BABEȘ-BOLYAI UNIVERSITY OF CLUJ-NAPOCA

FACULTY OF PSYCHOLOGY AND EDUCATIONAL SCIENCES

DOCTORAL SCHOOL *EDUCATION, REFLECTION, DEVELOPMENT*

-PhD thesis abstract-

SWIMMING SKILLS TRAINING. EDUCATIONAL APPLICATIONS IN CHILDREN AGED 5 TO 7.

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The PhD thesis entitled "Swimming skills training. Educational applications in children aged 5 to 7" the following keywords are directly and indirectly referred: **swimming**, **teaching methods, motor capacity, motor skills, communication, AC (communication apparatus) .**

OVERVIEW

Statistics show that millions of children worldwide are not learning to swim on time or perhaps never. (**Error! Hyperlink reference not valid.**, accessed June 2017). From personal experience, as well as from information obtained from a survey of swimming instructors, it is clear that the psycho-pedagogical component is not very present in the training of swimming instructors. The focus is predominantly on the other components of the introductory swimming process, such as teaching basic skills, ensuring proper movements and training as close to the ideal as possible.

The direct involvement of the student in learning is becoming an educational policy desired by many countries that wish to develop pedagogy to support the learner and involve him/her as much as possible in the learning process. This pedagogy, which places the student at the centre of its con-

cerns, is an active and interactive pedagogy, which brings improvements to all areas of teaching, especially those in which the dynamic part is more present. The permissibility of interactive pedagogy facilitates actions centred on the individual student's activity, through which they form basic skills and develop competences.

During my time as a swimming instructor, I have noticed that students don't come to the pool just to teach them to swim, they come to give them the confidence that they will succeed and that they will have proper learning conditions. This finding has remained a challenge on what needs to be further explored in education for children's success in swimming. What we want, through this research, is to demonstrate how we can use in lessons the teaching method that best suits the interests, but also the abilities that children have.

The swimming instructor becomes successful if he knows as many ways as possible to teach swimming correctly, which will help children overcome their water anxiety. After studying the literature from our country and abroad, coupled with 14 years of experience in teaching swimming to children, I came to the conclusion that this teaching field is not fully researched and explained.

Swimming is a form of physical exercise as well as entertainment that many people enjoy. A successful swimmer puts in a lot of effort to achieve results, but with the help of a competent coach there is a better chance of accelerating performance. The science of providing information about swimming methodology and technique can help people interested in swimming. To help counteract water resistance, the correct body position and forward motion technique must be learnt by moving the arms and legs.

"Teaching swimming - learning to swim, is more than learning to execute successive swimming strokes, it is a complex pedagogical system of action, through which the complex effects of personality development, learning the activity of movement prevail". (M. Biro, 2015, p.65).

The scientific approach undertaken in this work is in line with the development trends of teaching in recent decades, even if there are no specific in-depth studies on the swimming branch in the literature.

As part of the research entitled "**Swimming skills training. Educational applications in children aged 5 to 7"** we investigate optimal pedagogical applications that can be used in the instructional educational process for swimming activities, using the teaching tool called Aqua Cam. The whole scientific approach was structured on 6 distinct chapters such as:

- CHAPTER I - COMMUNICATION IN THE PROCESS OF SWIMMING INITIATION
- CHAPTER II - CONTEMPORARY APPROACHES TO CHILDREN'S SWIMMING
- CHAPTER III - MOTOR CAPACITY AND PSYCHOMOTOR SKILLS - A PREREQUISITE FOR THE ACQUISITION OF SWIMMING SKILLS
- CHAPTER IV - DIDACTIC APPROACHES TO TEACHING AND LEARNING SWIMMING
- CHAPTER V - RESEARCH COORDINATES
- CHAPTER VI - RESEARCH RESULTS, ANALYSIS AND INTERPRETATION

Chapter I **Communication in the process of swimming initiation** discusses definitions of communication and its role in the swimming teaching process. Professor I. Negulescu (2007) defines communication as the fundamental mode of psychosocial interaction of individuals, achieved through symbols and socially-generalized meanings with the aim of achieving group stability or changes in individual or group behaviour.

In the literature, there are several forms that communication can take, depending on the nature of the message and the communication channel used, the participation of individuals in the process, the tools used or the objectives.

There are mainly three types of communication depending on the nature of the message and the communication channel used.

Verbal communication is best described by the use of speech in both oral and written form and is considered the most complex and explicit form of communication.

For this type of communication to be effective, a number of skills are needed from the participants in the process, so based on expressive skills, the sender of the message will be able to convey the information effectively, and coordination skills will help in choosing the most appropriate communication channel and using it appropriately. Listening skills become essential for the receiver of the message to decode the message and understand it correctly.

This type of communication, verbal, has a number of qualities that make it the most commonly used form. First of all, it can be used in different ways, in written, oral or internal language, it allows to convey messages with complex and structured content, stimulates people's thinking and creativity and brings it out. There are also a number of disadvantages to verbal communication, such as the

fact that it lacks expressiveness if it is not complemented by other forms of communication, and the speed of transmission and reception of the message may be slower.

Nonverbal communication often accompanies verbal communication, but is also used alone. It is characterized by gestures, facial expressions, gait, body posture, eye contact. Mehrabian A. and Weiner M. (1968) were the first to study non-verbal messages and emphasized the complexity of the communication process in terms of the multitude of information conveyed through the attitudes of those involved.

Many authors consider that it occupies a larger part in the content of a message than the verbal one, because it involves more analysers: visual, olfactory, tactile-kinesthetic. Nonverbal language is considered a set of manifestations of emotions, states, attitudes of a person on the basis of which positive relationships can be established, based on empathy, persuasiveness and trust.

The face is considered the most expressive part of the child, so eye contact is essential in forming a relationship and conveying the right message. Smiles play a key role in making these relationships based on trust. Hands form gestures, being the most spontaneous form of communication manifestation with a role in regulating verbal discourse, and feet show the state of comfort or discomfort existing in a communication process. Expressiveness is the most important advantage of this form of communication, giving the correct meaning to the words used. It is also considered the most spontaneous and fastest form of communication, facilitating and completing any communication process. The main disadvantage is that it cannot be used individually when dealing with complex content and the message may be distorted if gestures are used excessively.

Paraverbal communication is part of nonverbal communication and is described by voice pitch, rhythm, intonation and accent, vocal timbre, pauses between words and speech speed. This form of communication can be used to convey a person's inner state or way of being. The main advantage of this form of communication is that it can streamline the process of influencing and controlling recipients, putting pressure and commanding respect.

After a more detailed study of the literature, we consider that a communication is effective when the message is understood as the sender wanted it to be understood, that is why the sender must take into account the 7 C's of communication: clear, concise, concrete, correct, coherent, complete and courteous.

Communication plays a vital role when it is carried out in teaching, because the purpose of any kind of teaching subject is the educational preparation of pupils and this preparation cannot take place without communication.

Teaching communication is put into practice through different types of verbal and non-verbal languages. Verbal language is the main resource the teacher uses to provide information, explain and guide students throughout the learning process.

Therefore, the language of the teacher must be didactic and consequently, it must be instructive and educational, fluent, natural, direct, clear and accessible. At the same time it must be well articulated, grammatically correct, lively and expressive.

Communication is present in all its forms in the teaching-learning process of swimming. The most important role of communication when it comes to sport is motivational. According to C. L. Pop, (2014) motivation is the sum of forces, internal and external energies that initiate and direct behaviour towards a goal, which once achieved will result in the satisfaction of a need or want.

Sport is defined by action, so when it comes to communication in sport the verbal message must be condensed, clear and most importantly motivating. The message must also be expressive and illustrative in order to create a clear picture in children's minds and to arouse their interest in learning. The communication method chosen by the teacher is essential in creating the necessary motivational climate for students, which will then help them to want to participate, develop skills and progress in sport.

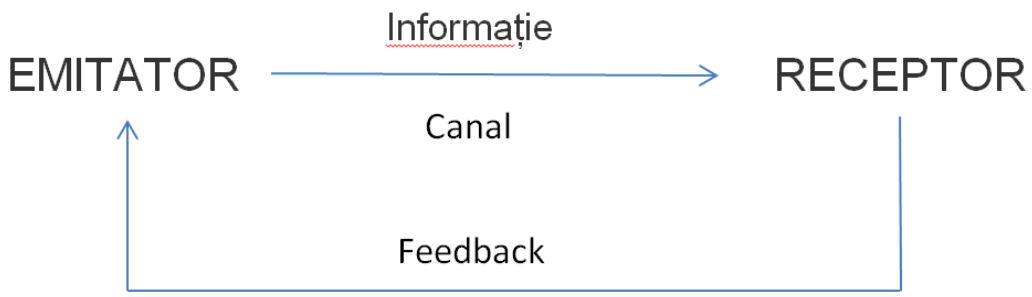
In trying to achieve effective communication we often encounter barriers to this process, and a teacher's success is determined by their ability to find solutions to remove these impediments.

Often, under the influence of external factors or our own thoughts, we do not pay attention to what is said to us, thus losing information and the meaning of what is said. The communication process involves attention mechanisms at both the receiver level (for active, participatory listening) and the sender level (for effective communication). Any alteration or total lack of attention at any level makes communication poor or even impossible.

Many theories of communication give this process several basic building blocks. Thus it is considered that in a general communication process the following are involved: sender, receiver, information, channel, feedback.

Figure 1. *Elements of the communication process*

(http://www.mpt.upt.ro/doc/curs/gp/Communication_skills.pdf)



The same general elements that form the communication process can also be noticed in the process of swimming initiation, where the initial sender is the teacher who wants to teach the children, i.e. the receivers to swim by transmitting information through different communication channels and then following the feedback that will come from the children.
The importance of these elements is crucial for the learning process of swimming to lead to results and progress.

In this chapter the channels of information transmission in swimming lessons have been highlighted and are mostly verbal and visual. Unfortunately these can be easily disturbed, given the environment in which the swimming lessons take place, so solutions must be found to reduce this degree of disturbance in order to convey the information as clearly as possible.

Feeback has been described as part of the swimming teaching process and is the result of the teacher's explanation of how the children perform the introductory swimming procedures. In this sense feedback is considered to be transmitted visually, but it can also be transmitted vocally, when children repeat the teacher's instructions or prefer to say what they are going to do in order to receive confirmation that the message has been well understood. In this paper feedback is considered the essence of communication.

In this paper feedback plays a very important role, since teaching via the AC communication device is based on providing real-time information and especially feedback related to individual progress.

The communication channel as part of this complex process that is communication is the term that describes how we convey the message to the receiver, in our case the students. It has an important influence on the effectiveness of the communication process as it is strongly involved in the quality of the information that needs to reach the person or target group.

We believe that a much better focus on the communication process can be achieved by using the Aqua Cam as an additional communication channel and by overcoming the communication barriers imposed by the noise in the swimming pool, the noise caused by contact with the water and the fact that some swimming procedures involve holding the head under water.

The second chapter **Contemporary approaches to children's swimming** highlights contemporary studies in this field that have added to or tried to contribute positively to the development of specific pedagogy as well as the particularities of swimming outside the pedagogical sphere. Also in this chapter, the course of swimming over the years was traced and a brief history of swimming since its discovery was given.

One cannot talk about an initiation or learning swimming course without getting the children to get used to the aquatic environment in the sense of reducing the insecurity with which they often come to the swimming course, making friends with the water and the environment of the pool, gaining self-confidence and the desire to learn and progress.

In this context, the teacher should present as clearly and friendly as possible what is going to happen in the lesson, explain to the children the aids to be used, help them to acclimatise to the water through various games and create a relaxed and friendly environment.

"Based on the idea that mastery of a varied system of motor skills and abilities is the basis of training even in high-level athletes, special attention must be paid to this. Through appropriate repetition a variety of basic motor skills and abilities can be formed (I. Sidonon, 1977 p. 52).

The means to achieve these objectives are a complex of exercises which according to N. Neagu (2011) can be: means of getting used to the water, means of aquatic breathing, floating and gliding, means of learning the technique of movement of the upper and lower limbs and means of learning the technique of primary coordination in the crawfish and back procedures. Also in this chapter we have described the important stages of the initiation process which has as its starting point the adaptation of children to the aquatic environment, floating and gliding, adaptation of breathing to the requirements of swimming, G. Kari (2012) says about breathing that normally the necessary act of lung breathing is performed unconsciously, without the intervention of the will, the nervous mechanism of breathing works by virtue of innate automatisms. Anatomical and physiological peculiarities influence the swimming technique according to Professor C. Hanțău in his work "Physiological peculiarities of age and their reflection in the development of motor skills in children", the development of children's physical and intellectual skills, as well as the intensity, quantity and pace of work on these skills, must take into account three basic principles: considering the age of the

child being worked with, since skills and abilities are formed, consolidated and perfected at different ages; the attempt to reach the upper limits of each child, but without in any way forcing the execution of movements or skipping certain steps; the development of individual abilities while respecting the physical, psycho-behavioural and social components of children, in accordance with each stage of development.

Anxiety has been dealt with succinctly in this last part of the chapter through numerous descriptions and definitions by specialists in the field and we have chosen to stop here only at the phrase that "Anxiety is a normal part of human life and is a response to certain situations in which people find themselves on a daily basis. A reaction is generated in response to a signal or threat of danger in order to confront and respond to it. Therefore a certain degree of anxiety is even desirable for the normal management of everyday demands (preparing for an exam, attending an interview, the need to speak in public, etc.)" (Guideline Working Group for the Treatment of Patients with Anxiety Disorders in Primary Care, 2006, p. 25).

Also when it comes to the process of learning to swim, many children experience anxiety and insecurity. First of all because it is something new, because there is the fear of water and the danger of drowning and the difficulty of practicing this sport leads to the need for effort and a lot of work to acquire the right skills and to make progress.

We believe that it is appropriate to assess children's anxiety by collecting data at the beginning of the initiation process in swimming. Based on them, it would be possible to determine the approach to the different subjects and the choice of teaching methods, and thus facilitate the whole teaching-learning process.

In the third chapter, **Motor Capacity and Psychomotor Skills - a prerequisite for the acquisition of swimming skills**, we wanted to highlight the importance of these vectors and the contribution they bring to the formation of specific swimming skills. After defining the concepts and highlighting the differences between the terms, we addressed the components of psychomotor skills, motor learning and motor intelligence so important in the formation of specific motor skills.

Synthesizing the views of several specialists, Professor Cârstea (2000) arrived at the following definition: "motor capacity is a dynamic human potential (progressive or regressive in ontogenesis) given by the dialectical unity between motor qualities and skills or abilities". (Gheorghe Cârstea, 2000, p.17). So after consulting the opinions of several specialists, we interpret the definition of motor ability as the success of an individual in completing a given task.

Motricity is approached differently by specialists in the field and interpreted by each according to their experience and studies on the subject. We have mentioned a few definitions that are considered the most relevant.

"Motricity represents the totality of the possibilities of action of the human being". (U. Șchiopu, 1997, p. 425)

According to A. Dragnea and A. Bota (1978) the concept of motricity is defined as "an innate and acquired ability of the human being to react with the locomotor apparatus to internal and external stimuli in the form of movement".

Psychomotor skills involve morpho-functional knowledge of the conditions that prepare and support them from a physiological and psychophysiological point of view. The analysis of psychomotor skills starts from the aspects that allow the child to form a system of movements by means of which he can act in any conditions, based on his own decisions, with efficiency, spontaneity and speed.

The teacher has to analyse the motor capacity of each student and, above all, observe and take into account any motor dysfunctions. This assessment of motor potential will help in determining the most appropriate way of teaching, so that an appropriate response can be obtained that will lead to improvement of motor skills and specific pedagogy that will result in a positive learning outcome.

Throughout this chapter, sub-chapters have been analysed which are considered very important in order to form a high performance learning process as close as possible to the ideal. In subchapter III.2.1. Psychomotor components and their impact in the process of initiation in swimming are listed the components of psychomotor according to Epuran, M. (1976), considered to be one of the most complete classifications, as follows: body schema; segmental and general dynamic coordination; laterality; static coordination - balance; perceptual-motor coordination (perception of space, rhythm and own movements); rapidity of movements; ideomotricity (as a dynamic synthesis of body schema and perceptual-motor coordination with the motor task).

In swimming, initiation and progress are closely linked to one's psychomotor capacity. The psychomotor components cited in the paper influence the process of initiation to swimming, making a significant contribution.

In subchapter III.2.2 Moral qualities and their role in swimming acquisition, the aim was to list the basic and combined moral qualities used in the process of initiation to swimming and to determine their degree of importance in this process. Motor learning was briefly covered in subchapter III.3 and reference was made to perceptual motor learning in pre-school children "J.B. Cratty (1966) ex-

plains the nature of perceptual-motor learning through 3 categories of factors that influence the process of acquiring motor skills.

These factors have been translated to the preschool age level and we have identified:

1. basic behavioural supports through: ability to analyse task, general level of development, muscle tension;

2. skills and personality traits: important perceptual skills, reaction time, speed of movement, flexibility factors, manual skills;

3. the unique variables of the performance situation: previous practice in similar tasks, emotional climate, task-specific motivation." (V. Horghidan, 2000, p. 143). Also in this sub-chapter M.Epuran (1976), presents a pedagogical model of motor learning, presenting its stages, as follows:

1. elementary skills - consisting of the practical application of knowledge in the initial conditions of learning (corresponding to the first period of pre-school age);

2. dexterity - the motor act is learnt and is characterised by higher performance indices (corresponding to the second period of pre-school age);

3. higher skill - adapting the learned motor act to new situations and to possible barriers that may arise to execution.

The improvement of the motor gesture under the impact of learning depends on many factors among which we cite the main categories, described by M.Epuran (1976): the psycho-physical characteristics of the subject who learns; the characteristics of the motor acts that are learned; the characteristics of the environment and specific training. Some authors consider that motor learning does not teach movements, but motor solutions, i.e. children learn to combine different movement parameters from one repetition to the next in order to achieve goals. At the end of the chapter, motor intelligence has been described by different authors and as a reflection we can say that motor intelligence aims at adapting and reaching concrete levels taking into account the spatial-temporal relations. In swimming, motor intelligence contributes significantly to the formation of specific acquisitions, but it is not mandatory that a certain level of development is reached. Because each child has a unique motor intelligence, the individual's ability to improve his or her muscular capacities, to learn and train swimming-specific motor skills, to understand movements and their execution, to be able to adapt in space, to coordinate movements and to adjust body position must be taken into account.

Chapter four, **Didactic approaches to teaching and learning swimming,** intends to capture some aspects related to the organization of didactic activities, the structure of the swimming

lesson, teaching styles, didactic principles, the play component, the basic pedagogical conditions used in the process of initiation in swimming, the inclusion of swimming in the sphere of non-formal education, studies related to the teaching of swimming to children and the description of the Aqua Cam communication apparatus. In our opinion, all these aspects are factors for optimizing teaching activities, especially in the teaching of swimming.

The first sub-chapter outlines the swimming lesson mentioning the duration of the lesson which at the age of 5-7 years is 50' to 60' depending on the objectives set in advance, the structure of the lesson which is similar to physical education and sport lessons and can be in links or parts depending on the external factors that influence it. The density of the swimming lesson has been described in order to emphasize the quality of a successful lesson, also the types of density according to the course material "Didactics of School Physical Education,p 27, 28, 29" presented by C. Prodea (2016) and these are motor, pedagogical and physiological density.

The fourth sub-chapter brings to the work contributions related to teaching styles used in the educational act adapted to the aquatic environment. Several classifications of teaching styles have been found, but the German psychologist L. Kurt (1939) offers the best known classification of teaching styles and classifies them into democratic, permissive and authoritarian styles. The results of the investigations show us that in teaching effective swimming, combining teaching styles and adapting from case to case according to a series of factors such as: organizational framework, age of the students, optimal performance according to age, technical standard of the pool, main role of the instructor are the best solution to lay the foundations of a healthy educational process. First and foremost in the introduction to swimming, it is the age of the children that influences the teaching.
In the continuation of this chapter we wanted to highlight the basic pedagogical conditions in the process of initiation and learning of swimming, and according to (Romanian Federation of Swimming and Modern Pentathlon Book, 2013-2016, page 81,) we listed the basic conditions that need to be taken into account in the process of learning swimming, and these are the age of the children, the pedagogical principles, the positioning and the most active participation of the teacher in the lesson, the recommendation that the teacher enters the water, the correct use of aids, the prohibition of bullying or forcing children, the use of appropriate language adapted to the age. Also the application of didactic principles in teaching swimming brings an important contribution to the educational process. I have taken these principles listed by Professor (Gh. Cârstea 2000), in the work Theory and Methodology of Physical Education and Sport p.78 individually and described the role it plays in the learning of swimming. The principles taken up and described in the theoretical background bring to the fore the conscious and active participation of the learner, without an active and especially conscious participation one cannot speak of a learning process with results. In order to fully respect the principle

of intuition, it is necessary that a clear, complete, concise explanation followed by demonstration is present in every educational act. The principles of systematization and continuity are closely linked in the instructional process, they direct all swimming teaching activity throughout a cycle of lessons. In the method of teaching swimming, in accordance with the principle of systematisation, a logical sequence of teaching the component elements of a procedure has been formed. The principle of sustainability involves ensuring an optimal number of repetitions for a skill to be correctly mastered.

In sub-chapter IV.5 Playful behaviour at the age of 5-7 years, play has been presented as a very important tool in teaching swimming to preschoolers. The functionality of the game has been disseminated with the help of pedagogical specialists' opinions. J. Piaget, an important researcher in the field of psychology reports that "the activity of play consists in assimilation that functions for itself, without any effort of accommodation" (G. Sion, 2003, p.114) and other authors define play as "A means of facilitating the child's transition from the dominant activity of play to that of learning" (H. Pache, A. Mateias, E. Popescu, F. Șerban, 1994, p. 81). After defining the game, we wanted to highlight the methodical indications on movement games and their classification according to a variety of characteristics depending on their usefulness.

Also in this chapter we wanted to establish whether swimming fits into non-formal education and brings educational benefits to its practitioners. In order to be able to classify an activity within non-formal education Cebanu L. (2014) says that activities and lessons should not be structured in a formal way, with a rigid evaluation and specific academic objectives. From the definitions of non-formal education reported by various authors and framed in this paper, it appears that swimming with all its valences fits perfectly into the sphere of non-formal education. The benefits of swimming as an integral part of non-formal education mentioned by Sterret W.I. and Crowley R.S. (2014) are development on the cognitive and emotional side. At the same time, swimming as a form of education improves problem-solving skills, improves memory, attention and contributes significantly to the development of concentration and focus on tasks. V. Andries, V. Clichici (2020) considers that non-formal education helps children to acquire a number of skills and classifies them into four categories: individual skills, social skills, technical skills and methodological skills.

- **The individual skills** that can be obtained or developed concern self-confidence, initiative, positive self-image, willingness to show and develop qualities, initiative to relate. The development of individual skill levels has a positive effect on children's confidence in their abilities and thus their ability to realistically assess the challenges they face.
- **Social skills** is about the ability to act in different social situations, the ability to approach people in an empathetic and responsible way and to form relationships. Once children have

developed this skill, they are ready and open to communication and cooperation, and know how to manage teamwork and possible conflicts.

- **Technical skills** are related to the ability to act in different situations of experimentation and exploration. Developing this type of skill helps children and young people to develop strategies to solve problems and make decisions.
- **Methodological skills** include problem-solving ability, reflective ability, and skills related to learning methods. They rely on children becoming aware that they are learning, what they are learning and how they are learning.

In swimming, which is considered a non-formal activity because of its specific nature, children develop a series of important skills for their lives and personalities. The most valuable skill is the acquisition of swimming skills, which according to the above classification is a technical skill.

Recent studies on teaching children to swim highlighted in sub-chapter IV.7 highlight a multitude of factors involved in the teaching of swimming. After reviewing the three studies mentioned in this paper we concluded that the difference between the parts of the lesson in terms of frequency of use of teaching methods in using a movement game for initiation was due to the gender of the teacher, male or female and how qualified that person was, in another study it emerged that in the lessons, the teacher's observation was the most noticeable (31, 11%), the teacher's explanation (19.29%) and organization (13.52%) also seemed outstanding. Students spent most of their swimming lessons performing movements (77%).

Researchers in the study "Examination of teaching - learning process in swimming applying Chaffers 'system of interaction categories" (Melinda Bíró, Edit N. Biróné, Balázs Fügedi, László Révész and Béla Szabó, László Honfi/ 2007) stated that teachers who teach swimming develop a high level of non-verbal activity. Another research from Moldova reveals the difficulty of teaching swimming to groups of children of different ages. This research contributes to the shaping of the needs of teaching swimming and to finding new teaching-learning methods adapted to the current requirements.

At the end of this chapter we have presented and described the communication device used by us in the research to transmit information to the children in real time during the educational process.

Aqua Cam is a waterproof teaching-communication system and is composed of a transmitter that is positioned on the instructor, as shown in figure 3. Wireless headphones with an attached microphone are connected to this transmitter.

Figure 2. *AC underwater communication system*

The system can also be used to stream via any mp3 audio device, or can be programmed to send a rhythm sound to swimmers to maintain the ideal pacing and cadence.

Figure 3 *AC system transmitter*

The children wear a receiver in the form of a helmet, which fits easily under the swimming helmet, through which they will receive information in real time from the leader of the educational process, this receiver is shown in figure 3.

Figure 3. *AC system receiver*

These two devices are powered by chargers. These can be seen in Figure 4.

Figure 4. *AC receiver charger*

The formative potential of Aqua Cam in teaching swimming.

According to A. Stoica (2022) pedagogues who access the computerization of the teaching-learning process are aware of the shortcomings of traditional education and especially of the need to include the learner more consciously in the process by asking for feedback and giving feedback.

In the following we will outline the many formative benefits this device brings to the introductory swimming process and in facilitating the feedback process.

As a main benefit we mention the students' closeness to the teacher and the creation of closer interpersonal relationships, the development of a sense of well-being and security and the relationship of trust between teacher and student

Another important benefit of using the Aqua Cam system in teaching beginning swimming skills is the differentiated, student-centred teaching and the ease with which the teacher can work individually with students as needed. The latter can more easily identify students who need individualised help, encouragement and extra motivation, which improves pupils' attitudes to learning and their involvement in the process, and makes the effort students put in to achieve results more effective.

Another key role is that each student is able to work at their own pace knowing that they will be constantly guided if necessary, and this facilitates the growth of self-confidence.

Receiving information and methodical instructions in real time helps to develop the speed of reaction in solving tasks and thus facilitates the response in a shorter time and with a more correct execution to external stimuli.

Instant feedback from the teacher to the pupil increases the pupil's attention to the task at hand and enhances long-term concentration. At the same time, the student also gives feedback to the teacher directly when the teacher has given the explanation through the way of execution, so that the teacher can come back with further details or corrections if necessary. This role of facilitating feedback in the teaching-learning process will reduce the time needed to teach and assimilate the specific skills of the introductory swimming process.

The modern design of this device captures children's attention from the first use and provides the right context for the educational process. Students are more curious and this makes them more engaged, more eager to use the underwater device and this will facilitate the learning process.

The use of the communication device in the teaching of the specific skills of the introductory swimming process helps to create the ability to concentrate continuously and to create a state of focus on the task for a longer time. Including Aqua Cam in the learning process helps minimise distractions in the learning environment, guiding the child more closely and avoiding 'dead' guys in the lesson.

Chapter V Research Coordinates

The method of teaching swimming through Aqua Cam, described by us in the theoretical section, is not found in the bibliographical sources in the field of pedagogy and physical education, concerning the initiation of children in swimming. There are practical concerns about the use of this method in adults, but there is no relevant pedagogical research for adults either. Aqua Cam communication technology is particularly applied to performance sports, and there is growing concern in this area.

The aim of our research is to measure, under experimental conditions, the effectiveness of applying modern communication technology in the teaching-learning process of swimming. Thus, the present paper tries to evaluate the opportunity of integrating a modern technology into

swimming practice, which is represented by an audio device, with the help of which the teacher can transmit information to the swimmer during the instructional-educational process, even if the swimmer is moving, during the swim and especially providing real-time feedback, so important at preschool and early school age.

The purpose of the research for teachers (swimming instructors and teachers): Familiarisation with interactive teaching-learning technique based on underwater communication device and development of non-contact distance learning methods between the leader of the learning process and the learner.

The purpose of the research for children: to facilitate the process of initiation in swimming, to create an environment conducive to learning and training specific motor skills with the help of the underwater communication device.

Research objectives:

O_1 - Development of a methodology for the design and implementation of pedagogical applications based on the underwater communication device (AC)

O_2 - Determination of AC characteristics (ease of information reception by swimmers, ease of learning to swim, swimmer satisfaction)

O_3 - Evaluation of the pedagogical effectiveness of AC (correct and timely reception and assimilation of information, motor effort adapted to the task, intrinsic motivation of pupils)

O_4 -Studying the quality of teacher-student communication in the context of AC use

V.2. Research hypotheses

The general hypothesis on which our experimental approach was structured was the following:

In children aged 5-7 years, the introduction of the underwater communication (AC) device into the teaching-learning process significantly improves the initiation process.

Based on this general hypothesis, the following specific hypotheses have been formulated:

Specific assumption 1

In children aged 5-7 years, the introduction of the underwater communication (AC) device into the teaching/learning of swimming leads to correct and timely reception and assimilation of information.

Specific assumption 2

In children aged 5-7 years, the introduction of the underwater communication (AC) device in the teaching-teaching of swimming leads to a decrease in the pedagogical density of the swimming lesson and an increase in the motor density.

Specific assumption 3

In children aged 5-7 years, the introduction of the underwater communication (AC) device in the teaching and learning of swimming leads to the optimisation of swimming-specific motor skills.

Specific assumption 4

In 5-7 year olds, the introduction of the underwater communication (AC) device into the teaching/learning of swimming leads to improved aquatic behaviour, including in anxious students.

Specific assumption 5

For 5-7 year olds, the introduction of the underwater communication (AC) method of teaching swimming leads to more effective teacher-student educational relationships.

V.3. Research variables

The **independent variable** was the introduction of the underwater communication (AC) device into the teaching-teaching process of swimming for 5-7 year old children.

The dependent variables are presented and detailed in Table 1.

Table 1. *Dependent variables, research methods and instruments*

No. it.	Dependent variable	Method of research	Research tool	Features of the tool
1.	Volume of time necessary to assimilate the skills specific to the initiation process in swimming	Method of observation	Progress sheet of swimming skills	Tool taken over and adapted

2.	Density of swimming class	Method of measurement (pulse and active blood oxygen)	Pulse oximeter	Medical device
3.	Level of development of swimming-specific motor skills -adaptation with the aquatic environment -breathing -sliding -crawfish leg movement -crawfish arm movement -back float -chest float	Method of observation	Progress sheet of swimming skills	Tool taken over and adapted
4.	Behaviour un water	Method of interpretation of the questionnaire	STAI questionnaire applied to children via their parents	The GAD - 7 Anxiety questionnaire will be described in detail in the section presenting the instruments used in the paper
5.	Quality of educational relationships teacher-student	Method of interpretation of the questionnaire	Questionnaire for children applied via parents	Of own conception

Place and period of research

The research was conducted at the Happy Kids Swim pool at Transylvania College and at the Universitas Swimming Complex, both in Cluj Napoca. In this regard, we have obtained the agreement of both units to carry out the activities specific to the teaching-learning process of swimming that are part of this research.

These two locations, which we consider to be the basic material conditions, have swimming pools suitable for the introductory swimming process with the following characteristics:

- small pool with dimensions: length 10 m and width 5 m, with increasing depth from 90 cm to 140 cm and water temperature 30-32 degrees.

- large pool with dimensions: length 50 m and width 20 m, depth 200 cm, water temperature 26-28 degrees.

Also in the process of swimming initiation were used as existing materials at the two pools:

- materials specific to teaching swimming in the introductory phase: aids (belts, floats, rafts, rods, water toys, toys specific to water breathing exercises)
- the specific materials used in the tests.

The duration of the research itself was approximately 20 months, from September 2017 to April 2019. The children participated in a total of 30 hours of swimming, divided into three courses of 10 hours each, being the period, considered by the swimming instructors, necessary and sufficient to correctly assimilate the process of initiation in swimming. Two hours of lessons per week were given, because for children aged 5-7 years, more hours would have been too demanding and excessive fatigue would have occurred.

Batch of subjects included in the research were pre-school and young school children aged 5 to 7 years.

The subjects were randomly selected according to their enrolment and swimming group assignment by the enrolment program of the pool where the experiment took place. It should be noted that most of the participating children were students of the Happy Kids kindergarten or Transylvania College primary school and come from social backgrounds that have had contact with water before starting the initiation process. The number of subjects included in the research consisted of 110 children. We mention that during the period of the initiation of the tests (autumn period - September 17 - November 15, 2018), out of a total number of 110 children, 7 of them suffered from diseases that required the interruption of their swimming instructional-educational activities in the pool where the experiment was carried out, and the other 7 children who do not appear in the study did not fall within the age group 5 - 7 years. It should be noted that the group of subjects is non-homogeneous and includes a number ofăr of 51 girls and 45 boys.

Research methods and tools

The research is based on a series of methods and tools with the help of which we have managed to collect the data as accurately as possible and obtain the results. While the methods used in the research helped in the approach to the study, the tools used helped in the collection of the data

on which the results were based and together helped in the formulation of the conclusions of the study.

Research methods

In order to carry out the study and the research, different research methods were used, which helped to organise the study, analyse the data, obtain the results and draw the final conclusions about the existence of an impact of introduction of the underwater communication device AC into the teaching-learning process of swimming.

Literature study

The theoretical foundations of this work were based on a review of the bibliography, which includes books, scientific papers, PhD theses, articles from journals and websites.

The method of conversation

Although we started this research with an experience in teaching swimming to children over 14 years old and with studies in the field, in order to clarify all the details and important aspects of this process of initiation in swimming, we also drew on the experience of professionals working in the field either as instructors at the pool or as swimming teachers. On the basis of these discussions, we reached a better understanding of all the details of the teaching-learning process, and thus a better organization of the activities that make up this process.

The method of observation

Direct observation is the method most often used in the conduct of research, at several stages. It can be said that she was even involved in the choice of the research topic, because we saw the need to improve the process of teaching swimming so as to overcome existing barriers such as noise inside the pool, children's difficult focus on the teacher's instructions, difficulty in communicating with children when they are in the water. Then, during the course of the study, direct observation was essential in order to adapt the teaching process to the needs of the participating children. Last but not least, we used the observation method to collect some data that are involved in proving specific certification hypotheses, based on the attached progress sheets.

The method of measurements

It was used to collect the values of indicators, pulse and oxygen saturation with the medical instrument pulse oximeter.

The experimental method

As it is considered an objective and scientifically relevant method, an attempt was made to establish the relationship between cause and effect. For the research, two groups of roughly similar subjects were organised for which different teaching methods were used, for one group the AC system was involved in the teaching and for the other group the teaching took place with classical methods. It was examined whether there were differences between the two groups in terms of the time taken to assimilate the skills of introductory swimming and their level of assimilation and execution. At the same time, it was examined whether there were differences between groups in pulse and oxygen values in the effort state and in the degree of anxiety of the subjects towards the swimming class.

The survey method

This method has been carried out based on questionnaires that were used to collect data on the basis of which comparisons were made between the two groups involved in the study in terms of their level of anxiety and teacher-student relationship.

Statistical-mathematical method

In order to be able to analyse and draw relevant conclusions at the end of the study, the data collected through the progress sheets and questionnaires were statistically processed using the Statistical Package for Social Sciences (SPSS) software. The statistical-mathematical indicators calculated and used are arithmetic mean, standard deviation, frequency, and maximum and minimum values.

In order to compare the results between the two groups of subjects and to check the significance of the difference between them, the **T-test** for independent variables was applied. The Levente test was used to determine the equality of variances and choose the correct variance calculation for the **T-test**. For all tests, the statistical significance index was calculated as well as the effect size.

Graphical method

In the study we also used several types of graphs in order to identify and observe the differences between the two groups of subjects involved in the study, as well as their distribution over different time intervals or performance levels.

Research tools used

In order to be able to determine the results of the research and to have a more concrete pic-

ture of the direction of the study, we used a number of research tools that we considered appropriate to obtain accurate and comparative results on the two groups of subjects included in our research.

- Pulse oximeter, medical device used to determine pulse rate and oxygen saturation
- Progress sheets for swimming skills;
- Anxiety questionnaire administered to children via parents
- Questionnaire to determine the quality of the relationship between the children and the teacher and their interest in the swimming course; (administered to the children through their parents)
- The instruction protocol that was used in teaching both groups.

Pre-experimental stage

This stage involved the assimilation of information that led to the formulation of the research hypotheses and the configuration of the methodological aspects of the investigation itself. This involved a series of sub-stages that helped to organise the study and formed the flow of the research

Setting research objectives and hypotheses

A number of four objectives were set which led to the formulation of five specific hypotheses on the basis of which the general hypothesis of the study was concluded, which was whether the introduction of the AC underwater communication device in 5-7 year old children into the teaching-learning process of swimming significantly improves the initiation process of swimming.

Choice of methods and tools used in the research

Methods and tools were chosen in accordance with the research topic to facilitate data collection, analysis and generation of results.

Obtaining parental consent

Annex 10 was used for this purpose, on the basis of which the children's parents were informed about the details of the study and gave their consent for their children's participation in the study.

Forming groups of subjects

In order to carry out the research, we started from the formation of groups of subjects, so the total group of 96 subjects was divided into two experimental groups.

The AC group, considered as an experiment, consisted of 50 children divided into groups of

10 subjects. In the training of this group, the teaching method used the underwater communication device (Aqua Cam). It should be noted that this method is also based on classical explanations and demonstrations given to the children at the beginning of the lesson and at the beginning of the execution of the procedures, but also on explanations given during the execution.

The control group consisted of 46 children divided as in the AC group into groups of 10 subjects. In the preparation of this group, the classical training plan was used, in which the methods and teaching methods of swimming initiation, used by most specialists in the field, were used. In this sense the transmission of information was in the classical form consisting of transmitting information to the students from the water or from the edge of the pool through verbal communication, explanation and demonstration of skill learning exercises.

Planning for swimming lessons

Planning was developed for a duration of 30 academic hours (50 minutes), in which methodically staggered exercises were structured for the five skills specific to the introductory swimming process.

Segmentation of the experiment content

The content of the experiment was divided into several study segments according to the specific hypotheses established for this research:

- to test the learning time of the specific skills of the introductory swimming process and to compare them between the two groups in order to observe and analyse if there are differences;
- comparison of the values of the indicators pulse rate and blood oxygen saturation, in the hour of swimming with number 28, at the beginning and at the end of the hour in the context of the effort exerted, these two values were obtained with the pulse oximeter;
- comparative test by groups to determine the level of assimilation and execution of the learned skills;
- application of the questionnaire to determine the children's interest in the swimming course and the quality of the relationship between children and teacher; (applied to children through parents)
- testing children's anxiety and comparing the experimental group using AC with the control group at the beginning of lesson 1 and at the end of lesson 15;

The tests assess the extent to which the independent variable has influenced the statistical and mathematical interpretation, generating differences between the two groups.

Formative experiment stage

During this phase, several steps were taken to conclude the hypotheses formulated.

Description of teaching-learning methods

During this stage, the children involved in the study were introduced to the teaching techniques specific to each group. In the experimental group, the interactive technique of teaching swimming using the AC underwater communication device was introduced and the use of the device was learned, while the control group was taught the classical methods involved in the teaching-learning process of the specific skills of swimming initiation,

Presentation of the flow of the 30 hours of study

The children were informed about the skills to be learned, the content of a swimming lesson, and the tests that will take place along the way, in order to have a clearer picture and not to be stressed by the whole process that takes place for research purposes.

Initial data collection

Based on the established hypotheses and in order to be able to carry out the proposed comparisons, a set of values was also collected at the beginning of the experimental process and during its development for certain indicators. Some of these were picked up in the first hour of the course, such as the children's anxiety level towards the swimming course, others after a certain number of hours of the course.

The teaching-learning process itself

The teaching-learning process of swimming initiation was based on a planning that aimed at the assimilation and gradual development of specific swimming skills. Different exercises were used, gradually phased according to the teaching principles based on the instruction protocol detailed in Table 2, to develop the skills required for each of the skills that make up the initiation process in swimming.

Table 2. *Protocol of instructions*

Application tim of the protocol	Tips of encouragement and support (from the	Cognitive aspects	Motor aspects	Safety and security

	teacher)			
Entering the pool enclosure and entering the water	-hi! -welcome to the fun -we're waiting to get in the water -all will be well -I'm here for you -please be calm -together we will succeed	-bravo! you're good -you're doing great -I'm glad you're here and part of my swim group -I like how you get involved -let's focus -listen to me carefully and I will help you -trust yourself -you are strong and you will succeed -with patience we succeed		-there is no running in the pool (we only swim here) -things will be put in order -entry into the water shall be made only at the teacher's direction -jumping into the water is allowed only at the teacher's instruction
Back floating	-don't be afraid I'm by your side -water will sustain you -trust me -imagine you're a floating boat -imagine you're a floating starfish -stay relaxed -breathe in/out slowly -please be calm	-bravo! you're good -you're doing great -I'm glad you're here and part of my swim group -I like how you	-keep your body stretched out and hold onto the edge with one hand until you find your balance in the water -hold your body stretched with arms and legs sideways, like a floating star	-the instructor positioned near the subject -the instructor will communicate continuously with the subject -in subjects with severe execution difficulties, the scapulohumeral side (neck and

	-together we will succeed	get involved -let's focus -listen to me carefully and I will help you -trust yourself -you are strong and you will succeed -with patience we succeed	-keep your body stretched out with the arms at the side of the body maintain floating balance in the water for more than 5 sec. -keep your body stretched with the arms at the side of the body, the teacher will communicate with the student and will intervene with a snaking movement with help provided from the scapulohumeral side -look at the ceiling -keep the body in position -ears in the water looking at the ceiling -keep the body relaxed	shoulders) should be used as an aid
Inhaling/exhaling Swimming breathing (Diving)	-stay relaxed -we imagine we're blowing out a candle -don't be afraid I'm by your side -trust me -think of yourself as a diver -exhale hard like you want to make waves -please be calm -together we	-bravo! you're good -you're doing great -I'm glad you're here and part of my swim group -I like how you	-hold your breath for 5 seconds (apnea) -take a deep breath -exhale sharply (blow) -exhale as if you wanted to blow out a candle -exhale as if you wanted to	-if the child swallows water, intervention with calming advice (it's nothing, cough and you will recover) -the instructor will intervene and not allow exhalations longer than 5 seconds, espe-

	will succeed	get involved -let's focus -listen to me carefully and I will help you -trust yourself -you are strong and you will succeed -with patience we succeed	hold a balloon in the air -keep your eyes open when putting them in the water -come back up after each loud exhale	cially in the early phase of learning to breathe, to prevent water ingestion using the following instructions: -stop, enough -pull the face out of the water -expire continuously, explosive -do not stay underwater for too long -take a deep breath -repeat
Chest fkloating	-don't be afraid I'm by your side -water will sustain you -trust yourself -trust me (as a teacher) -imagine you're a floating boat -stay relaxed -in the first phase you remain in apnea (hold the air in your chest) -breathe in/out slowly -please be calm -together we will succeed	-bravo! you're good -you're doing great -I'm glad you're here and part of my swim group -I like how you get involved -let's focus -listen to me carefully and I will help you -trust yourself -you are strong and you will suc-	-keep the body stretched out on the surface of the water, arms and legs sideways, like a floating star on the chest -hold your breath 5 sec -relax on the water	-the instructor positioned near the subject -the instructor will communicate continuously with the subject -in subjects with high execution difficulties, the scapulohumeral side (neck and shoulders) will be used as an aid

		ceed -with patience we succeed		
Jumping in the water	-don't be afraid I'm by your side -water will sustain you -trust me (as a teacher) -please be calm -together we will succeed -we'll jump together -	-bravo! you're good -you're doing great -I'm glad you're here and part of my swim group -I like how you get involved -let's focus -listen to me carefully and I will help you	-feet close together, jumping into the water -stretched body -breath holding -exhalation after jump -exhalation after jumping, movement of legs towards the edge of the pelvis with arms stretched forward	-positioning near the jump site -use of aids -support with both hands on the first jumps -one-handed support on the following jumps -unaided jumping

		-trust yourself -you are strong and you will succeed -with patience we succeed		
Advancing with aid (swimming raft)	-don't be afraid I'm by your side -water will sustain you -trust me -	-bravo! you're good -you're doing great -I'm glad you're here and part of my swim group -I like how you get involved -let's focus -listen to me carefully and I will help you -trust yourself -you are strong and you will succeed -with patience we succeed	-hold the raft with hands outstretched and gripping the holes -chin on the raft -light foot tapping	-keep your arms outstretched so you don't get off balance -chin on the raft -don't push the raft in the water because you'll sink -both arms will remain on the raft

Post-experimental phase

This stage, considered the final stage of the study, involved measuring the indicators of interest, analysing the final data, interpreting the results and drawing conclusions for the study hypotheses.

Chapter VI Research Results and Conclusions

Statistical data on the groups of subjects participating in the study

In order to constitute the two groups of subjects participating in the study, a balance in terms of age was maintained when selecting and placing them in one of the two groups.

Table 3. *Age of participants in the experimental group with AC*

Age of participants in the experimental group with AC					
		Frequency	Percent	Valid percentage	Cumulative percentage
Valid	5 years	25	50.0	50.0	50.0
	6 years	15	30.0	30.0	80.0
	7 years	10	20.0	20.0	100.0
	Total	50	100.0	100.0	

The experimental group, in which the underwater AC device was used as a teaching tool, consisted of 50 children, aged between 5 and 7 years, 50% being 5 years old and the other 30% 6 and 20% 7 years old, as can be seen in the statistical data presented in Table 3.

Table 4. *Age of participants in the witness group*

Age of participants in the witness group					
		Frequency	Percent	Valid percentage	Cumulative percentage
Valid	5 years	26	56.5	56.5	56.5
	6 years	13	28.3	28.3	84.8
	7 years	7	15.2	15.2	100.0
	Total	46	100.0	100.0	

The control group in which the classical method of teaching swimming was used was made up of 46 children, aged between 5 and 7 years, 56% of whom were 5 years old and the other 28% 6 and 15% 7 years old, according to the statistics presented in Table 4.

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Table 5. *Description of the age characteristics of the study participants*

Descriptive statistics for the groups in the study					
	N	**Minimum age**	**Maximum age**	**Average age**	**Standard deviation**

Age of children in the group who had AC	50	5	7	5.70	789
Age of children in the control group	46	5	7	5.59	748

Table 5 statistically describes the age characteristics of the participants in the study, it can be seen that the subjects of the two groups had the same values in terms of age range, and the average age is also very close, the difference between the two being insignificant and without influence on the results. The standard deviation being very close to 1 in both cases demonstrates the consistency of the data.

The general hypothesis on which our experimental approach was structured was the following:

In children aged 5-7 years, the introduction of the underwater communication (AC) device into the teaching/learning of swimming significantly improves the initiation process.

Conclusions based on specific assumptions

Children's focus on technology and their decreasing interest in sports activities were the driving force behind this research. Whether it's phones, video games or tablets, children are quick to learn how to use tools involving modern technology. Thus, we aimed to see if the introduction of a teaching method based on modern technological tools significantly improves the process of initiation in swimming in several aspects.

This interest in technology among the younger generation has made the process of adapting to the Aqua Cam underwater communication system much easier and has even sparked the children's interest and enthusiasm for swimming lessons.

On the basis of the research, an attempt was made to demonstrate the five specific hypotheses deduced from the general hypothesis, thus observing for each hypothesis whether there are differences between the two groups involved in the study, between the group in which the teaching-learning process of swimming initiation took place also through the AC system, and the group considered as a control, where the teaching was done in the classical form.

In order to investigate **hypothesis number 1**, concerning the fact that the introduction of the AC underwater communication device for 5-7 year old children in the teaching-teaching of swimming could lead to the reception and assimilation of correct information in a short time, we processed the data obtained. Based on the results represented both in graphical and descriptive form

we can conclude that in the group where the AC teaching system was involved the teaching-learning process of swimming took place in a smaller number of hours than in the control group. The same result was obtained in the detailed age analysis between the subjects of the two groups. Moreover, we also detailed the results obtained for each motor skill that forms the process of initiation in swimming, and it could be observed that there is a difference between the two groups involved in the study, namely the group in which the teaching was based on the AC system, managed to assimilate in a shorter time each skill taught.

Statistical analysis based on the independent samples t-test again shows that there are semi-statistically significant differences in the assimilation time of the swimming initiation process obtained by the two groups involved in the study, which proves hypothesis number 1 of the research.

Hypothesis number 2, which aims to investigate whether teaching through the AC system leads to a decrease in the pedagogical density of the swimming class and an increase in the motor density for 5-7 year old children, was investigated based on the value of pulse and oxygen saturation indicators and their variation in the children's effort state. Based on the results obtained and the comparative analysis between the two groups of subjects, the hypothesis in question in the study is confirmed because the values of the two indicators in the effort state varied more in the group in which teaching was carried out using the AC system. Specifically, the pulse rate had higher values and lower values were obtained for oxygen saturation, so we can say that there was an increase in motor density while the teaching density of the swimming lesson decreased. We find that following the application of this method the subjects were more actively involved in the lesson, which led to an increase in the level of motor skills through multiple repetitions of the exercises. Also the teacher's effort and wasted energy were significantly reduced, he spoke less and more precisely.

The conclusion of hypothesis 3, in which we investigated whether the introduction of the underwater communication device AC in the teaching-teaching of swimming leads to the optimization of the acquisition of specific swimming motor skills for children aged 5-7 years, is that the teaching through this device has an impact on the optimization of the process of initiation in swimming, more specifically for the acquisition of specific swimming skills that involve keeping the face towards the surface of the water or the head in the water, but also helps overall to improve the teaching and learning of the whole process of initiation in swimming.

This was demonstrated on the basis of the data collected on the level of assimilation and execution of the specific skills of the initiation process, which were processed graphically and statistically, separated by the five skills of the initiation process in swimming.

Analysis of the means and t-tests, applied to the data obtained for each skill, adaptation to the aquatic environment, crawfish-style leg movement, crawfish-style arm movement, back leg movement,

back arm movement, side breathing, found that there were differences in the level of learning and execution of the observed skills between the two groups. For some skills, however, we observed a small difference, considered to be insignificant, such as adaptation to the aquatic environment, movement of legs on the back and movement of arms on the back.

For the other skills, crawfish-style leg movement, crawfish-style arm movement and lateral breathing, the results of the T-tests show that the difference between the two groups of subjects is significant when it comes to the level at which the children were able to perform them, and on the basis of the averages obtained it is shown that the children for whom the AC system was included in the teaching process assimilated better and managed to acquire and execute the skill more efficiently than the children in the group in which teaching took place without the AC system, using the classical method.

In the study, **for Hypothesis 4**, the aim was to demonstrate whether there is an impact on the aquatic behaviour of 5-7 year old children by introducing the AC underwater communication device into the teaching-teaching of swimming. To this end, the anxiety questionnaire was administered to the children through their parents at the beginning of the first swimming class in order to establish the child's typology in terms of anxiety towards the swimming class, and later in the middle of the second class to see any changes.

Based on the analysis of the data obtained, it can be seen that the level of anxiety improved during the swimming lessons among the children in the two groups. The group where the teaching of the initiation process in swimming was based on the AC system and the control group where the teaching took place using the classical methods and tools but with approximately equal percentages.

In this respect the hypothesis is not proven because the reduction of anxiety among children attending the swimming course was not closely related to the teaching method used, and the teaching process through the AC teaching system did not have a significant impact on improving the aquatic behaviour of 5-7 year old children.

In order to investigate **hypothesis number 5**, concerning the fact that the introduction of the teaching method of swimming through the underwater communication device AC leads to the improvement of the teacher-student educational relationship, a questionnaire was administered through the parents, aimed at the children's opinion about the swimming course and the teaching methods used. After analysing the data obtained through this questionnaire and their graphical representation, it can be observed that in the group that benefited from teaching through the AC system there is a greater interest in the swimming class shown by the children. The explanations are clearer and easier for children to understand, and so the teaching-learning process of the specific skills of swimming initiation is more effective. The results obtained are also due to the fact that it was inter-

esting for the children to use and learn swimming skills using AC technology, a method considered very attractive by the subjects.

General conclusions

Based on the conclusions of each specific hypothesis, a conclusion is also drawn for the general hypothesis of our experimental approach. Given that it has been demonstrated that teaching using the Aqua Cam underwater communication device brings significant improvements to the teaching-learning process of the skills that form the initiation process in swimming, such as the time of assimilation of swimming skills, the level of assimilation and execution of specific skills, the improvement of the motor density and the efficiency of the teacher-student educational relations, we can conclude that the general hypothesis is proven, thus the introduction of the Aqua Cam underwater communication device in the teaching-learning process of swimming significantly improves the process of initiation in swimming both from a pedagogical and motor point of view.

I would also add here the benefits observed in this study for the Aqua Cam-based teaching method. Perhaps the most important finding is the children's enthusiasm for working with this device and how they perceive the relationship with the teacher. The children being very curious, easily accepted the method and were more interested and attracted to the swimming course. There were also a few children among the 50 who were initially reluctant to use the AC device in water, but further explanations were given, examples were exemplified out of the water, and thus they were able to overcome their uncertainty and accept the teaching method.

We consider the development of the cognitive part to be a big plus, the children in the experimental group were more present, more receptive, their attention was captured much more easily, they had a more prolonged state of concentration and a much faster and firmer response to external stimuli. On the active focus side, each individual is different, so their approach to learning will also need to be different and so it is necessary to take into account their individual particularities. The application of the content through Aqua Cam made it possible to bring the teacher closer to the student and his or her needs, resulting in more concrete responses from the children.

Following our research, we strongly believe that this method of teaching based on the AC communication device should be made available to as many children as possible, so that they can benefit from an enjoyable introductory swimming experience that will last a lifetime. At the same time, all the tools used to generate our results, the instruction protocol, the progress sheet, the satis-

faction questionnaire and the whole process of initiation in swimming are designed to help teachers who teach swimming lessons and who want to try a method that will make their work easier and moreover to attract children to swimming. This work can be a starting point for young swimming teachers who are at the beginning of their career and want to train modern teaching techniques.

In view of the general development of society that takes place every day, and the fact that technology is increasingly part of human life and is necessary for the increasingly fast pace at which we live, there is a need to develop pedagogical methods in all areas and to find helpful tools to facilitate the teaching-learning process. For teaching swimming, the use of the AC device can be one of the pedagogical methods that facilitate the assimilation of specific swimming skills, and the results of our research show that any study can generate new openings.

The results obtained from this experiment reinforce the idea that there is a great need in research to introduce the technical means available to us in different experiments and at young ages. In the years to come I recommend a more thorough study in this direction and perhaps finding new ways to test the quality of swimming lessons and not only the children's satisfaction with them. As expected, the conduct of experimental research has generated new possibilities to glimpse new perspectives, to set new objectives or hypotheses. The data collection and processing phase gave us the opportunity to discover some of the limitations of our research.

This paper contains 208 pages, 26 tables, 33 charts, 12 appendices (including the anxiety test, instruction protocol, progress sheets, applications to various institutions, parental agreements for the conduct of the experiment) and 5 figures, a bibliographical list comprising 165 titles (Romanian and foreign authors) and a rich list of online references.

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