

EFFECTIVE FIRST-AID EDUCATION FOR SECONDARY SCHOOL CHILDREN: CURRENT METHODS AND LATEST INSIGHTS

^aMARTINA HRUŠKOVÁ, ^bPAVLA BÍLKOVÁ, ^cMONIKA BOLTNAROVÁ, ^dMONIKA JUNGVRTHOVÁ, ^eBARBORA BARTOŠOVÁ, ^fPETRA KUBOUŠKOVÁ, ^gLENKA SIMANDLOVÁ, ^hNIKOL PODLEŠÁKOVÁ

University of South Bohemia in České Budějovice,
Faculty of Education, Jeronýmova 10, CZ - 371 15 České
Budějovice, Czech Republic

email: ^amhruskova@pf.jcu.cz, ^bbilkop01@pf.jcu.cz,
^cboltnp00@pf.jcu.cz, ^djungvm01@pf.jcu.cz,
^ebartob03@pf.jcu.cz, ^fkuboup00@pf.jcu.cz,
^gsimanl05@pf.jcu.cz, ^hpodlen01@pf.jcu.cz

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Abstract: This article aims to analyse, through a questionnaire, whether the selected activating methods and the CLIL methods are effective in teaching first aid for secondary school children. Secondary school children (lower secondary level, N=231) from South Bohemia (municipalities with different populations) filled out questionnaires before and after a first-aid course between 2019 and 2023. Evidence-based educational pathway and current European Resuscitation Council guidelines were followed. The study was focused on the differences in the level of knowledge and attitudes of children educated partially/fully through activating methods/CLIL compared to common first-aid teaching (PowerPoint presentation, first-aid videos, worksheets). Through the questionnaire survey (a) significant differences were found in the mean values of knowledge of first aid in sum before and after a first-aid course in all subgroups with partial/fully teaching through activating methods/CLIL (p=0.00) as in all subgroups with conventional teaching (p=0.00), (b) the assigned role (rescuer vs. rescued) in simulations with moulage does not affect the increase in knowledge level (p=0.53) and children prefer the role of the rescued (p=0.04), and (c) children educated through activating methods/CLIL declare a higher attractiveness of teaching (100%), a greater motivation to continue learning first aid using the same methods (88%) and a greater willingness to pass another first-aid course (100%). In general, from the short-term perspective both approaches of teaching first aid are effective (p=0.00), but from the long-term perspective teaching partially/fully using activating methods/CLIL is more appreciated by children. After the first-aid course 96% of children evaluated that first aid is a very important or important part of the curriculum.

Keywords: first aid, education, lower secondary level, school, activating method, moulage, CLIL, social science

1 Introduction

First pre-medical aid is defined as the first and immediate assistance given to any person with either a minor or serious illness or injury, with care provided (a) to preserve life, (b) prevent the condition from worsening (e.g. circulatory failures), or (c) to promote recovery. It includes initial intervention before professional medical help is available, such as stopping massive bleeding, helping during choking, and (if necessary) performing cardiopulmonary resuscitation (CPR) while waiting for an ambulance, as well as the complete treatment of minor conditions, such as applying disinfectant and a plaster to a cut. First aid is generally performed by someone with basic medical training, who must consider also his or her own safety and the safety of other people present (FAM, 2021; Kelnarová et al., 2012; Hrušková & Gutvirth, 2010).

Any human being (including secondary school children) is always expected to provide basic assistance, especially in case of emergency. That is not just a moral obligation but also a legal requirement for an adult, which includes calling the Emergency Medical Service (in the Czech Republic 155) for professional help (§ 150, No. 40/2009 Coll.).

First-aid training for children can make a significant impact: first-aid knowledge and skills can enable children to react effectively in emergency situations and help their peers and families in need. First-aid training also helps to diffuse preventive messages and strengthens the processes of behavioural change aimed at making youngsters more resilient, safer and healthier (GFARC, 2024). For example, in Norway first aid tends to be taught from the primary-school level (Bakke, Bakke & Schwebs, 2017) and 72% of the population felt that they would be able to provide first aid in case of an emergency (Bakke et al., 2016). Comparison of the number of patients that

received CPR from a bystander (in 2020 before the lockdown; Tjemland et al., 2023) showed that willingness to provide CPR in Norway (60/100,000) is among the highest worldwide. In the Czech Republic, an even higher willingness to provide CPR was calculated in 2020 before the lockdown (68/100,000; Tjemland et al., 2023), but this high number could be influenced by the fact that in certain cases in the Czech Republic, it is not necessary to breathe into an adult due to the quick arrival of Czech emergency services. Therefore, other statistics point to the percentage of patients reported as receiving FullCPR (bystander CPR with chest compressions and ventilations): 8% in the Czech Republic vs. 92% in the Netherlands (median 21%). Reversible collapse, defibrillator and FullCPR significantly affect patient survival. Chest compressions alone (COnly) seem to be less effective only in primary cardiac arrest with quick arrival of an ambulance as FullCPR and COnly differ significantly regarding “location at home”, “shockable rhythm”, “collapse witnessed” and “intervention time” (Wnent et al., 2021). Additionally, in the overall paediatric cohort aged 0 to 18 years, CPR with rescue breathing was associated with a greater odd of neurologically favourable survival compared with compression-only bystander cardiopulmonary resuscitation (Naim et al., 2021).

While the public can play a crucial role in saving lives during emergencies, intervention is only effective if people have the skills, confidence and willingness to help (Heard, Pearce & Rogers, 2020). Human factors contributing to decision-making during resuscitation are identified and can be mitigated by tailored stress training and cognitive aids (Groombridge et al., 2019). Students with previous first-aid training reported providing first aid more frequently than those who had not passed any first-aid course. Students with first-aid training could be tutors at educational activities or camps, consequently they could provide first aid more frequently. Also, students who have gone through a first-aid course could be less afraid to help someone (Kuba & Havlíková, 2023). In the Czech Republic (Kuba, Sekerášová & Ročková, 2023), security is significantly the strongest factor that would reduce respondents’ willingness to provide first aid (own security for 67% of respondents; security of other persons – family members, friends, etc. – then for 64%). Other factors influencing willingness to provide first aid (Kuba, Sekerášová & Ročková, 2023) are the “looks healthy” factor (bystanders don’t know if the person needs help; 47%), the “bystander effect” factor (someone else is already helping that person, 41%) and poor knowledge of first aid/uncertainty (37%). In any case, most of the factors that cause a decline in willingness to help can be positively influenced by targeted long-term first-aid training.

Public knowledge of first aid is a valuable survival tool and key factor in reducing the number of avoidable deaths during emergency situations (Oliver, Walter & Redmond, 2017). In the field of first-aid education, the most relevant knowledge source is the European Resuscitation Council (ERC Guidelines, 2015; 2021). These guidelines are updated usually every five years and reflect the latest scientific findings in the field of first aid. Other publications and projects subsequently build on these findings (e.g. Greif et al., 2021; British Red Cross, 2022; Truhlář et al., 2021; SBR Project, 2022). The basic rules for communication in a crisis are summarized as (a) choosing the shortest possible forms of expression, (b) choosing clear, unmistakable words for communication and (c) focusing on the quick use of acquired knowledge in specific situations (Tesařová, 2014). When calling the emergency line, Tesařová (2014) recommended following the rule for communication: (1) “I am (who, where), (2) I see, (3) I foresee, (4) I do and (5) I request”. These basic rules can be taught to Czech pupils not only in Czech but also in foreign languages. The acquired language resources may one day help them save their lives.

Educational goals and the educational pathway in the first-aid theme are generally designed to positively influence bystanders’

willingness to help and specifically for children and teenagers include knowledge, skills and attitudes which are precisely defined (De Buck et al., 2015; De Buck et al., 2020; Global First Aid Reference Centre (GFARC, 2024); Belgian Red Cross, 2024). For educating school and home learners, e.g. the British Red Cross supports teachers (British Red Cross, 2024a) and pupils/students (British Red Cross, 2024b) by appreciated supporting materials with step-by-step activities. It is recommended that training interventions be longer than 3 hours in duration, include theoretical, practical and didactic components, contain well-designed resources, and require advanced lecturers. Certainly, educational resources should be age appropriate and context specific (Reveruzzi, Buckley & Sheehan, 2016). The top three most appropriate and successful teaching methods for each age group are as follows: (a) for 5–8-year-old children Game, Story Telling and Song, (b) for 9–12-year-old children Case Study, Game and Role-Play, and (c) for 13–18-year-old children Role-Play, Flip Chart, Case Study/Video/Manikin. In contrast, text messaging and the use of individual worksheets for children were perceived as non-feasible or non-desirable educational methods (De Buck et al., 2020).

The knowledge and opinions regarding first aid of teachers (Hrušková et al., 2022) and future teachers (Hrušková et al., 2023) were assessed. The inclusion of a mandatory first-aid course for future teachers, the content of which was influenced by statistical data from the South Bohemian Rescue Service and teacher statistics were examined (Hrušková et al., 2023). However, pupils/students also have their own attitude to first aid and to the methods and forms by which this theme is taught.

The aim of our study was to analyse, through a questionnaire, whether the selected methods (simulations with moulage, the CLLL methods, educational games cooperative and non-cooperative) are effective in teaching first aid for secondary school children. Another aim of the study was to assess feedback for the selected methods and the attitudes on first aid held by secondary school children.

2 Material and methods

The study was conducted between 2019 and 2023 at selected secondary schools from South Bohemia (municipalities with different populations). Teachers, parents of children and children (N=277; Tab.1. below) were contacted personally and via email. Teachers supervised the children throughout the filling in of the questionnaires and the first-aid course. The first-aid courses (a mandatory part of the curriculum in selected secondary schools) were led by future teachers (students of the Faculty of Education, University of South Bohemia).

Table 1: Numbers of children.

	3rd grade of lower secondary level	4th grade of lower secondary level	In total
Simulations with moulage	78 (49 boys, 29 girls)	-	78
German/Czech CLLL	24 (11 boys, 13 girls)	-	24
English/Czech CLLL	-	48 (24 boys, 24 girls)	48
Educational games	112 (60 boys, 52 girls)	15 (7 boys, 8 girls)	127
In total	214	63	277

Various educational forms and methods of teaching were used. Children filled out anonymously the same questionnaire before (Pretest) and immediately after the end of the course (Posttest/Posttest I), some of them also completed the test 14 days (educational cooperative games), 21 days (German/Czech CLLL) and 30 days (simulations with moulage, English/Czech CLLL) after the course (Posttest II). Through a questionnaire, the

knowledge level of first aid (between 20 and 25 items), feedback for selected methods (between 3 and 5 items) and attitudes (between 3 and 5 items) were collected. The questionnaire items and their number were consulted with the children's teachers. The results of several pilot studies are also presented (below).

The educational pathway (De Buck et al., 2015; De Buck et al., 2020; GFARC, 2024; Belgian Red Cross, 2024) and current European Resuscitation Council guidelines (ERC Guidelines, 2015; 2021) were followed. In the process of developing curricula for primary and secondary education with the Ministry of Health/Ministry of Education, the tool can be useful for the inclusion of first aid in health education (GFARC, 2024).

The themes of first aid are listed below (Tab. 2. below). For every theme, there is a list of objectives. These objectives are categorized under knowledge, skills and attitudes. Knowledge corresponds to "What a child should know and understand", Skills corresponds to "What a child should be able to practically apply", and Attitude corresponds to "The child's willingness to show a particular behaviour". In any event, the educational pathway for first aid sets the objectives per two-year age range (11 to 12 years, 13 to 14 years, etc.).

The educational pathway for first aid covers the following first-aid themes: General (seeking help from an adult or medical care provider, hand-washing, wearing gloves, etc.), Four Main Steps in First Aid (make the area safe, evaluate the ill or injured person's condition, seek help, give first aid), Resuscitation (CPR), Choking, Skin Wounds, Burns, Bleeding, Injuries to Bones, Muscles or Joints, Poisoning, Stings and Bites, Fever, Diarrhoea, Convulsive States and Disaster Principles.

For each objective, a certain age cluster offers a time frame or "window" for the following: Encourage (E), Know (K), Repeat (R). Encourage (E) means that the teacher encourages the children to achieve the goal. Encouraging means that the teacher actively pays attention to it. Know/Know How (K) means that the teacher makes explicit efforts so that all the children achieve the goals. The children should acquire certain knowledge, skills or attitude. Repeat (R) means that the teacher repeats and emphasizes the purpose consciously with the children. He/she repeats for the children who have already achieved the objective and strives to reach the children who have not yet achieved the objective. If "~" is mentioned after an objective has already been reached, no specific attention should be paid to this objective (of course, there is possibility of feedback during a guided discussion with these advanced pupils/students).

An evidence-based educational pathway (De Buck et al., 2015; De Buck et al., 2020; GFARC, 2024; Belgian Red Cross, 2024) has been adapted to the needs of a Central European country. Due to the frequency with which damage to health occurred (UZIS, 2022), selected objectives were reduced (e.g. the danger of carbon monoxide (CO) poisoning, as well as some objectives in the topics Stings and Bites, Fever, Diarrhoea and Convulsive States/Fits). On the other hand, the two-way tourism of Central Europeans and people living in areas with a higher incidence of these dangers and the interest in the breeding of poisonous animals and the cultivation of poisonous plants in Central Europe means that even these topics cannot be completely ignored. In addition, in Central Europe there is also a notable need for education for emergency situations (accidents, fires, natural disasters, terrorist actions and other situations associated with evacuations), but this is not the aim of this text, only solitary topics of this theme have been added to the evidence-based educational pathway.

The educational pathway on first aid can be used by first-aid teachers to help them decide which content to teach to children of certain age ranges. In the process of developing curricula for primary and secondary education with the Ministry of Health/Ministry of Education, the tool can be useful for advocating the importance of first aid in health education (GFARC, 2024).

Table 2: Evidence-based educational pathway for 11–12-year-olds (11), 13–14-year-olds (13), 15–16-year-olds (15) and 17–18-year-olds (17) (De Buck et al., 2015; De Buck et al., 2020; GFARC, 2024; Belgian Red Cross, 2024), modified by authors.

1. GENERAL				
Encourage (E), Know/Know How (K), Repeat (R)				
KNOWLEDGE	(11)	(13)	(15)	(17)
The children know why/that they must find help from an adult as quickly as possible in an emergency.	R	~	~	~
The children know how to seek help from a medical care provider.	R	R	R	R
The children know the six principles of first aid (but not psychosocial first aid, only comforting in a simple way).	K	R	R	~
SKILLS	(11)	(13)	(15)	(17)
The children can wash their hands.	R	R	R	R
The children can put on disposable rubber gloves or plastic bags.	R	R	R	R
The children can use the six principles of first aid when looking after an ill or injured person (without delivering psychosocial first aid).	K	R	R	R
ATTITUDES	(11)	(13)	(15)	(17)
The children are prepared to help.	R	R	R	R
The children are prepared to comfort the ill or injured person.	R	R	R	R
The children are prepared to ensure their own safety.	R	R	~	~
The children are prepared to fetch an adult.	R	R	R	R
The children recognise the importance of fetching an adult.	R	R	R	R
The children recognise the importance of seeking help from a medical care provider.	R	~	~	~
The children recognise the importance of avoiding infection.	R	R	R	R
The children recognise the importance of ensuring the comfort of the ill or injured person (by covering him with a blanket, by protecting him against the sun, etc.).	K	R	R	R
2. FOUR MAIN STEPS IN FIRST AID				
Encourage (E), Know/Know How (K), Repeat (R)				
KNOWLEDGE	(11)	(13)	(15)	(17)
The children know the four main steps in first aid.	K	R	R	R
The children know which wound must be treated first when providing first aid.	K	R	R	~
The children know the importance of an open airway.	K	R	R	R
The children know when they should place a person in the recovery position.	E	K	R	R
The children know when someone is about to faint or has fainted.	R	R	R	R
The children know what to do when someone is about to faint or	R	R	R	R

has fainted.				
SKILLS	(11)	(13)	(15)	(17)
The children ensure their own safety.	R	~	~	~
The children ensure the safety of the ill or injured person and bystanders.	R	R	~	~
The children can seek help from an adult in an emergency.	R	~	~	~
The children can seek help from a medical care provider correctly.	R	R	~	~
The children can establish whether a person is conscious or not.	R	R	R	R
The children can establish whether an unconscious person is breathing.	K	R	R	R
The children can tilt the head back and lift the chin up correctly [technique].	K	R	R	R
The children can place a person in the recovery position [technique].	K	R	R	R
The children can provide further first aid.	E	K	R	R
ATTITUDES	(11)	(13)	(15)	(17)
The child's willingness to provide four main steps in first aid.	~	~	~	~
The children appreciate the importance of ensuring their own safety.	R	R	~	~
The children appreciate that it is also important to ensure the safety of the ill or injured person and bystanders.	R	R	~	~
The children recognise the importance of fetching an adult.	R	~	~	~
The children recognise the importance of the correct and complete application of the four main steps in first aid.	K	R	~	~
The children are ready to provide further first aid where able.	E	K	R	R
3. RESUSCITATION				
Encourage (E), Know/Know How (K), Repeat (R)				
KNOWLEDGE	(11)	(13)	(15)	(17)
The children know that they should perform cardiopulmonary resuscitation (CPR) on an unconscious person who is not breathing normally.	K	R	R	~
The children know the different aspects of CPR, and in which order they should be administered.	K	R	R	~
The children know how many chest compressions should be given.	K	R	R	~
The children know the correct chest compression depth.	K	R	R	~
The children know the frequency at which chest compressions should be given.	K	R	R	~
The children know how many rescue breaths should be administered.	K	R	R	~
The children know that they must always seek help from a medical	K	R	R	~

care provider if a person is unconscious.				
SKILLS	(11)	(13)	(15)	(17)
The children can correctly perform CPR on an unconscious person who is not breathing normally.	E	K	R	R
The children can correctly carry out chest compressions [technique].	E	K	R	R
The children can correctly administer rescue breaths [technique].	E	K	R	R
ATTITUDES	(11)	(13)	(15)	(17)
The child's willingness to provide resuscitation in first aid.	~	~	~	~
The children recognise the importance of performing CPR.	E	K	R	R
The children are prepared to perform CPR.	E	K	R	R
4. CHOKING Encourage (E), Know/Know How (K), Repeat (R)				
KNOWLEDGE	(11)	(13)	(15)	(17)
The children know the difference between mild and severe choking.	K	R	R	~
SKILLS	(11)	(13)	(15)	(17)
The children can administer first aid correctly in the event of a choking incident.	K	R	R	~
The children can correctly give blows to the back [technique].	K	R	R	~
The children can correctly give abdominal thrusts [technique].	E	K	R	R
ATTITUDES	(11)	(13)	(15)	(17)
The child's willingness to provide first aid in the event of a choking incident.	~	~	~	~
5. SKIN WOUND Encourage (E), Know/Know How (K), Repeat (R)				
KNOWLEDGE	(11)	(13)	(15)	(17)
The children recognise a skin wound.	R	~	~	~
The children know which equipment is needed to provide first aid for a skin wound.	R	~	~	~
The children know when the injured person should seek medical help for a skin wound.	K	R	R	R
The children know the importance of tetanus vaccinations, and why tetanus is dangerous and linked with skin wounds.	K	R	R	R
The children know that an injured person with a skin wound in which a foreign object is embedded should always seek medical help.	K	R	R	R
SKILLS	(11)	(13)	(15)	(17)
The children can correctly provide first aid for a skin wound if clean water is available.	R	R	~	~
The children can stop the bleeding of a wound that does not stop bleeding by itself.	K	R	R	R
The children can correctly provide first aid for a skin wound in which a foreign object is embedded.		K	R	R

ATTITUDES	(11)	(13)	(15)	(17)
The child's willingness to provide first aid in the event of a skin wound incident.	~	~	~	~
The children recognise the importance of correctly providing first aid for a skin wound in which a foreign object is embedded.	E	K	R	R
6. BURNS Encourage (E), Know/Know How (K), Repeat (R)				
KNOWLEDGE	(11)	(13)	(15)	(17)
The children recognise a burn.	R	R	~	~
The children know how to provide first aid for a burn (regardless of the degree of the burn).	R	R	~	~
The children know when to seek medical help for a burn.	K	R	R	R
The children know the difference between a superficial, intermediate and deep burn.	E	K	R	R
The children know what commonly causes burns (hot water, flames, fire).	R	~	~	~
The children know what can cause a burn (heat, chemicals, radiation, etc.).	E	K	R	R
SKILLS	(11)	(13)	(15)	(17)
The children can correctly provide first aid for a burn.	R	R	~	~
The children can seek medical help if the burn is serious.	K	R	R	R
ATTITUDES	(11)	(13)	(15)	(17)
The child's willingness to provide first aid in the event of a burn incident.	~	~	~	~
The children recognise the importance of continuously applying water to a burn.	R	R	~	~
7. BLEEDING Encourage (E), Know/Know How (K), Repeat (R)				
KNOWLEDGE	(11)	(13)	(15)	(17)
The children know what they have to do in the event of a nose bleed.	R	R	~	~
The children know when to seek medical help for a nose bleed.	R	R	~	~
The children know how to correctly stop (severe) bleeding.	K	R	R	~
The children know that medical help must always be sought in the event of severe bleeding.	K	R	R	~
SKILLS	(11)	(13)	(15)	(17)
The children can correctly stop a nose bleed.	R	R	~	~
The children can apply a bandage to stop (severe) bleeding [technique].	K	R	R	~
ATTITUDES	(11)	(13)	(15)	(17)
The child's willingness to provide first aid in the event of a bleeding incident.	~	~	~	~
The children recognise the importance of stopping bleeding as quickly as possible.	R	R	~	~

8. INJURIES TO BONES, MUSCLES OR JOINTS Encourage (E), Know/Know How (K), Repeat (R)				
KNOWLEDGE	(11)	(13)	(15)	(17)
The children know that they must not move a part of the body that is seriously painful.	R	~	~	~
The children know three possible injuries to the motor system (dislocation, fracture, muscle or joint injury).	K	R	R	~
The children recognise an injury to bones, muscles or joints.	K	R	R	~
The children know the difference between an open and closed dislocation or fracture.		K	R	R
SKILLS	(11)	(13)	(15)	(17)
The children can correctly provide first aid for a minor injury to bones, muscles or joints.	E	K	R	R
The children can splint a broken bone.	E	K	R	R
The children can provide first aid to a person with an open fracture.		K	R	R
ATTITUDES	(11)	(13)	(15)	(17)
The child's willingness to provide first aid in the event of injuries to bones, muscles or joints.	~	~	~	~
9. POISONING Encourage (E), Know/Know How (K), Repeat (R)				
KNOWLEDGE	(11)	(13)	(15)	(17)
The children know the signs of poisoning.	E	K	R	R
The children know some of the causes of poisoning (alcohol, drugs, toxic substances, CO, etc.) and how poisoning can be prevented.	E	K	R	R
The children know that urgent transportation to medical care is necessary.	E	K	R	R
The children know toxic substances that are poisonous when swallowed.	R	R	~	~
SKILLS	(11)	(13)	(15)	(17)
The children can gather information on the nature and severity of the poisoning incident.	E	K	R	R
The children can seek medical help in case of poisoning.	E	K	R	R
ATTITUDES	(11)	(13)	(15)	(17)
The child's willingness to provide first aid in the event of a poisoning incident.	~	~	~	~
10. STINGS AND BITES Encourage (E), Know/Know How (K), Repeat (R)				
KNOWLEDGE	(11)	(13)	(15)	(17)
The children know that a bee or wasp sting can be life-threatening because of allergic reactions.	E	K	R	R
The children know when to seek medical help in case of bee or wasp stings.	E	K	R	~
The children know that they must always seek help from a medical care provider in the case of a snake bite.	R	R	R	~

The children know that many snakes are poisonous, and that some types of snake venom can cause death.	E	K	R	~
The children know that it is not safe to touch or catch the snake.	R	R	R	~
The children know that sucking or cutting the venom out will not help and may harm the person even more.	E	K	R	~
SKILLS	(11)	(13)	(15)	(17)
The children can remove a bee or wasp stinger.	E	K	R	~
The children can provide further first aid in case of a bee or wasp sting.	E	K	R	~
The children can provide further first aid in case of a snake bite.	E	K	R	~
ATTITUDES	(11)	(13)	(15)	(17)
The child's willingness to provide first aid in the event of injuries to bones, muscles or joints.	~	~	~	~
The children recognise the importance of correctly providing first aid in case of a bee or wasp sting.	E	K	R	R
The children recognise the importance of correctly providing first aid in case of a snake bite.	E	K	R	R
11. FEVER Encourage (E), Know/Know How (K), Repeat (R)				
KNOWLEDGE	(11)	(13)	(15)	(17)
The children know that fever can be a sign of serious illness.	R	R	R	~
The children know that a person with fever needs medical attention to determine the cause of the fever.	R	R	R	~
The children know that fever can be very dangerous and lead to death if left untreated.	R	R	R	~
The children know that a person with fever needs to rest and drink lots of fluids.	R	R	R	~
12. DIARRHOEA Encourage (E), Know/Know How (K), Repeat (R)				
KNOWLEDGE	(11)	(13)	(15)	(17)
The children know that diarrhoea is usually caused by an infection.	R	R	R	~
The children know that poor hygiene (not washing hands, touching stools, eating unsafe food, drinking unsafe water) can lead to diarrhoea.	R	R	R	~
The children know that diarrhoea causes dehydration.	R	R	R	~
The children know that diarrhoea can be very dangerous and can lead to death if left untreated.	R	R	R	~
The children know when to seek medical help in case of diarrhoea.	K	R	R	~
The children know that someone with diarrhoea needs to drink lots of fluids.	R	R	R	~
13. CONVULSIVE STATES/FITS Encourage (E), Know/Know How (K), Repeat (R)				

KNOWLEDGE	(11)	(13)	(15)	(17)
The children know that convulsive states are not caused by demons or bad spirits but are the result of physical illnesses or injuries.	R	R	R	~
The children know that someone having convulsive states is not contagious.	R	R	R	~
The children know that convulsive states can be accompanied by other symptoms such as loss of consciousness, discolouration of nails and lips, eyes turning away, etc.	K	R	R	~
The children know they should not hold the person experiencing a fit down or put objects into his/her mouth.	R	R	R	~
The children know how to provide first aid in case of convulsive states.	R	R	R	~
The children know when to seek medical help in case of convulsive states.	K	R	R	~
14. DISASTER PRINCIPLES Encourage (E), Know/Know How (K), Repeat (R)				
KNOWLEDGE	(11)	(13)	(15)	(17)
The children know the concept of risk awareness.	E	K	R	R
The children know the concept of which disaster victims are more likely to survive and different categories of victims to treat (triage).	E	K	R	R

Source: De Buck et al., 2015; De Buck et al., 2020; GFARC, 2024; Belgian Red Cross, 2024; modified by authors.

The points scored in the Pretest and Posttest I, and in Posttest II, were analysed using repeated-measures ANOVA or Students t-test (total points scores of first-aid items and separately feedback and attitudes). All analyses were conducted in Statistica 14 (Tibco Software, CA, USA). The level of significance α was set as 0.05.

3 Results

3.1 Simulations with moulage

Simulations with moulage after a theoretical explanation of correct first-aid procedures allow students to practice skills, decision-making and critical thinking in a safe, supervised environment. Thus, such simulations improve preparedness for crisis situations and develop empathic behaviour (Weller et al., 2012; DCosta et al., 2024). They provide physical prompts, conceptual prompts (e.g. bleeding means low blood pressure), and semantic prompts (e.g. moulage contributes to emotional engagement) (Stokes-Parish, Duvivier & Jolly, 2019).

The aim of our study was to examine the effect of assigned roles in selected simulations with moulage (unconsciousness, skin wounds caused by glass shards, 1st, 2nd and 3rd degree burns, bleeding, open fracture, joint injury) and improving first-aid skills through simulation and moulage techniques. The following first-aid themes were included: general, four main steps in first aid, resuscitation (CPR), skin wounds, burns, bleeding and injuries to bones, muscles or joints.

The children (49 boys, 29 girls, 3rd grade of lower secondary level/in the Czech Republic 8th grade of elementary school) were after the theoretical basis of first aid (1 hour, "classroom teaching" activity, i.e. presentation and first-aid videos, a puzzle-solving activity in worksheets) divided according to the results of the Pretest into two groups (Rescuers vs. Rescued, both

subgroups N=39) with a close knowledge level (t-test; $p=0.84$). Each child from the subgroup of Rescuers (39 children) had to correctly treat selected emergency conditions and injuries (non-cooperative educational game). Each child from the subgroup of Rescued (39 children) had to apply make-up according to the template and follow the prepared script. The moulage techniques included make-up techniques with special effects on rescued participants. Castings and moulded wounds, painted bruises, lacerations and illusions of blood loss were applied. The moulage provided visual cues for the rescuers' actions, with the importance of not disrupting the flow of the experience and allowing sufficient space and time.

The points scored in the Pretest and Posttest regarding the role in simulations (the subgroup "Rescuers" and the subgroup "Rescued") were analysed using repeated measures ANOVA (total points scores).

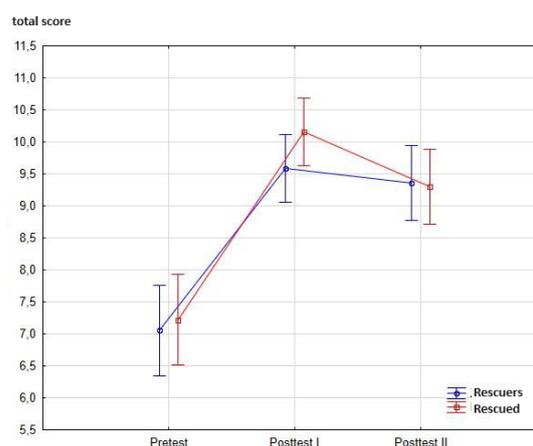
a. Level of knowledge according to the assigned role in simulations with moulage

The level of first-aid knowledge changes over time (Tab. 3, Graph 1.) The lowest level of knowledge of first aid is in Pretest, the highest in Posttest I. Although after 30 days (Posttest II) the level of knowledge decreased only slightly, it shows the importance of repeating the information already learned and following an evidence-based educational pathway.

Table 3: Total points scores in the subgroups of Rescuers and Rescued (Pretest, Posttest I, Posttest II).

		Mean	SD	Median
Pretest	Rescuers (N=39)	7.1	2.43	7.5
	Rescued (N=39)	7.2	1.98	7.5
Posttest I	Rescuers (N=39)	9.6	1.73	9.5
	Rescued (N=39)	10.2	1.58	10.5
Posttest II	Rescuers (N=39)	9.4	1.82	9.5
	Rescued (N=39)	9.3	1.88	9.5

Source: Authors.



Graph 1: Level of knowledge of first aid in Rescuers vs. Rescued group. Attending the first-aid course increased significantly the total score in both research groups (details in text). Source: Authors.

A repeated measures ANOVA was used to evaluate the questionnaire. In general, the effect of having completed a first-aid course with simulations and moulage is statistically highly

significant ($F_{2, 152} = 93.30$; $p < 10^{-17}$). The increase did not differ depending on the role ($F_{1, 76} = 0.40$; $p = 0.53$) or time ($F_{2, 152} = 1.12$; $p = 0.33$). Thus, the assigned role had no influence on the first-aid knowledge level.

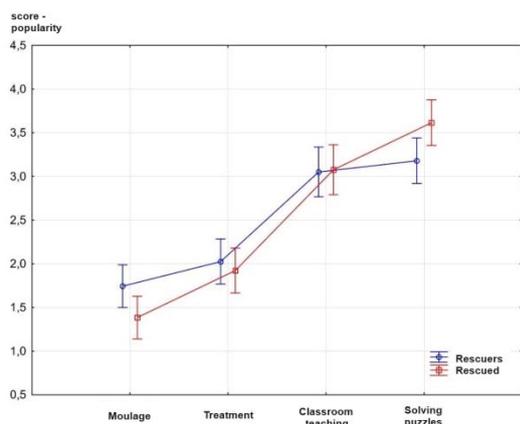
b. Preferences of activities according to the role

Children (even if the “rescued” children did not treat and the “rescuers” did not mask) rated first-aid course activities (“moulage”, “treatment”, “classroom teaching”, “puzzle solving”) according to popularity (1st most popular/favourite to 4th least popular). Evaluating of activities according to popularity showed that the “moulage” and “treatment” activities were rated mostly as very/quite popular/favourite or quite popular/favourite, on the contrary, the “solving puzzles” and “classroom teaching” activities were evaluated mostly as quite unpopular/least popular.

Table 4: Personal preference of activities in the first-aid course – Rescuers and Rescued.

Personal preference	1st	2nd	3rd	4th
Moulage	45 (58%)	25 (32%)	5 (6%)	3 (4%)
Treatment	23 (30%)	37 (47%)	15 (19%)	3 (4%)
Classroom teaching	6 (8%)	10 (13%)	35 (45%)	27 (34%)
Solving puzzles	4 (5%)	6 (8%)	23 (29%)	45 (58%)

Source: Authors.



Graph 2: Personal preference of activities in the first-aid course (from 1st most popular/favourite to 4th least popular) – Rescuers and Rescued. Source: Authors.

Even if the group of Rescued did not treat and the group of Rescuers did not mask, both groups rated the individual activities very similarly. The effect of the role (by a repeated measures ANOVA) in the level of knowledge of first aid is not statistically significant ($F_{1, 76} = 0.40$; $p = 0.53$).

Two-sample t-tests and the non-parametric Mann-Whitney test (M-W) were used to compare the order of personal preference of individual activities, as the use of the t-test is disputable with the order scale used (1–4). The popularity of the “treatment” and “classroom teaching” activities did not differ (t-test: all $p > 0.57$, M-W: all $p > 0.71$), the ratings of the “moulage” and “solving puzzles” differs in the groups. The “moulage” activity was rated better by Rescued (t-test: $t = 2.07$; $df = 76$; $p = 0.04$; M-W: $U = 622$; $p = 0.17$), whereas the “puzzle-solving” activity was rated better by Rescuers (t-test: $t = -2.35$; $df = 76$; $p = 0.02$; MW: $U = 607.5$; $p = 0.13$).

c. Grades for activities according to the role

The individual activities (“moulage”, “treatment”, “classroom teaching”, “puzzle solving”) regarding the assigned role (the subgroup Rescuers and the subgroup Rescued) were analysed using repeated measures ANOVA. Children rated the individual activities (1 outstanding, 2 very good, 3 satisfactory, 4 marginal, 5 unsatisfactory).

The effect of the role (by a repeated measures ANOVA) in the rating of activities during the first-aid course is statistically significant ($F_{3, 228} = 3.65$; $p < 0.01$). Two-sample t-tests and the non-parametric Mann-Whitney test (M-W) were used to verify the results of the average grades of individual activities, as the use of the t-test is disputable with the ranking scale used (1–5). The mean grades of the “moulage”, “treatment” and “classroom teaching” activities did not differ (t-test: all $p > 0.29$, M-W: all $p > 0.33$), the mean grades of the “solving puzzles” activities differ across the groups with a better rating among the Rescuers (t-test: $t = -2.31$; $df = 76$; $p = 0.02$; M-W: $U = 530$; $p = 0.02$).

Table 5: Evaluation by grades for activities in the first-aid course – Rescuers and Rescued.

	N	Mean	SD	Median
Moulage	78	1.54	0.85	1.00
Treatment	78	1.78	0.98	1.00
Classroom teaching	78	2.08	1.13	2.00
Solving puzzles	78	2.65	1.26	3.00

Source: Authors.

d. Other items of the questionnaire

Is it useful to be able to provide first aid?

96% of children agree/rather agree with the statement, 3% neither agree nor disagree, 1% rather disagree.

Is it useful to use simulations with moulage in first-aid teaching? 77% of children found it useful to use simulations with moulage in first-aid teaching.

Teachers and parents of children expressed their support for including simulations with moulage in first-aid teaching (100%). Beyond the scope of the questionnaire, some teachers pointed to the time-consuming preparation of this activating method.

3.2 Content and Language Integrated Learning (CLIL) in German/Czech and English/Czech

CLIL is a competency-based educational approach (Coyle, Hood, & Marsh, 2010). The idea is to teach both (a) the content/subject (educational non-language goal) and (b) the language (educational language goal). This idea is captured in the phrase “using language to learn, learning to use language” (British Council, 2024). CLIL also uses specially standardized tests designed for a foreign language and non-language content (Ball, Kelly & Clegg, 2014). We differentiate two kinds of CLIL: (a) the soft CLIL involves a strong focus on the linguistic requirement and less focus on the content knowledge, as opposed to (b) the hard CLIL approach where children/students are taught mostly content-based information with a small and supportive amount of linguistic skills (Ikeda, 2013). Also, the CLIL had no detrimental effects on the science learning of the secondary learners participating in the study (Hughes & Madrid, 2019).

First-aid teaching through hard CLIL (according to Ikeda, 2013) enables Czechs to receive assistance in a foreign country and also to help tourists visiting the Czech Republic in case of an emergency. By integrating language learning with practical first-aid skills, CLIL enhances cognitive abilities, engagement and preparedness, ultimately leading to more effective and competent bystanders.

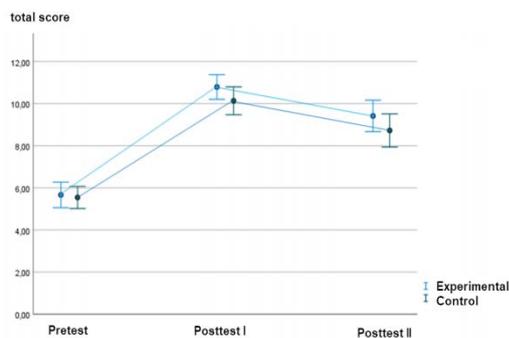
Additionally, CLIL also supports curricula that promote interpersonal skills, cultural sensitivity and the communication and language skills required by employers, as well as develops pupils' self-confidence, motivation and independence and supports internal motivation to learn. It also leads pupils to higher creativity and engagement of higher cognitive functions (Tejkalová, 2013).

3.2.1 German/Czech CLIL

Children (N=24; 11 boys and 13 girls) were in the 3rd grade of lower secondary level/in the Czech Republic 8th grade of elementary school; A1 level according to Common European Framework of Reference for Languages (CEFR, 2024). Current secondary school children in the Czech Republic choose a 1st foreign language (English in our group) and 2nd foreign language (German in our group). The language goal (vocabulary and grammar) resulted from the content of a first-aid course (the hard CLIL according to Ikeda, 2013). The principles of language support (scaffolding) were used in the teaching (Mehisto, Marsh & Frigols, 2008). Children were divided according to the results of the total score of the Pretest into knowledge balanced subgroups with the German/Czech CLIL (experimental; N=12) and without the German/Czech CLIL (control, N=12). Both groups passed a one-day first-aid course (5 hours in total). The subgroup with German/Czech CLIL passed the first-aid course in German (in their 2nd foreign language) and Czech, the subgroup without German/Czech CLIL passed the first-aid course in Czech only. The content of the first-aid course was calling emergency services, four main steps in first aid, resuscitation, bleeding, injuries to bones, burns and convulsive state/epilepsy.

a. Level of knowledge of first aid – the German/Czech CLIL

The lowest level of knowledge of first aid is shown in Pretest (Graph 2, below), groups with and without CLIL did not differ (t-test, $p=0.76$). The highest levels of knowledge of first aid were counted in Posttest I (Pretest vs. Posttest I, both groups $p=0.00$). A better Posttest I score was found in the subgroup with the German/Czech CLIL ($p=0.04$). After 21 days (Posttest II) the level of knowledge decreased slightly, the Posttest I vs. the Posttest II scores differ statistically significantly (both $p=0.00$). This shows the importance of repeating the information already learned and following an evidence-based educational pathway.



Graph 2: Level of knowledge of first aid with the German/Czech CLIL (experimental group) vs. first aid without CLIL (control group). Attending a first-aid course increased significantly the total score in both research groups (details in text). Source: Authors.

In general, both groups improved their knowledge statistically significantly ($p=0.00$; repeated measures ANOVA). The subgroups with the German/Czech CLIL scored higher than the subgroup without CLIL in Posttest I ($p=0.04$). This may indicate a greater motivation of the CLIL group as children were learning in an unusual way.

We can conclude that the use of CLIL in teaching first aid will not worsen the level of knowledge and we support using CLIL in first-aid teaching.

b. Benefits of learning first aid and a foreign language together – the German/Czech CLIL

The language educational goal does not disadvantage secondary school children teaching with CLIL in natural sciences (grammar, vocabulary, working with text, communication, etc.; Hughes & Madrid, 2019).

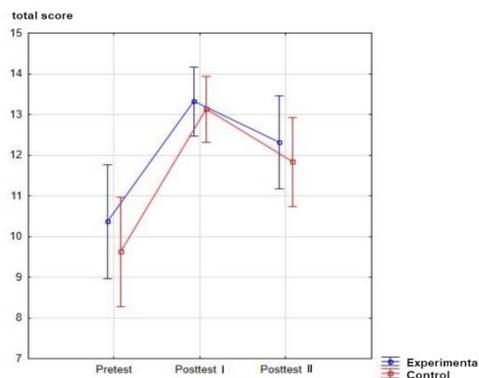
It was investigated whether the children themselves perceive teaching with CLIL as a benefit. Learning first aid combined with any foreign language proved to be useful in their life for 87% of pupils and 83% of pupils proved it as important.

Furthermore, the pupils recorded which foreign language they would prefer in combination with biology (including first aid): if children must use a foreign language (their 1st foreign language is English, 2nd foreign language is German) during biology lessons, 78% of pupils would choose English exclusively and 13% both English and German. No other language was chosen and 9% of pupils rejected any form of implementation of a foreign language within biology lessons (including first aid).

3.2.2 English/Czech CLIL

Children (N=48; 24 boys and 24 girls, 4th grade of lower secondary level/in the Czech Republic 9th grade of elementary school; A2 level according to CEFR, 2024) passed a 3-hour first-aid course (calling emergency services, four main steps in first aid, resuscitation, bleeding, injuries to bones). The subgroups with and without the English/Czech CLIL corresponded to classes for organizational reasons and given that the Pretest total scores did not differ ($p=0.60$). The subgroup for a specific class was decided by a coin toss. The principles of language support (scaffolding) were used in the teaching (Mehisto, Marsh & Frigols, 2008). A first-aid course for the experimental group (12 boys and 12 girls) made use of the English/Czech CLIL method, but for the control group (12 boys and 12 girls) only Czech was the language of communication. The language goal resulted from the content of a first-aid course (the hard CLIL according to Ikeda, 2013).

a. Level of knowledge of first aid – the English/Czech CLIL



Graph 3: Level of knowledge of first aid with the English/Czech CLIL (experimental group) vs. first aid without CLIL (control group). An attendance of the first-aid course increased significantly the total score in both research groups (details in text). Source: Authors.

The level of knowledge of first aid in the Pretest and Posttests in our English/Czech CLIL study shows a similar trend as in the German/Czech CLIL study. The lowest level of knowledge of first aid was in Pretest (groups with and without CLIL did not differ; t-test, $p=0.60$), the highest in Posttest I in both groups. After 30 days (Posttest II) the level of knowledge decreased slightly.

A repeated measures ANOVA and Tukey's test show that students improved statistically significantly ($p=10^{-12}$). The level of knowledge did not differ between the experimental and

control groups in Pretest, Posttest I and Posttest II ($p=0.76$), therefore the CLIL/non-CLIL learning had no effect on the pupils' level of knowledge of first aid. We can conclude that the use of CLIL in teaching first aid will not worsen the level of knowledge and support.

b. Importance of first aid knowledge perceived by children – the English/Czech CLIL

In Pretest, both groups of children evaluated the importance of more than 4 points out of a maximum of 5 (Mean 4.7 and SD 0.6 in the experimental group and Mean 4.3 and SD 1.0 in the control group; $p=0.12$). In Posttest and Posttest 2 both groups of children increase the mean rating of the importance of first-aid knowledge ($p=0.22$), but the differences between the experimental and control groups were not statistically significant ($p=0.73$). Thus, no influence of CLIL vs. non-CLIL teaching on the importance rating of first aid was found.

c. Benefits of learning first aid and a foreign language together – the English/Czech CLIL

In the Pretest, both groups of children rated the benefit an average of 4 points out of a maximum of 5 (Mean 4.0 and SD 1.2 in the experimental group and Mean 4.0 and SD 1.1 in the control group; $p=0.90$). As the repeated measures ANOVA analysis showed, the change in the perception of the benefit of learning a foreign language and first aid together over time is not statistically significant ($p=0.76$). At the same time no effect of teaching on the rating of the language benefit was found ($p=0.58$). The perception of the benefit of a foreign language in first-aid learning seems to be high and did not change due to the teaching.

d. Other items of the questionnaire – the English/Czech CLIL

The most popular part of the course was the resuscitation training and an educational game (quiz questions from all parts of the course). Both activities received on average more than 4 points out of a maximum of 5. Some children with a positive attitude towards the CLIL method determined in which subject they would like to encounter the CLIL method. Besides biology geography was the most frequently mentioned (mainly because of travelling), followed by "all subjects", physics, mathematics, physical education and history.

3.3 Educational games

a. Cooperative educational games

This type of game involves collaboration, negotiation, and the sharing of resources among players. For organizational reasons the experimental (4th grade of lower secondary level, $N=15$, 7 boys and 8 girls) and control (3rd grade of lower secondary level, $N=20$, 14 boys and 6 girls) group were determined randomly (a coin toss), regarding the fact that 3rd and 4th grade did not differ in the level of knowledge in Pretest ($p=0.83$).

An experimental group was learned through educational games (board game with cards, quiz, cooperative "escape game" with simulations and moulage). A control group was educated in the same themes using conventional teaching (PowerPoint presentation first-aid videos, worksheets).

The lowest first-aid knowledge level was calculated in Pretest and the highest level in Posttest I; after 14 days the knowledge level decreased slightly (Posttest II). Both groups improved their knowledge statistically significantly ($p=0.00$; ANOVA). T-test did not assess any differences between the experimental and control groups in Posttest I or Posttest II ($p=0.53$ and $p=0.34$, respectively). Using repeated measures ANOVA showed that the level of knowledge was not affected by inclusion in the experimental or control group ($p=0.88$).

Children rated a first-aid course with and without a cooperative educational game (1 outstanding, 2 very good, 3 satisfactory, 4 marginal, 5 unsatisfactory). 93% of children in the experimental group (with a cooperative educational game) rated the activity at an outstanding/very good level. The means of evaluation grade was 1.27 ± 0.57 in the experimental group and 1.40 ± 0.60 in the control group ($t=0.52$, $sv=33$, $p=0.61$).

b. Non-cooperative educational games

Non-cooperative games focus on strategic decision-making without cooperation or communication between players. The children (3rd grade of lower secondary level/in the Czech Republic 8th grade of elementary school, $N=39$, 25 boys and 14 girls) rated a non-cooperative "escape game" with simulations and moulage. Masked participants were "rescued" using a pre-prepared scenario at selected locations. There are tools near all locations, only a few were needed for proper treatment. If the rescuer were treated correctly, the rescuer got one of the clues and moves on, if not, the rescuer (a) incurred a penalty, (b) could learn the correct treatment with a quick look for help and (c) had to go back one or more locations. As the pupil moved forward in the game, the combination of clues led to a password that would open the treasure chest. The activity was intended for any number of pupils. This activity can also be easily adjusted according to the number of pupils and their abilities.

Children rated the first-aid course with a non-cooperative educational game (1 outstanding, 2 very good, 3 satisfactory, 4 marginal, 5 unsatisfactory). 79% of children with the non-cooperative educational game rated the activity at an outstanding/very good level.

c. Educational games during COVID pandemic restrictions

During the COVID pandemic restrictions, online learning e.g. via Microsoft Teams was the only possibility for educating most children in the Czech Republic. In the experimental group ($N=26$, 12 boys and 14 girls, 3rd grade of lower secondary level/in the Czech Republic 8th grade of elementary school) the children were taught by instructional videos, brainstorming, practical skills training, educational game and worksheets. Instead of manikins, children used plush toys, dolls, robots, etc. to practice improvised exercise of resuscitation at home. In the control group ($N=20$, 12 boys and 8 girls, 3rd grade of lower secondary level/in the Czech Republic 8th grade of elementary school) the children were taught theoretically through a presentation and a worksheet.

Level of first-aid knowledge: The level of knowledge of first aid in the Pretest and Posttest in our pandemic study shows a similar trend as the studies above. Both groups (experimental and control, Pretest vs. Posttest) improved their knowledge statistically significantly (both $p=0.00$).

First aid in the curriculum: Children taught online during the COVID pandemic restrictions, e.g. via Microsoft Teams graded the importance of first aid in the curriculum (1 very important, 2 important, 3 neither important nor unimportant, 4 unimportant, 5 very unimportant). In Posttest (Mean 1.37, SD 0.64) children rated the first-aid course to be part of the curriculum higher than in Pretest (Mean 1.80, SD 1.00; $p=0.02$, Tab. 6.).

Table 6: Evaluation by grades for first aid as part of the curriculum (1 very important, 2 important, 3 neither important nor unimportant, 4 unimportant, 5 very unimportant).

Grade	1	2	3	4	5
Pretest	23	13	7	2	1
Posttest	32	12	1	1	0

Source: Authors.

96% of children in Posttest vs. 78% of children in Pretest evaluated first aid as a part of the curriculum as very important or important.

d. Willingness to pass another first-aid course

Primary schoolchildren (N=8, 5th grade) evaluated the teaching of first aid using the theoretical basis and educational games very positively, they considered it more fun than learning (100%). We focused on opinions and attitudes among the children on the lower secondary level again (3rd grade of lower secondary level). The children were asked if they can declare a higher attractiveness of teaching through educational games vs. conventional teaching (100%), a greater motivation to continue learning first aid using the same methods vs. conventional teaching (88%) and a greater willingness to pass another first-aid course (100%).

e. Learning with physical activity/movement

Although our studies did not primarily focus on the need for movement during lessons, children from the secondary school level indicated a high need for movement during lessons. Activities associated with chest compressions on manikins or solving tasks associated with physical activity were rated very highly (82–93% stated that the activity was their favourite compared to various activities without movement).

4 Discussion

Children are never too young to learn first aid. The earlier children are trained, the more likely it is that the provision of first aid will become a normal part of their lives. Repeated training provides them with a lot of knowledge and life skills, which leads to empowerment. From as early as 6 or 7 years old, children can learn how to seek help from an adult or medical care provider, how to ensure their own safety, how to bandage a wound and how to comfort an injured person. To this end, training tools and materials have to be adapted to their age and context (GFARC, 2024).

Moreover, the Czech children could be motivated by the example of Peter Safar, one of the world's most famous doctors of Czech origin born in Austria (Ingram, 2024). He designed the concept of the "alphabet of cardiopulmonary resuscitation", which was first published in 1964 in the journal of the Iowa State Medical Society (Safar, 1964). He confirmed the effectiveness of relaxing the airways by tilting the head in the field and the mechanical efficiency of lung-to-lung breathing. He provided evidence that lung-to-lung breathing also leads to adequate oxygenation of the blood and brain of people who have experienced respiratory arrest (Franěk, 2024). He was close to the scientists who rediscovered chest compressions and the use of an external defibrillator. After Laerdal visited Safar in the USA, the first Resusci-Anne was created in 1960, which enabled the start of population-wide and systematic resuscitation training. Marginal note: as a model for the manikin's face, Laerdal used the death mask of the so-called "Unknown Woman of the Seine" as a symbol for the drowning, who represent one of the target groups of resuscitation (Franěk, 2024).

4.1 Educational pathway

For supporting motivation and encouraging the teaching of first aid, an educational pathway is given (above). Motivation to teach first aid could be reduced by the unclear range of topics and procedures of basic first aid for pupils (Bakke et al., 2017), lack of time for the inclusion of first-aid teaching in education (Campbell, 2012) as a consequence of an extensive curriculum of subjects, or lack of funds for first-aid instructors and equipment (De Buck et al., 2015) – especially a sufficient number of resuscitation manikins (Kuba & Havlíková, 2023). Additionally, our previous research (Hrušková et al., 2022) has shown that some teachers (3% of all teachers) stated None regarding a first-aid course. According to Czech law and from the point of view of pupils and their parents, it seems impossible

for children and adolescents be under the charge of someone who has not passed any first-aid course. A lack of knowledge of first aid can have serious consequences for a particular teacher.

An acute condition does not have to be lethal if bystanders can take the right steps immediately, however. Bystanders are the basis for the chain of survival (a series of actions that, properly executed, reduce mortality). Trained pupils could help themselves and the people around them, and not only after the first-aid course but also in adulthood. They could be bystanders willing and able to help. When first-aid training is not mandatory, uptake in schools is low, even if teachers are convinced of its importance (Campbell, 2012).

According to a British study (Cooper, 2012), 89–99% of the pupils enjoyed first-aid training, and 98% of the parents believed it was important for their children to learn first aid. Future teachers of Physical Education, Human Biology, etc. can teach first aid very competently (Jimenez-Fábrega et al., 2009; Bohn et al., 2012) but need more support in their university curricula in Norway (Bakke et al., 2017), just as in the Czech Republic (Kuba & Havlíková, 2023). Also primary schoolchildren evaluated the importance of first aid. 85% of pupils before the first-aid course and 95% after the course rated first-aid teaching as very important/important (Simandlová, 2019). They also chose first-aid teaching at school as the best source of information, closely followed by the family. Other sources (books, internet, clubs) were rated worse (Simandlová, 2019).

In the Czech Republic, teaching basic first aid should be an integral part of the Framework Education Programme for Basic Education (FEP BE, 2008). After an update ("minor revision"; FEP BE, 2021) only isolated parts of basic first aid remained in the mandatory education at the lower secondary-school level: within the mandatory subject Physical Education, first aid in physical education and sports is required; within the mandatory subject Chemistry, first aid in case of skin contact with acid or hydroxide is required; and within the mandatory subject Biology, first aid for mushroom poisoning is required. On the contrary, providing adequate first aid if necessary is a required part of the non-mandatory subject Health Education. Another update ("major revision"; FEP BE, 2023) is currently being worked out, which should hopefully lead to the re-inclusion of all basic first aid for pupils.

The educational pathway on first aid can be used by first-aid teachers to help them decide which content to teach to children of certain age ranges. In the process of developing curricula for primary and secondary education with the Ministry of Health/Ministry of Education, the tool can be useful for advocating the importance of first aid in health education (GFARC, 2024).

4.2 Simulations with moulage

Moulage is a technique used to simulate injury, disease and other physical characteristics specific to a scenario, often used in health and emergency-worker training, predominantly for simulation-based learning activities. There is ample opportunity for broadening its scope. In first-aid teaching, the use of moulage and simulation in first-aid training is a powerful educational tool that significantly improves the quality of training for professionals as well as for non-professionals (DCosta et al., 2024). In medicine, moulages are a proven educational tool (Zare & Eßler, 2013). Moulds can replicate diseases in detail and are considered "living" images of patients. As medical teaching aids, they embody the individual patient, but they also focus on what is typical. A study on medical students' perceived engagement in simulations suggests that the use of moulage does impact learner experience by improving learner satisfaction, confidence, and immersion within the task (Stokes-Parish, Duvivier & Jolly, 2020). Participants (medical students) have noted that the benefit of the moulage was that they did not need to "switch out" of simulation mode to gather cues from other sources.

Moulage provides physical prompts, conceptual prompts (e.g. bleeding means low blood pressure), and semantic prompts (e.g. moulage contributes to emotional engagement) (Stokes-Parish, Duvivier & Jolly, 2019). Contrary to the results of a systematic review on studies from medicine, nursing and other health disciplines where it was summarized that moulage did not improve knowledge attainment and performance (DCosta et al., 2024), in our study from the lower secondary level significant differences were found in the mean values of knowledge of first aid in sum before and after a first-aid course ($p < 10^{-17}$).

When the children of our study had to choose the most popular activity out of several, moulage received the highest rating (the mean grade 1.54 ± 0.85). Findings from other studies (Li et al., 2019; DCosta et al., 2024) showed improved participant satisfaction and confidence regarding clinical skills, and these findings support simulation as an effective learning technique to increase self-efficacy. Self-efficacy is an individual's perception of their ability to achieve a goal, and while it is not a reflection of their actual capabilities, it can positively affect performance and achievement, which is also desirable in teaching children.

As simulations with moulage after a theoretical explanation of correct first-aid procedures allow students to practice skills, decision-making and critical thinking in a safe, supervised environment, they also improve preparedness for crisis situations and develop empathic behaviour (Weller et al., 2012; DCosta et al., 2024). By providing realistic, hands-on experiences, these techniques enhance learning outcomes, boost confidence, and ultimately lead to better preparedness and more effective emergency care. As simulations have been found to improve empathy and communication skills in healthcare students (Levett-Jones, Cant & Lapkin, 2019), such simulation-based education is advantageous and essential for children due to the preparation for a crisis situation and communication during such situations. Moreover, in our study the assigned role (rescuer vs. rescued) in simulations with moulage does not affect the increase in knowledge level ($p = 0.53$) and children prefer the role of the rescued ($p = 0.04$). Teachers and parents of our children express 100% support for first-aid learning through simulations with moulage, although some teachers noted the time-consuming nature of this learning activity as in other studies (Kuba, Řiha, Zvěřinová & Krečková, 2019).

In our study we prove that the assigned role had no influence on the first-aid knowledge level ($p = 0.53$), but the popularity of the moulage activity was shown to be dependent on the assigned role when it was more popular with the Rescued group (those to which moulage was applied). Of course, teachers must design the time schedule carefully and choose enough simulations so that all children can take turns in both roles. However, it can be stated that in the first-aid course for children of the lower secondary level, we did not need another human resource to be "rescued", children prefer to be rescued.

4.3 Content and Language Integrated Learning (CLIL)

The term CLIL (Content and Language Integrated Learning) was coined in 1994 by David Marsh and Anne Maljers among others (Anderson, McDougald & Cuesta, 2015) as an umbrella term that could encompass a wide range of situations related to "the experience of learning non-language subjects through a foreign language" (Marsh, 2012). As a later study in the Czech Republic and Slovakia (Marcineková, & Pavlasová, 2020) showed, only 32% of Czech teachers said that they applied CLIL, whereas only 13% in Slovakia. At the same time (Marcineková & Pavlasová, 2019) it was found that English (85%) was the main CLIL language used by Czech teachers, while some teachers also used German, French and Russian. Teachers realize CLIL the most often in regular lessons, then in projects and laboratory lessons. Human biology is the most frequently used topic of teaching units they teach in CLIL. In our study, besides biology geography was the most frequently mentioned (mainly because of travelling; as in Hnátková, 2013), followed by "all subjects", physics, mathematics, physical education and history.

Evaluation of the CLIL method and activities for effective CLIL lessons are for the Czech Republic offered by e.g. the National Pedagogical Institute of the Czech Republic (NPI, 2012) and by Adamus (2024). In the Czech Republic there are some CLIL materials prepared for children of different language levels, e.g. Labyrinth (Pavlová et al., 2015), NIDV (2014) for Czech teachers, others are Lingo MINT (2020), Clemen (2009), Dale & Tanner (2012), Müller & Schroeder (2015), Quartapelle, Sudhoff & Wolff (2018), Goethe-Institut (2024a, 2024b), Haataja (2013) and CLIL-LOTE-START (2011).

As Šulista (2020) brought positive findings that in mathematics lessons the CLIL method in the classroom does not have to have a negative impact, our study showed pupils' positive preferences for learning of a foreign language and first aid together. Most children in our study proved CLIL with first aid to be important (83%) and useful in their life (87%).

Levels of knowledge in the CLIL method often diverge. Some studies have shown an improvement in the knowledge of children who complete CLIL compared to pupils taught only in their native language (Van de Craen et al., 2007; Huijbregtse et al., 2000; Day & Shapson, 1996), others showed the close level of knowledge (Surmont et al., 2016; Zydariš, 2007), but for some classes, the implementation of CLIL is not met with enthusiasm by the children (Hořáková, 2012). A methodological limit when comparing different studies can also arise when determining the amount of language use in teaching, e.g. Betáková, Homolová & Štulrajterová (2017) state that if a foreign language is used in a professional subject for at least five percent, it is CLIL. However, teaching is usually designed for a higher amount of the language content even within hard CLIL.

In our study, the level of knowledge of first aid improved in CLIL as well as in non-CLIL statistically significantly ($p = 0.00$), the level of knowledge did not differ between the CLIL and the non-CLIL groups ($p = 0.76$), therefore we can conclude that the use of CLIL in teaching first aid will not worsen the level of knowledge and support. Moreover, the results show that the activating methods in CLIL teaching were received positively by the children, and they enjoyed them. Most children would like to take the same first-aid course again, with the CLIL method. It turned out that children perceive content-oriented CLIL (hard CLIL) well. Our finding is consistent with Ikeda (2013), who affirmed that Japanese students (16–18 years old) prefer hard CLIL and appreciated the cognitive activities, constructive learning, increased content knowledge and enhanced communicative competence (vocabulary and oral presentation).

The CLIL vs. the non-CLIL teaching of a co-author (PB) made it possible to compare the feelings of teaching in both groups. A more relaxed atmosphere prevailed in the experimental group. On the other hand, the control group was dominated by a rather discouraged atmosphere. This difference could have been influenced by the nature of the pupils, information about different teaching in both classes and, finally, perception of the teacher. We can also assume that the children were more open to learning the given topic thanks to the non-traditional concept of teaching. Our findings are in conformance with Binterová (2012) and Suchopárová (2012). Similarly, Muñoz-Luna (2013) sees the main benefit of CLIL for a vocational subject in that the pupil works harder when trying to understand a foreign language, and at the same time the teacher emphasizes the main ideas more. Both the students and the teacher have to cope with the language barrier. The basic principles of the CLIL methodology thus include the use of a wide range of aids and materials, the involvement of as many senses as possible. The teacher must find a way to make information available to as many students as possible, choose diverse strategies, repeat information more often, reformulate and vividly model and illustrate. This then leads to more effective learning.

However, there are also studies reporting that children after CLIL teaching have a lower level of knowledge than children taught in a traditional way (Vojtková & Hanušová, 2011). The cause of the last-mentioned case may be a misunderstanding of

the test questions or insufficient language skills needed to answer them, if the test is given in the CLIL language (Ball, 2014). This problem can be solved either by allowing pupils to use their native language during testing (Stohler, 2006), by using only the native language for content testing, as for example in the research of Van de Craen et al. (2007) or Rosi (2018), or by developing questions that can diagnose that the cause of failure is a misunderstanding (Hofmannová et al., 2008). In the years 2002–2004, Stohler (2006) analysed the causes of students' mistakes in teaching and in oral examinations. Her research confirmed that CLIL does not have a negative effect on pupils' performance in content learning if pupils are allowed to use their native language during testing (the task was in a foreign language, they were also allowed to use their native language when answering). According to Stohler (2006), when students were tested only in a foreign language (the tasks and their answers had to be in a foreign language), their results slightly lagged those of students in regular classes. Also, Day and Shapson (1996), Van de Craen et al. (2007) and Rosi (2023) confirm that CLIL students perform better in a non-language subject than their peers when tested in their native language. The same result is reached by Huijbreghse et al. (2000), whose research confirmed the better results of pupils from the bilingual program in all tested subjects. Hajer (2000) attributes the cause to a lack of understanding of the content of the curriculum already while teaching.

The results show that the activities were received positively by the children, and they enjoyed them; the potential rewards for the effort are very great (Anderson, McDougald & Cuesta, 2015). Already during the lesson itself, when e.g. an educational game was implemented, it became clear that the children were enthusiastic and that they enjoyed the game, which was reflected in their activity and interest during the game. In German/Czech CLIL they spoke Czech during the game only exceptionally, or they used English and therefore communicated almost exclusively in German. In the English/Czech CLIL they communicated in Czech only briefly and then only exceptionally when there was a mutual misunderstanding during the activity, but almost always in English. Children in both CLIL teaching used the vocabulary and language resources acquired in the previous activities. Although they did not always express themselves grammatically correctly, this did not hinder understanding. Although the level of language education was not the aim of the study, it was obvious that the activities are also effective in terms of language. In further studies, it would be appropriate to test both content and language. Appropriate for CLIL research is the factor rotation technique, which was implemented in other CLIL research (Wossala, 2017). Its disadvantage is the large organizational and time-consuming nature of the experiment.

4.4 Educational games

For secondary school children it is refreshing to learn through educational games. But the content of the games needs to be (a) professionally correct and (b) based on an appropriate knowledge level and (c) the principle of the game needs to be fun. First-aid content can be included within well-known and popular games, e.g. Dobble (Dobble, 2024), Quartets (card game), Triominos (Trimino, 2024), AZ-quiz (Quiz, 2024), various board games with cards (Canva, 2024), puzzles (skeleton, organs), pexesos and pexetrios (concentration card games with pairs or triplets of images/information, which could be the same or could complement/belong to each other, e.g. symptoms for diseases or names of specialist doctors), crosswords (Crossword, 2024), word-search games (Word Search, 2024), Guess Who/What Am I games, riddles, etc. In the online space we could create interactive Jeopardy! (Jeopardy, 2024) Google slide games, virtual/online board games, Kahoot! Game, use QR codes or Mentimeter, etc. Games can be categorized into cooperative and non-cooperative games. In cooperative games, players can form coalitions and work together to achieve a common goal. This type of game involves collaboration, negotiation and the sharing of resources among players. On the other hand, non-cooperative games focus on strategic decision-making without cooperation or communication between players.

4.5 Further educational materials

The offer of materials for teaching first aid shows a great deal of variety. For effective teaching, the use of some materials can be limited by outdated procedures and an inappropriate level of difficulty. The level of difficulty should correspond to the educational path and not discourage the student too much by being too simple or too difficult.

a. Materials for first-aid teaching

For teaching first-aid in the lower secondary level in the Czech Republic, the following can be recommended: Little Anne Q CPR (Laerdal, 2024), ZdrSem (2024), První pomoc na PFF UK (2024), ČČK (2024), Skaut (2024), ZáchrankaApp (2024), and possibly Záleský (2022) and FSPS MUNI (2024).

Educational materials for medics, paramedics, first responders as well as for the public interested in advanced first aid are offered by the educational portal Akutne.cz (2024). Akutne.cz as a part of the educational content of the MEDical FACulties NETwork (MEFANET, 2024) is a project aimed at building and strengthening the cooperation of medical and non-medical health faculties of the Czech Republic and Slovakia in the development of teaching using modern information and communication technologies.

b. Virtual reality, augmented reality and 5D cinema

Another possibility in first-aid learning is the use of virtual reality (VR), augmented reality (AR) and 5D cinema, but we must always keep in mind the goal of education, not just likeability. The distinctions between VR and AR come down to the devices they require and the experience itself: AR uses a real-world setting while VR is completely virtual. AR users can control their presence in the real world; VR users are controlled by the system. 5D cinema combines 3D movies, seats that move and various environmental effects to simulate odours, lightning and thunder, wind, frost, rain and snow, and explosion impact.

Paramedic students (García-Pereira et al., 2020) wore virtual reality headsets that immersed them in the shot and made it possible to collect basic clinical information and assign it and sort it. Although no difference in satisfaction between live or virtual reality was found, participants were found to experience a lack of human interaction and emotional immersion as a limitation of the virtual-reality technology. However, virtual reality can be a viable option for improving immersion given its minimal maintenance costs and the ability to expose students to situations that are difficult to imitate with traditional techniques, such as those that are dangerous or rare (Mills et al., 2020). Augmented reality (virtual objects seem to co-exist in the same space as the real world) can represent an interesting approach for moulage involving human interaction while maintaining desirable features of virtual reality simulations such as immersion and cost effectiveness (DCosta et al., 2024).

VR is a tool that allows the consolidation of a greater amount of knowledge in the short term and can be used for situations such as pandemics, where traditional formats are not available. Also, student satisfaction when using participatory methodologies in training such as VR or role-playing is very high (Figols Pedrosa et al., 2023; Nas et al., 2022). The use of VR could be recommended as a prequel to a live first-aid course with simulations as a teaching methodology due to the lower cost. A good training program with VR/AR/5D cinema seems to be (1) theoretical preparation (optionally with 5D movie), (2) VR/AR (saves time and salary for lecturers), (3) practical exercises and (4) tactical exercises of IZS (HZS ČR, 2023).

Experts (García-Pereira et al., 2020; Kent et al., 2016) have also pointed out that medical students or trainees of first-aid courses should get used to the presence of olfactory stimuli, for example by using a 5D cinema, VR and AR. However, odours/smells do not provide any benefit on the performance of manual dexterity tasks, but odours do have a positive effect on the performance of

some spatial reasoning tasks (Krueger, 1996). In the quasi-experimental study, which used a clinically relevant smell (mouldy cheese which suggested a diagnosis of wound infection), participants reported improved outcomes from the simulation (Kent et al., 2016).

A limitation of virtual reality due to the weight of VR headsets and subjective discomfort and pressure load on the head implies a potential for improving the physical comfort of VR headsets by reducing weight and designing headsets with an integrated shape (Yan et al., 2019). In addition, AR appears to be more advantageous for teaching a larger number of students, the time for teaching can be reduced and nausea (cybersickness/virtual-reality sickness) can be avoided.

VR may improve the quality of chest compressions (Trevi et al., 2024; Alcázar Artero et al., 2023) as well as the use of a defibrillator (Trevi et al., 2024) compared to instructor-led face-to-face basic life support (BLS) training. The virtual learning environment was perceived to be engaging, realistic and facilitated the memorization of the procedures (i.e. it can give feedback), but limited decision-making, team building, psychological pressure and a frenetic environment were underlined as disadvantages (Trevi et al., 2024).

c. The KID card and LOCIKA

For children and others, the KID card for children (KIDcard, 2024) is one of the projects of the SOFA organization (SOFA, 2024). The card is a very effective and easy-to-use tool that helps to detect a child at risk in time. The card is intended for all professions that may encounter children at risk (variants for teachers, health workers, social workers, policemen and firefighters, children, parents and the public). It provides guidelines for identifying acute or chronic threats to a child's life, safety and health. It also describes the procedure for ensuring the child's protection in case of danger.

For caregivers, LOCIKA (2024) bring a series of supporting articles, instructions and information on how to handle difficult situations with children (for parents, teachers, social workers and others) how to support them, how child protectors should take care of themselves, and how child protectors can deal with their own fear and anxiety.

4.6 Study limitations

The present study was limited in the willingness/unwillingness of the secondary schools to follow the requirements for dividing pupils into groups according to the results of the Pretest. If it was not possible to create knowledge-balanced groups of children, the Pretest was evaluated and if the pretest results did not differ statistically significantly, a coin toss was used to determine which class would be the experimental group and which class would be the control group. Another limiting factor could be the different number of children in the subgroups (e.g. children with German as the 2nd foreign language learning in the same grade by the same teacher/methods), which was reduced by appropriate statistical methods. Additionally, our results might not be generalizable about all types of activating methods and how their use in teaching affects other contexts.

5 Conclusion

It is important to teach first aid. Children are highly motivated and never too young to learn first aid. The earlier children are trained, the more likely it is that the provision of first aid will become a normal part of their lives. Repeated training provides them with a lot of knowledge and life skills, which leads to empowerment.

Children rate the first-aid courses highly, even slightly better, if it takes place through activation methods including CLIL, but the differences between the teaching of activation methods including CLIL compared to conventional teaching are not statistically significant. With regard to the fact that the

differences between activating teaching methods including CLIL compared to classical teaching are not statistically significant, activating methods including CLIL have another added value in that children find them fun and want to learn again.

Through a questionnaire, it was analysed whether the selected activating methods and the CLIL methods are effective in teaching first aid for secondary school children. An evidence-based educational pathway and current European Resuscitation Council guidelines were followed. The study was focused on the differences in the level of knowledge and attitudes of children educated partially/fully through activating methods/CLIL compared to common first-aid teaching (PowerPoint presentation, first-aid videos, worksheets). Significant differences in the level of knowledge in all subgroups with partial/fully teaching through activating methods/CLIL were found. Also, the assigned role (rescuer vs. rescued) in simulations with moulage does not affect the increase in knowledge level and children prefer the role of the rescued. From the perspective of organizing such a first-aid course, it turns out that no additional persons are needed for the simulations. In German/Czech CLIL as well as in English/Czech CLIL we can conclude that the use of CLIL in teaching first aid will not worsen the level of knowledge and support. Moreover, the children educated through activating methods/CLIL declare a higher attractiveness of teaching, a greater motivation to continue learning first aid using the same methods and a greater willingness to pass another first-aid course.

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Primary Paper Section: A**Secondary Paper Section: AM, AQ, FQ**