personal and professional development. Enabling teachers to understand and develop confidence in assessment is an important element in measuring the quality of the candidate experience and the course undertaken.

Tools used for assessment are the questionnaire, the interview and the observation. The questionnaire is directly related to the task that is evaluated and it includes the indicators of learning goals that have been defined. Interviews can be individual or group, focused on a specific issue or more general. By observing a teaching process it can be determined if the instructors use participatory teaching techniques or it can investigate the extent to which the learners have acquired some skills.



The assessment should be tied to specific learning outcomes, and the learner should be given whatever feedback will help them develop or consolidate their knowledge, skills or attitudes. Time constraints mean that some elements of the feedback will need to be the learner's self- and peer-evaluation, but this should not be seen as a problem. Encouraging discussion, debate and reflection will increase learning opportunities. It is important to allow time, and provide a structure, for these activities if they are to be properly integrated into the learning/assessment system.

5.5 Conclusions

Adult learning is a complex process, defined by several factors, such as the characteristics of the learners, their motivation and learning barriers, investigation of the training needs, definition of the training goals and objectives, proper planning, and the relationships among trainers-trainees.

The structure of an adult training program, the training techniques used and its detailed content are influenced by the aforementioned factors.

To facilitate the teaching of adults, a wide area of learning theories has been introduced over the years, in an attempt to explain how adult learners receive, process, and retain knowledge during learning. Learning theories should include learning in the domains of knowledge, skills and attitudes. Any theories should address learning in each of these three domains.

The goal and objectives of L.I.F.E.F.O.R.C.E. regarding adult education involve training of elementary school teachers in BLS and first aid, as well as inclusive education and high order thinking skills, in the organization of informal learning, extra-curricular activities and management of emotional responses of school children when faced with emergency situations. They also aim to help the trainers apply this knowledge and skills to other environments, and it will give them flexibility in the teaching approach, in order to achieve the learning goals, and expand the teaching methodology to other learning activities and special learning groups.

Based on the above, the multi-theories model of adult learning proposed by Taylor and Hamdy, which utilizes aspects of several adult learning theories emphasizing the roles



of learners and teachers was chosen as an adequate teaching approach and was adapted to the adult learning parameters of L.I.F.E.F.O.R.C.E.



6. Conclusion

The recommended algorithm of BLS was broken down for school children of 1st-4th grade. It was discussed how the individual items have to be evaluated in order to find out how they have to be implemented so that they are age-appropriate and achieve the highest possible learning effect for the children without overtaxing them.

Theoretical framework and methodology for school children and teachers are described. By analyzing different theories the different developmental stages of children are closely observed. This made it possible to identify appropriate skills per age and to combine them to the BLS algorithm to ensure the best possible development of skills. Suggestions for adaptations of the learning environment are also presented for children with learning difficulties due to different impairments. For training the teachers the multi-theories model of adult learning proposed by Taylor and Hamdy, which utilizes aspects of several adult learning theories emphasizing the roles of learners and teachers was chosen as an adequate teaching approach and was adapted to the adult learning parameters of L.I.F.E.F.O.R.C.E. Social and emotional but also perceptual and cognitive skills are discussed that are activated during the BLS algorithm or that are already brought along by children through social backgrounds before the training. It is visualized that these skills occur with different frequency in the learning process and their development is particularly important to protect children during lifesaving activities and to emotionally cope with the extraordinary situation. Introducing music in the L.I.F.E.F.O.R.C.E. and BLS training process, can be an effective instrument to improve access and lighten the learning process and to arouse the interest of the children.



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