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Water safety is learned at school: Monitoring the level of Drowning Prevention Knowledge (DPC) of schoolchildren in Rio de Janeiro, Brazil

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ABSTRACT
Educational activities carried out in the school environment with a focus on the prevention of water accidents can help to prevent premature death caused by drowning, a worldwide health problem. The objectives of this study were: to compare the level of preventive knowledge of drowning in elementary school children and adolescents and to monitor behavioral changes in students who participated in the research in the year 2022. The methodology adopted was a longitudinal study carried out in 2022-23 with children and teenagers from Elementary School (5th, 6th, 7th and 8th years) of the public network, from the Fernando Rodrigues da Silveira Application Institute (CAp UERJ) located in the State of Rio de Janeiro, Brazil. The total number of students surveyed in 2022-23 was 281, 57 from the 5th and 6th grade, 112 from the 6th and 7th grade and 112 from the 7th and 8th grade. The students answered a structured questionnaire that contained 20 items on the level of Drowning Prevention Knowledge (DPC), divided into three parts: a) correlating the universal figures used on the plates for prevention to the texts that contained their meanings (7 questions); b) make a connection between the colors of the green, yellow and red flags that are used on the beaches and their meaning in relation to bathing conditions (3 questions) and c): mark true or false in relation to the correct behavior/attitude that should adopt in the aquatic environment in order to avoid accidents and prevent drowning (10 questions). The results showed that 98.5% of the students came to know the meanings of the signs, and in some cases, for example, 100% got the meaning of the number 2 plate right, which refers to the emergency telephone, with a linear increase in the correct answers due to the higher education. When comparing all the students responding in 2022 and 2023, there was a tendency for improvement in the correct correlation regarding the yellow flag, when the prevalence increased from 92% to 93%, and in relation to the green flag from 91% to 95%. In relation to the red flag, the prevalence of correct answers regarding its meaning remained the same, as 93% of the students responded appropriately. In relation to the drain that sucks up the water from the pool, the result showed that the younger ones are the ones who least know about the risks of putting their hand in the drainage system. However, these students were the ones that improved the most after this intervention, with the prevalence of correct answers going from 77.2% to 86%. When analyzing all students in 2022 compared to 2023, there was an

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improvement in the level of Preventive Knowledge of Drowning, going from good preventive knowledge to excellent preventive knowledge. It can be concluded that in all years of schooling the intervention was effective to the point of improvement in the level of preventive knowledge of drowning, which went from good preventive knowledge to excellent preventive knowledge in the period between 2022 and 2023. monitoring through the test of preventive knowledge of drowning at school are important and necessary to reinforce some safety values and concepts, in addition to reformulating false safety criteria in some children and spreading knowledge of the culture of prevention of accidents in aquatic environments, not only in swimming lessons for those who participate in methodologies like swimming + safe, but also family members, teachers and friends who help create a prevention network that can start at school.

Keywords: Drowning, Water safety, Schoolchildren.

1 INTRODUCTION

Drowning is a preventable cause (PEDEN; ISIN, 2022) of premature mortality (PEDEN et al., 2022) that worldwide is estimated to be related to 320,000 cases of annual deaths (ALQAHTANI et al., 2022).

In this context, learning to swim is an important factor to face any difficulty that the child has in the liquid environment (SALOMEZ; VINCENT, 2004), especially the younger ones (MOSEK et al., 2020). There is consensus that childhood drowning can be prevented through education (XIE et al., 2022). Thus, it is necessary to think about water safety beyond what can be taught only in swimming lessons.

According to the World Health Organization (WHO), swimming should be taught as a component of a program that has content focused on safety skills, knowledge and attitudes towards water (WHO, 2017). Ekanayaka et al. (2021) emphasize that, in addition to improving safety attitudes in water, safe behaviors should be promoted around different aquatic environments.

However, swimming is still underutilized when the aspect is the prevention of drowning in children (VASCONCELLOS, 2019). Children receive insufficient education about water safety in swimming lessons and are not achieving essential skills that help prevent drowning (WILLCOX-PIDGEON et al., 2020).

According to REJMAN et al. (2020) learning in swimming pools does not provide opportunities to develop the full range of adaptive skills that may be needed in different open water environments, such as navigating currents and waves, floating dressed or making life-saving decisions. Brayne et al. (2022) state that educational campaigns, for example, the one that advises “Float to Live” created in the United Kingdom, help to prevent drowning events. The “float to live” advice is a key message in the national drowning prevention campaign. It encourages respect for water. The campaign urges

people to follow this potentially life-saving advice if they find themselves in trouble after falling into cold water: Fight your instinct to swim too hard or floundering it could lead to drowning. Instead, relax and FLOAT on your back until you regain control of your breathing.

In the case of drowning prevention, the skills that must be developed are multiple and go beyond the private education of individuals. There are a series of skills that must be mastered before a child has full swimming capacity to the point of avoiding drowning (WILLCOX-PIDGEON ET AL., 2020), such as: knowing how to identify the deep end of the pool (QUAN ET AL., 2015); knowing how to get in and out of the water safely (STALLMAN ET AL., 2008); being able to experience public water areas alone (MOSEK ET AL., 2020) which are often beaches or pools that children are used to visiting routinely (BARCALA-FURELOS ET AL., 2019); In addition, it is important to know how to deal with difficult circumstances in aquatic situations (DAVEY ET AL., 2019).

Not everyone has access to swimming, but “everyone” has access to school and in it drowning prevention can be introduced to spread attitudes and values that save lives. Thus, the school is possibly the most appropriate place to use teaching by competence, attributing to the educational process a capacity for practical use of what is taught (KOON ET AL., 2023). In addition, in the school environment there may be an articulation between theory and practice, demanding that the taught content acquires a functionality for the student (ZABALA, 2010; PERRENOUD, 2000; DARIDO & SOUZA JÚNIOR, 2007).

A competency brings together knowledge, skills and attitudes for its perfect execution (PERRENOUD, 2014; BRASIL, 1998; ZABALA, 2010). In motor tasks, it is understood that it is not enough to perform motor skills, but that this performance occurs based on defined concepts and with the appropriate attitudes for its implementation (VASCONCELLOS; MACEDO, 2021).

Hence, there may be a significant need for increased water safety education for children (DAVEY ET AL., 2019). This education may come after a diagnostic assessment (VASCONCELLOS ET AL., 2019) to help understand the limitations of students that can cause childhood drowning accidents, followed by education of parents and teachers (AL-QURASHI ET AL., 2019) and towards an adequate safety regulation (VASCONCELLOS; MASSAUD, 2022).

Classes on water safety are based on skills development. The concepts, skills and attitudes necessary for aquatic skills are aligned with conceptual, procedural and attitudinal pedagogical content in drowning prevention. For Vasconcellos and Macedo (2021) drowning prevention should start out of the water and be maintained in the water through pedagogical content: conceptual, procedural and attitudinal. In this sense, it is up to the teacher to select the educational content they need to teach so

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that students do not drown and have a preventive awareness throughout their lives (VASCONCELLOS; MACEDO, 2021). The contents are presented as teaching and learning objects, and point to the need for the student to experience them in a concrete way in the school routine (BRASIL, 1998).

For Vasconcellos et al. (2022) it is necessary to define the concept to be learned at school to prevent drowning, such as what to do in a given situation. Then, after the definition of these concepts, objectives can be determined, contents and methodologies chosen to consolidate it as a competence to be learned by the student.

The objectives of this study were to follow the behavioral and attitudinal changes in children and adolescents in elementary school at CAP UERJ and to compare their levels of preventive knowledge about drowning.

2 MATERIALS AND METHODS

This is a longitudinal study carried out in 2022 and 2023 with children and adolescents studying Elementary School (5th, 6th, 7th and 8th grades) at the Fernando Rodrigues da Silveira Application Institute (Cap-UERJ). The institution is part of the public education network in the state of Rio de Janeiro, Brazil. In the first semester of 2022, when the study began, 1,140 students participated in the Cap-UERJ classes, distributed between the 1st year of Elementary School and the 3rd year of High School, totaling 48 classes.

After surveying the number of students per class in each school year, a contact was made with the Physical Education teachers at Cap-UERJ who teach classes for the groups to be researched, to whom, once clarified about the importance, the objectives and methodology of the study, authorized its realization.

In the year 2022, 12 classes were selected for the study, totaling 300 students, distributed among four 5th grade classes with 15 students each, four 6th grade classes and four 7th grade classes, all with 30 students. The classes were selected because they contain, according to Xie et al. (2022), the target audience with the highest risk of drowning due to lower awareness of this risk. In addition, in this age group, students can read, interpret figures, symbols and can be followed longitudinally for enough time to identify changes in relation to the topic researched during their school trajectories.

The total number of students surveyed in 2022 was 281, of which 57 were 5th grade students, 112 6th grade students and 112 7th grade students. At the beginning of the 2023 school year, students were approved for the following school year, therefore, those who were in the 5th year became the 6th

year, those in the 6th year became the 7th, as well as those in the 7th became attend the 8th year of elementary school.

All children and adolescents aged 9 to 15 who were attending the 5th, 6th and 7th years in 2022 and the respective 6th, 7th and 8th years in 2023 were considered eligible. completing the questionnaire. In 2022, 8 students were absent on the days of the survey, 4 students changed schools after the start of the survey, and 7 had some type of mental disability. In 2023, the same students were reassessed, with no losses.

In this way, the total number of students surveyed in the longitudinal study 2022 and 2023 were the same 281 who started the survey.

The research instrument answered by the students during Physical Education classes was a structured questionnaire developed by Vasconcellos et al. (2022), divided into three parts containing 20 items on the level of Preventive Drowning Knowledge. In the first part, the students correlated the universal figures used on the signs to prevent drowning to the texts that mean those images (7 questions). In the second part, they had to make the connection between the colors of the green, yellow and red flags that are used on the beaches and their meaning in relation to bathing conditions (3 questions). In the last part, the student marked true or false in statements related to the correct behavior/attitude to be adopted in the aquatic environment in order to avoid accidents and prevent drowning (10 questions).

Upon receiving the completed questionnaire, the researcher revised it for completeness. Data analysis included calculating averages for continuous variables and percentages for categorical variables. The level of preventive knowledge was stratified into five ranges, namely, those who scored 0-2 points as having very weak preventive knowledge; 3-4 points as weak; 5-6 points as a regular; 7-8 points as good and 9-10 points as having excellent preventive knowledge. The result of checking the level of knowledge about drowning prevention was the sum of each correct answer, worth 0.5 points each, obtained in the 20 items surveyed in the three parts of the questionnaire. The more correct answers the student had, the better their level of knowledge about drowning prevention (VASCONCELLOS et al., 2022).

As a form of intervention, in 2022, up to two weeks after the diagnostic assessment on the level of Preventive Knowledge of Drowning, the researchers returned to the school with the individual results of the questionnaire. The students were seated on the court (figure 1) and received their questionnaire corrected with a score from 0 to 10. The researchers read the questionnaire, item by item,

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to provide the correct answer for the 20 items and also explain the importance to know the meaning of each part of the test in relation to prevention.

Figure 1: intervention carried out at CAP UERJ

Each class received a single questionnaire return intervention that lasted an average of 40 minutes. During this time the researchers also allowed the students to ask about water accident prevention.

In the intervention on water safety, the teacher worked on conceptual pedagogical content showing the meaning of the word linked to prevention (in green) and its antagonism (in red) with, as shown in table-1. Other examples were addressed, such as the meaning of the colors of the flags that are posted on the beaches to indicate the current degree of danger of the sea and the student learning to discern the risk of drowning. Of course, the green flag means a place suitable for bathing; yellow, risk of drowning; red, high risk of drowning and; the black one, unprotected area for lifeguards.

For Vasconcellos et al. (2022) there is a need to teach concepts to students, such as ditch or return current, with a simple explanation that is appropriate for the age group, and with illustration, above all, explaining that ditch means that in that place there is a movement of water towards the open sea and that this is a place where the swimmer should not stay, as there is a danger of being dragged to the bottom by the strong rip current that is formed.

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Table 1: of conceptual contents of water safety worked at school

Word	Significance in practical application in pool or beach	Examples of what to see
released	is free from restrictions on free bathing; there is no imminent danger.	green flag
prohibited	it is not allowed to enter a certain area or do anything;	no diving sign
safe	it is free of danger; guaranteed; sheltered; protected for bathing, from the current, from the waves, by lifeguards;	lifeguard gift card
dangerous	there is a risk to life, the place or situation is a threat to the life or integrity of the person and can cause harm;	Red flag
shallow	the depth of the water is below the height of the navel; it is not deep; being suitable for bathing but unsuitable for diving; prohibited for diving;	no diving sign
deep	it is too deep to be able to put your feet on the ground and unsuitable for those who cannot swim or float without equipment; need to know how to move without assistance;	background site sign
present	there are lifeguards on site who can assist or guide with supervision and are present in the life of bathers;	lifeguard gift card
absent	the lifeguard is away from the place or not present at the place;	missing lifeguard plate
clean	it is free of dirt, clear, visible to see the depth or any danger in the water;	own bath plate
dirty	is not or is not clean; is covered with dirt in the water preventing the bottom from being visible and can cause skin diseases;	bath plate

Then the teacher worked on the attitudinal content, with the aim of the student learning to "know how to respect and live with" norms, postures, values and attitudes, such as knowing how to respect the rules for using the aquatic environment and the teacher, adopting habits to prevent drowning and/or accidents and, finally, internalize something that will last a lifetime. Among the factors associated with drowning are: problems arising from a lack of awareness and understanding of the dangers of water and an increase in aquatic risk behaviors (EKANAYAKA et al., 2021).

|After the pedagogical intervention with the conceptual and attitudinal contents, the students viewed a banner and received an explanatory folder on drowning prevention, material donated by the Brazilian Society of Water Rescue (SOBRASA).

Each class had two students chosen, one boy (sheriff Kim) and one girl (sheriff Tatá) who received a badge (figure-2) to be the sheriffs of prevention in their class. They were elected by the class after voting on who could be the "guardians" who would help prevent accidents at school. For KOON ET AL., 2023 peers are a primary motivator in childhood and can contribute to prevention.

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Figura 2: Sheriffs Kim and Tatá in the form of badges designed by SOBRASA

Na intervenção pedagógica, ao abordar o conteúdo conceitual em relação ao que se deve saber para executar uma ação procedimental, o aluno aprendeu sobre como "saber fazer, executar", como por exemplo, os procedimentos adequados de entrar na água em local raso, de como nadar em uma situação de "cair na corrente de retorno", das diferenças entre nadar na piscina e no mar, como nadar de colete salva vidas, etc.

Para Moreland et al. (2022) intervenções sobre segurança aquática podem abordar, por exemplo, o uso consistente de coletes salva-vidas em barcos e entre nadadores que não tem muita habilidade aquática em águas naturais, pois isso, tem o potencial de reduzir as mortes por afogamento.

O quadro-2 apresenta o resumo com exemplos dos três conteúdos (conceitual, atitudinal e procedimental) que podem ser trabalhados, tanto por professores nas escolas, como por professores de natação, pedagogos, pais e voluntários da prevenção.

Table 2. of the pedagogical contents of Water Safety

Contents	What to learn?	What are the examples?	What to work on in Swimming + Safe?
Conceptual	**Know about:** facts, concepts, symbols, images and gestures	Knowing what can and cannot be done; understand the risks and know how to conceptualize and identify: what is dangerous; what is safe; what is shallow/deep and what care is taken in each of these spaces; what is the meaning of the figure or text contained in a certain plate; which is the best place to bathe; where is slippery and what are the risks; when to call to call emergency services; know the differences between preventing and helping, how to identify a lifeguard present or absent.	with the meaning of the colors of the flags that are posted on the beaches (green, yellow and red) to indicate the current degree of danger of the sea and the student learns to discern the risk of drowning. Concepts and opposite meanings of some words, expressions or phrases, such as: prohibited/allowed, danger/safe, deep/shallow, dirty/clean, lifeguard absent/present, prevent/help, calm/heavy sea, ditch, visible, aspiration drain, bottom drain and plate;

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Attitudinal	**Know how to have:** respect, responsibility, discipline, interact with norms, postures, values and attitudes	Knowing how to respect the rules for using the aquatic environment and the teacher; adopt habits to prevent drowning and/or accidents; wait for the teacher's call to get in and out of the pool, slowly or using the stairs and without somersaulting "somersault"; play without pushing or sinking other students into the water; stay away from the drain (hole) that draws water from the pool and the bottom drain; avoiding accidents in the pool and valuing prevention actions in the pool and, finally, internalizing something that will last a lifetime.	with the norms, values and attitudes for using the pool with a focus on drowning prevention. Using the senses of hearing for the student to hear about how he should behave to avoid accidents, of vision, to learn to always be in the teacher's visual field, of touch for the student to feel that he needs to be in contact with the teacher while he still can't swim! An arm's length away from the palate to learn not to eat and then swim/dive, as well as guide parents not to drink alcohol if they are thinking about going into the water or taking care of someone and finally, in terms of smell, to be aware of the strong smell of chemicals and something burning.
Procedural	**Know how:** to do, proceed, to execute, accomplish, to float, move, swim	Knowing how to act appropriately to any situation in the aquatic environment; quickly analyze the situation and proceed accordingly; actions must be thought out and executed wisely; know how to perform the proper procedures in each item of the aquacity test, in order to improve their aquatic skills. The aquacity test consists of 10 items that assess the degree of adaptation of the student to the liquid environment, related to mastery of breathing, immersion, eye-hand coordination, fluctuation, propulsion of arms, propulsion of legs, submerged displacement, changes between decubitus dorsal and ventral, squatting and jumping (kangaroo), vertical support (water polo leg), request for help with raising arms, searching for a nearby edge and clapping.	with the diagnosis of aquacity on the first day of class, it allows the swimming teacher to work with the objectives, in a specific way, to improve each component of the basic aquatic skills that were not successful in the test (procedural content). The aquacity test presents procedural content guidelines that underlie the skills to be mastered by the learner. In addition, the student reflects on each action taken in class in order to make it aware and the teacher shows the applicability in different real contexts.

3 RESULTS AND DISCUSSION

Regarding knowing the meaning of the figures on the prevention signs, the result of this study showed that 98.5% of the students came to know the meanings of the signs, for example 100% got the meaning of the number 2 sign right, which refers to the emergency telephone with a linear increase in the number of correct answers as a function of higher education (Chart 3).

Incidentally, the sign is defined as an object shaped like a sign, with an illustration or inscription indicating something like: danger, shallow place, lifeguard present, etc.

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Table 3: Prevalence of correct answers about the meanings of the drowning prevention signs

	Prevalence of correct answers by years of schooling			
	5º-6º year	**6º-7º year**	**7º-8º year**	**All**
Concepts of the Plates	2022-2023	2022-2023	2022-2023	2022-2023
Plate 1 missing lifeguard	84,2%; 93,0%	92,0%; 98,2%	99,1%; 100%	91,7%; 97%
Plate 2 emergency telephone	98,2%; 100%	99,1%; 100%	100%; 100%	99,1%; 100%
Plate 3 forbidden to push	100%; 98,2%	99,1%; 100%	98,2%; 100%	99,1%; 99,4%
Plate 4 prohibited diving	96,5%; 96,5%	98,2%; 99,1%	97,3%; 100%	97,3%; 98,5%
Plate 5 no swimming	96,5%; 96,5%	99,1%; 99,1%	97,3%; 100%	97,6%; 98,5%
Plate 6 background location	96,5%; 98,2%	98,2%; 100%	98,2%; 100%	97,6%; 99,4%
Plate 7 lifeguard present	87,7%; 93,0%	92,9%; 97,3%	97,3%; 100%	92,6%; 96,7%

A symbol, whatever it may be, is always that which, by convention or by principle of formal or other analogy, replaces or suggests something. If the current symbol used on a sign is no longer able to represent its meaning in relation to the similarity that exists, it may be necessary to revitalize the symbols that are being used to prevent drowning and who knows how to modernize the symbols in order to universalize them according to the vocabulary. that this child audience knows (VASCONCELLOS et al., 2022).

The “universal” symbol used to represent the telephone managed to be universally expanded, even though it is for younger people a symbol of a model of device that they may never have experienced, because in the illustration of the questionnaire a figure of a fixed device was used and not from a cell phone. Many households no longer have fixed telephone sets and when they do, the device differs from the one shown on the sign used in the study. An example of sign revitalization was made by the National Traffic Council (Contran), which changed the image of the traffic sign about exclusive parking spaces for the elderly. Now, the standing person drawing no longer has a cane to identify. Another change is that the person on the sign is no longer curved with a weakened person stigma.

Regarding plate 1 (absent lifeguard), there was a trend towards improvement in the correct meanings in all years of schooling. The missing word, which appears on plate 1, raised doubts when filling out the diagnostic questionnaire in 2022 and the meaning had to be explained to some students who had doubts about the definition of the word, which may have reflected in the result of the initial research, because some did not know about the image, did not associate the chair with the lifeguard, or confused it with the figure of the lifeguard present (plate 7) that was positioned outside the

observation chair and for this reason some students interpreted that the plate indicated that the lifeguard was not present, that is, the lifeguard was absent (table 3).

It was possible to verify that the lower the schooling/age, the greater the difficulty in getting the lifeguard signs right, whether absent or present. In addition, plate 7 (lifeguard present) showed an improvement trend in 2023 in all years of schooling. Namely, from the 5th-6th year it went from 87.7% to 93%, from the 6th-7th year it went from 92.9% to 97.3% and with excellent improvement from the 7th-8th year from 97.3% to 100 %. Knowing how to recognize this plaque is also important because, according to Moreland et al. (2022) lifeguard supervision around children in or near water is promising to prevent drowning. According to Vasconcellos et al. (2022) the concept of lifeguard has changed in recent years by removing the word "saves", which had connotations of a heroic act and the rescue is highly valued, and including the word "guard", which conceptually stars in the figure of protection, and it brings in the person who has the responsibility of guarding, protecting, caring for and anticipating risk situations. It was in this connotation of guard that the intervention with sheriffs mentioned in the methodology was carried out.

Even if there is a lifeguard, solutions are needed to help this professional identify children who are drowning or involved in activities that increase the risk of drowning (JOHNSON; LAWON, 2022). Undoubtedly, the presence of a lifeguard is a protective factor in drowning events (BRAYNE et al., 2022).

Regarding sign 3 (no pushing), when comparing 5th year students after the intervention and arrival in 6th year, a tendency of decline in correct answers was observed. Despite the prevalence of correct answers for this sign being still high (above 98%), it was noticed that some students, despite mistaking the real meaning of sign 3, were correct that it was a sign indicating prohibited, but confused it with the sign prohibiting diving or as forbidden to swim.

Regarding the regulatory signs, with a diagonal line inside the circle ( ), as was the case with signs 3, 4 and 5 and indicate that pushing, diving and swimming behaviors were prohibited, respectively, they had improvements and each one reached 100% of correct answers with the older class (8th grade) in 2023. The symbol chosen to represent the prohibited sign seems to have been well disseminated in the intervention in these years of schooling.

When analyzing the prevalences separated by years of schooling, it was noted that the 6th grade students started to have less assertiveness in the question of respect for the rules, of what they can or cannot do, as in sign 3 that mentions "prohibited pushing", which it is a conceptual issue in relation to what one should know to perform an attitudinal action, while the 7th and 8th grades improved in 2023,

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starting to report doing less risky, wrong or dangerous activities, perhaps due to the increase in maturity linked to older age compared to 6th year. The prevalence of prohibited pushing in the 6th year is noteworthy, as this change may be a behavioral indicator of problems in interpersonal relationships, as these students are ignoring the fact that this behavior presents a risk to someone else. On this topic, KOON ET AL., 2023 mention that in addition to awareness of prevention, there should be more programs to motivate behavior and promote safe decision-making.

In fact, in relation to the diagnostic evaluation carried out in the previous year, the 6th year maintained the same result both in plate 4 (no diving) and in plate 5 (no swimming).

Plate 6 (background location) there was an improvement trend in all years of schooling. The great improvement in the 7th and 8th years (from 98.2% to 100%) is noteworthy, to the point that all students in these years started to correctly understand the meaning of this sign 6. The deep place sign was also taught in the intervention and according to Vasconcellos et al. (2022) by receiving conceptual content in class, students can learn to "know about" concepts, symbols, and images, such as what is shallow/deep and what care should be taken in each of these spaces.

In all seven plaques, the results showed that there was a tendency for a linear increase in the prevalence of correct answers as the school year increased. The upward trend shown in this study in all years of schooling surveyed seems to indicate that an intervention carried out had a positive effect on the investigated group. Although the causes of drowning are numerous and complex, prevention can be achieved through a combination of simple and feasible actions (PEDEN et al., 2022).

The result of this study carried out with students who responded to the conceptual and attitudinal pedagogical content test, when separated by years of schooling, the results showed that the 6th grade was the group that most tended to improve in 2023 in the correct answers in relation to the three flag colors as shown in graph 1. The biggest improvements happened from 2022 to 2023 in the answers about the green and yellow flags.

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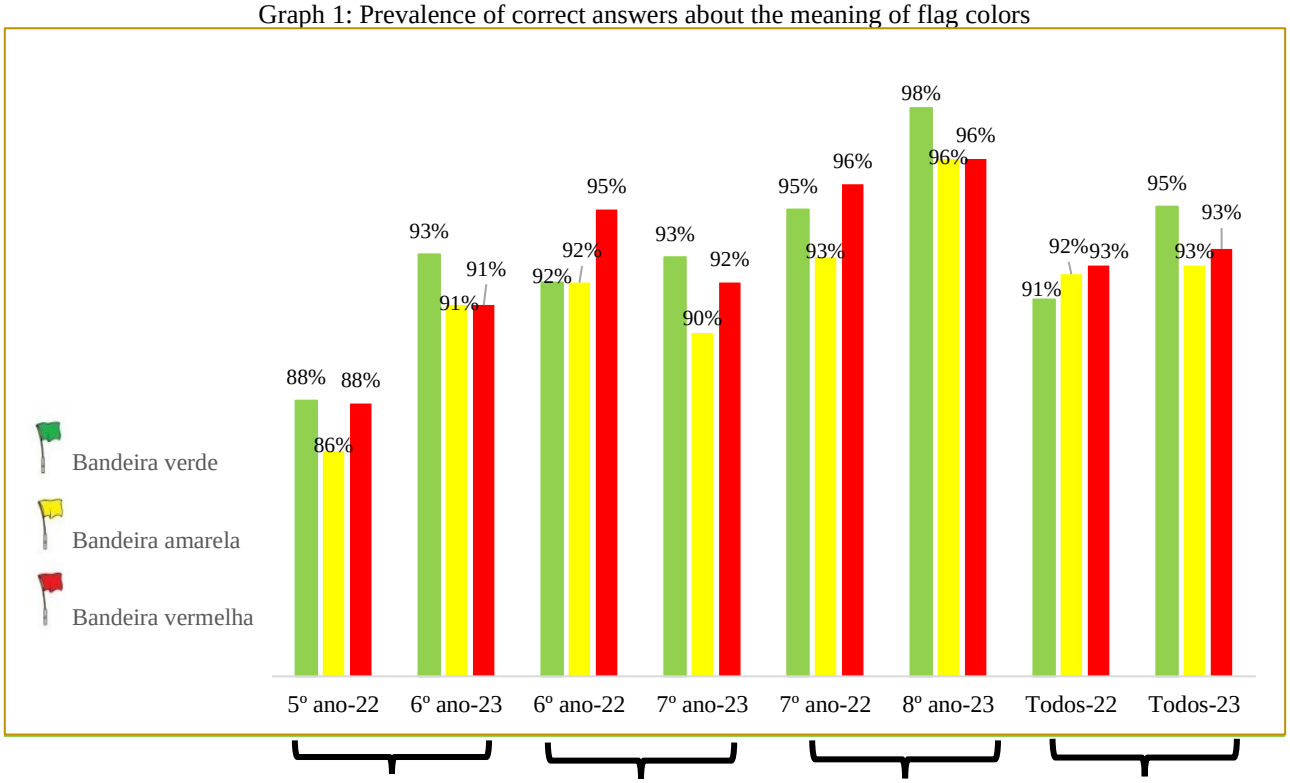
Graph 1: Prevalence of correct answers about the meaning of flag colors



In fact, it is important to teach the real meaning of the flags, for example the yellow flag (risk of drowning). Yellow symbolically indicates “caution”, in addition, Woods et al. (2022) mention that some people mistakenly interpret the yellow flag as private swimming areas. In addition, the red color indicates “stop immediately” and in this context can be used to prevent movement/use of the aquatic environment (VASCONCELLOS et al., 2022).

In the group of older students (8th grade), consequently with higher education, they were the ones with the highest prevalence of correct answers, obtaining values very close to the total number of correct answers on the green flag (98%).

It was noted that as age/education increased, preventive knowledge also grew in relation to the meaning of the flags. This was demonstrated in the linear growth trend according to the year of schooling. Thus, it is important to invest in preventive information with younger people (VASCONCELLOS et al., 2022).

When comparing all 2022-23 students together, the results showed an improvement trend in the correct correlation regarding the yellow flag, when the prevalence went from 92% to 93%, and in relation to the green flag from 91% to 95%. In relation to the red flag, the prevalence of correct answers regarding its meaning remained the same, as 93% of the students responded appropriately, as shown in (Figure 3).

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There was a tendency of worsening in the students of the 7th grade class, in the flags: red with a decrease of 95% of correct answers to 92% and of the yellow flag from 92% to 90%. There was a tendency for improvement in this group only in the green color when going from 92% to 93% of correct answers.

In a general analysis of this graph in Figure 3, although the index of correctness of the meanings of the flags with their color indicator is high (93%), the red flag, which indicates a high degree of risk of death, does not present, in any of the years , 100% hit. Which indicates the need to continue the intervention to spread knowledge about its meaning. For KOON ET AL., 2023 there should be education efforts so that young people have safe behavior and avoid dangers and risks.

Continuing to teach about the meaning of the red flag is important, as studies have shown that people avoid some places to swim or dive because they associate the red flag with the meaning of dangerous (WOODS et al., 2022).

Teaching the symbols that can help with prevention are important in younger schooling, as children learn to interpret the symbols even before learning to read (Vasconcellos et al., 2022). According to the World Health Organization, in addition to teaching children basic water safety skills, the teacher also needs to teach about the inherent risks, such as water depth, visibility, current, presence of sharp objects, dangerous animals and/or microbes (WHO, 2022), as there is a lack of knowledge about how to avoid the aquatic incident (DE OLIVEIRA et al., 2021), as even a bucket of water can cause drowning or death of babies and therefore they must always be empty when there are children close by (SIDDIQUI; SINGH, 2022)

This conceptual content can help prevent drowning by working on student awareness (VASCONCELLOS ET AL., 2019) so that they are able to apply water skills if they are in a dangerous situation (GUPTA ET AL., 2019), have control emotional to reason about the best option to follow, know the sign warnings, be careful with drains (GUPTA ET AL., 2019) do not have high-risk behaviors in the aquatic environment (LIN ET AL., 2019) and know how to identify if you are in good health conditions to swim (ISIN; PEDEN 2022).

Regarding chart-2 which dealt with the correct behaviors in the swimming class, the results showed that more than 90% of the students answered that they should play without pushing the other students on the edge or into the water (question 1). The risk of drowning a child who is pushed into the pool is why this behavior is seen as inappropriate in the aquatic environment during swimming lessons. Furthermore, children who frequent aquatic environments more frequently may engage in risky behaviors while in the water and are more likely to drown (XIE et al., 2022).

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There was an improvement in relation to question 1 over the years of schooling, except in the youngest where it worsened, falling from 94.7% to 91.2% in 2023 the prevalence of correct answers regarding the correct behavior of not pushing other students into water to avoid accidents and or drowning.

One cannot discard the hypothesis that it worsens due to the possibility of having a culturally acquired behavioral pattern, where some conducts are presented according to the social and environmental reality of each interviewee. For example: children who live near the beach or have easy access to the pool consider some prohibition rules better, as they are familiar with the environment. On the other hand, non-acclimated children are unaware of the signs, warnings of possible danger and are afraid to ask about the rules for using the place (VASCONCELLOS et al., 2022).

Regarding the drain (hole) that draws the water from the pool (question 2), the result showed that the younger ones are the ones who least know about the risks of putting their hand in the drainage system. However, behavior improved the most after the intervention, from 77.2% to 86% the prevalence of correct answers. In fact, the children were unaware of the dangers of putting their hand or any part of their body into the suction drain, some of them did not even know that there was a drain where the water was aspirated in the pool.

Namely, the suction drain is a circular opening in the pool where the suction hose connects to the plumbing. If you have turned on the suction, it can suck the part of the body that touches it, which can cause serious injury or drowning (VASCONCELLOS et al., 2022).

Vasconcellos et al. (2022) identified that students were unaware of the real danger of being sucked into this drain and this causing drowning. This reinforces the importance of investing in preventive information for this younger audience in order to contribute to prevention. Focusing on prevention strategies in this item can help to reduce accidents with children who are sucked by the vacuum cleaner.

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Table 4: Prevalence of correct attitudes related to swimming lessons

Correct behaviors in swimming lessons	Prevalence of correct answers per year			
I must...	5th-6th year 2022-2023	6th-7th year 2022-2023	7th-8th year 2022-2023	All 2022-2023
1. Play pushing other students into the water?	94,7%; 91,2%	89,9%; 92%	92,9%; 95,5%	90,5%; 92,9%
2. put your hand in the drain (hole) that draws water from the pool?	77,2%; 86,0%	89,3%; 96,4%	96,4%; 97,3%	87,6%; 93,2%
3. wait for the teacher's call to enter the pool?	100%; 100%	99,1%; 98,2%	99,1%; 100%	99,4%; 99,4%
4. ask or tell the teacher when leaving the pool?	91,2%; 78,9%	95,5%; 94,6%	88,4%; 98,2%	91,7%; 90,5%
5. avoid accidents in the pool and value prevention actions?	100%; 96,5%	97,3%; 98,2%	99,1%; 100%	98,8%; 98,2%
6. entering the pool with a somersault jump "somersault"?	94,7%; 96,5%	98,2%; 99,1%	99,1%; 100%	97,3%; 98,2%
7. play near the bottom drain in the pool?	98,2%; 96,5%	98,2%; 100%	97,3%; 100%	97,9%; 98,8%
8. play races in the wet area around the pool?	98,2%; 94,7%	97,3%; 97,3%	97,3%; 100%	97,6%; 97,3%
9. trying to swim across the river because I take swimming lessons?	96,5%; 96,5%	100%; 100%	99,1%; 100%	98,5%; 98,8%
10. enter the rough sea because I take swimming lessons?	100%; 96,5%	99,1%; 98,2%	98,2%; 100%	99,1%; 98,2%

Source: primary research data

It is possible that the intervention carried out in the previous year in order to clarify the dangers that this aspiration site offers may have alerted the children to a change in behavior in this aquatic environment, in a way that contributed to a better understanding and establishment of the correct attitude. against this suction system.

The 6th year had worse awareness of avoiding accidents (question 5). It seems that the concept of prevention is still not very clear to this group, as all of them answered correctly in the previous year.

The concept of prevention is directly linked to preventing something bad from happening, avoiding harm, harm to locals, for example, a slippery place sign, it is forbidden to play around the pool. Conversely, the concept of unprepared is unprepared, who did not take precautions to avoid accidents. For Peden et al. (2022) there must be standardization in communication so that messages can portray safe behavior.

Regarding questions 3 and 4, students seem to feel more autonomous and that they do not need to be told to leave the pool, apparently this attitude seems to be an attempt to exercise their autonomy, ignoring the risks of this behavior. The 6th grade was the group that least mentioned that they need to ask for permission to get out of the water. The 6th and 7th got worse in question 4. In a qualitative analysis done after answering the questionnaire, the students mentioned that they don't consider it necessary to tell the teacher that they intend to leave the pool.

In the intervention, it was explained about the constant control of all students. That the swimming pool is like a classroom where the student does not leave without the teacher's consent.

Leaving without warning can cause the student to drown in another part of the pool or even in another pool that is not being used in class.

Perhaps this result is due to the fact that they are children and adolescents, since in childhood they begin to have more autonomy and many begin to visit aquatic environments unaccompanied, so it is necessary to educate young people to use these spaces correctly and safely. At this stage of life, identity formation occurs and they absorb many values, habits and ideas from the world around them to shape their personality. KOON ET AL., 2023 highlight the need for carefully designed education programs that consider and address these changes at this stage of life.

Attention should be paid, as there are cases of children and/or adolescents who feel the need to transgress, challenge the rules or disqualify their parents.

Regarding entering the pool by diving in a dangerous and inappropriate way (question 4), the study found that the older they got, the more they became aware of the danger caused by head diving. In the intervention, it was explained to the students how this type of diving can cause a cervical injury and consequently can lead to severe motor disability such as quadriplegia depending on the level of the injury. Diving in shallow water can cause irreversible damage. In fact, in all groups there were improvements in the prevalence from 2022-23 and the 8th grade stands out, schooling in which everyone answered correctly.

For Vasconcellos (2022b) it is important not to dive in unknown, shallow, murky waters, places without lighting, not participating in games when diving and looking for warning signs about the depth of the water. Preventive and educational measures, in particular, are important in preventing new cases of neck injuries with severe and permanent motor disability caused by diving accidents.

Attention is drawn to the improvement in the prevalence of correct answers in the 7th and 8th grades about not playing near the bottom drain. Namely, the bottom drain, also called the bottom drain, is one of the devices responsible for sucking the pool water through the pump and if a person gets close, they can be sucked to the point that the body gets stuck in the bottom of the pool and even causes the death by drowning (VASCONCELLOS et al., 2022).

It is possible that the cases exemplified in the correction of the questionnaire, with great repercussions in the media, about children who were trapped in the bottom drain of the pool, may have helped to spread the information so that children do not play near the bottom drain. During the answers, the students cited cases seen on social media of children who were sucked into the back drain (VASCONCELLOS et al., 2022). In swimming pools, the malfunction of the pool water drainage system can result in serious injuries or even death, and children are mainly affected by these accidents.

To prevent such accidents, safety practices related to the water circulation system must be developed in swimming pools and similar areas (ATILGAN et al., 2021).

The results showed that there was a decline in the prevalence of classes with less education, in relation to the correct awareness of students that they should not run around the pool (question 8). This may indicate a devaluation of preventive measures, thus disregarding the risks of these practices. In fact, there is a risk of falling in the area around the pool as it is constantly wet/slippery and is not recommended for running. Falls in or around the pool can result in dire health consequences such as serious injury, human disability or even death. Therefore, children should be discouraged by lifeguards and family members from risky behavior in the pool due to the danger posed to the child (JOHNSON; LAWSON, 2022).

In relation to behaviors related to safer swimming lessons (VASCONCELLOS, 2020), the result of the research showed that when all students were analyzed, more than 98% of students answered, for example, that one should not swim across the river and not even going into the rough sea just because they have swimming lessons. This demonstrates that the student is able to discern and have an attitude of humility to recognize that, even knowing how to swim in the pool, he does not have the specific ability to swim across a river or enter rough seas, etc. But this does not guarantee that when he is faced with this situation he will act this way. Attention is drawn to the worsening prevalence regarding behavior in the 6th and 7th grades, which declined from 100% to 96.5%. This finding may be due to the proximity of the sea in the daily life of most students, making the environment hostile, less dangerous at first sight, making them ignore danger signs.

In a general analysis, the 6th year presented the worst result of correct answers for the ten questions when compared to the 7th and 8th. A possible justification for the drop in prevalence could be inattention when performing the test, perhaps when reading without attention, the student may have marked the wrong question. However, the lack of attention of this group may indicate dangerous behavior in situations of lack of safety and possible drowning. The 8th year presented the best result of correct answers for all ten questions, being better in all compared to the other years of schooling. This was already an expected result, as shown in another part of the test. Indeed, the older they are, the greater their ability to interpret texts and answer questionnaires, the more practical experiences, the more teaching and, consequently, the more knowledge they have about safe conduct.

In all years of schooling, the intervention seems to have had an effect and there was a trend towards an improvement in the level of knowledge about drowning prevention.

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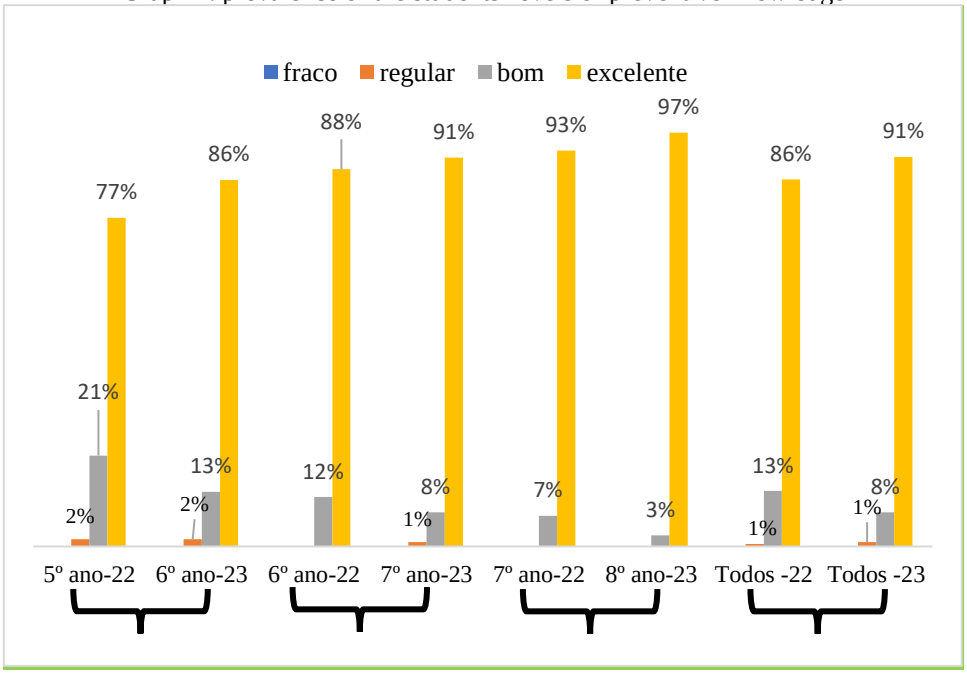
When analyzing all students in 2022 compared to 2023, there was an improvement in the level of Preventive Knowledge of Drowning, going from good preventive knowledge to excellent preventive knowledge (graph 2).

Graph 2: prevalence of the students' levels of preventive knowledge



As schooling increased in parallel, the level of preventive knowledge grew. The fact that a single intervention improves the level of preventive knowledge in schoolchildren demonstrates that prevention can be a good resource to invest in to avoid future drownings. Small actions, when well directed at school, seem to have an impact on improving the level of preventive knowledge. It is necessary to adopt more effective and efficient strategies to prevent drowning in places with few financial resources (MUGEERE et al., 2022).

This work is in line with the drowning prevention proposal made by the United Nations (UN) General Assembly, which suggested that effective and low-cost interventions be carried out worldwide (SCARR et al., 2022). In fact, Leavy et al. (2023) mention that effective interventions contribute to efforts being an essential first step to address the global challenge of drowning prevention.

If almost all children were able to identify what the sign means, as well as the colors of the flags, and even so if they drown one day, it is possible that the problem is related to the attitude towards risk. It is likely that even if the child identifies on the sign that the lifeguard is absent in the supervision of the pool or beach, that the place is deep, it is forbidden to swim for him, even so, he chooses to enter

the water. Analogously, many children know that they must wear a seat belt or that they must cross at crosswalks, but they choose not to cross and/or wear a belt, that is, the knowledge is not put into practice in the face of the real situation. to prevent the accident.

It is necessary to teach, in addition to the correct identification of signs and flags, the correct attitudes to be put into practice at a given moment in life, in face of these scenarios (swimming pools, beaches, rivers, dams and lakes). Having attitudes that value prevention and not recklessness/irresponsibility are virtues for enjoying the aquatic environment safely.

One of the operational difficulties of the study was dealing with some students who showed resistance in answering the same questionnaire again, but given the explanation given by the researcher regarding the objective and importance of reassessing their knowledge, they better understood its purpose. And when they realized that, regardless of the grade received, their wisdom and mastery of the subject improved compared to the previous year, they felt a sense of pride.

4 CONCLUSIONS

There were improvements in the level of drowning prevention knowledge in all years of schooling investigated with a linear trend of better performance as the student's schooling year increased. The school seems to be a propitious and effective place to address the topic of drowning prevention. Even without a swimming pool or practical swimming lessons, this drowning prevention work can be influenced and carried out in schools, even more so by reaching the number of children affected. It is suggested that it be incorporated as an action of the Physical Education discipline through an annual dynamic with the school years of the second segment of fundamental education or in all years.

The diagnostic use and monitoring through the test of preventive knowledge of drowning at school are important and necessary to reinforce some safety values and concepts, in addition to reformulating false safety criteria in some children and spreading knowledge of the culture of accident prevention in aquatic environments, not only in swimming lessons for those who participate in methodologies such as swimming + safe, but also family members, teachers and friends who help create a prevention network that can start at school.

It is common in the school phase for the behavior of a friend to influence the other in the search to feel belonging to a certain group, in this sense it is believed that the correct values in situations of risk of drowning can be multiplied through prevention sheriffs and everyone who participates in the guidelines to increase the level of knowledge about drowning prevention.

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It is hoped that other schools can also disseminate values of preventive knowledge with students from these and other years of schooling so that the number of deaths from drowning can decrease in the country.

This CPA test can also be used in the school environment to diagnose the level of students' knowledge of drowning prevention and help in the formulation of content to be taught, as well as in the design of out-of-school accident prevention campaigns.

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ANNEX

Test of conceptual and attitudinal pedagogical contents in Safer Swimming

In conceptual content, the student learns to "know about" facts, concepts, symbols and images.

1. Correlate the meaning of the figures to the text that must be contained on the plate

1 2 3 4 5 6 7

Figure source: sobrasa.org

( ) Forbidden to push
( ) Bottom location
( ) No diving
( ) Absent lifeguard
( ) Emergency phone
( ) Lifeguard present
( ) Swimming prohibited

2. Connect the columns correlating to the meaning of the flags

1. flag  green ( ) risk of drowning
2. flag  yellow ( ) suitable place to bath
3. flag  red ( ) high risk of drowning

In the attitudinal content, the student learns to "know how to respect" the norms, postures, values and attitudes to live with the rules for using the aquatic environment and the teacher, adopt habits to prevent drowning and/or accidents and, finally, internalize something that will be taken for life.

3. Regarding swimming lessons. Answer yes or no

	YES	NO
1. Should I play push the other students in the water?	( )	( )
2. Should I put my hand in the hole that sucks up the pool water?	( )	( )
3. Should I wait for the teacher's call to enter the pool?	( )	( )
4. Should I ask or advise the teacher when leaving the pool?	( )	( )
5. Should I avoid accidents in the pool and value prevention actions?	( )	( )
6. Should I enter the pool with a somersault jump?	( )	( )
7. Should I play near the bottom drain in the pool?	( )	( )
8. Should I play races in the wet area around the pool?	( )	( )
9. Should I try to swim across the river because I swim?	( )	( )
10. Should I enter the rough sea because I take swimming lessons?	( )	( )

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Total correct answers:_____ which equals_____points.

The result of checking the level of knowledge about drowning prevention is the sum of each correct answer, worth 0.5 points each, obtained in the 20 surveyed items. The more correct answers the student has, the better their level of knowledge about drowning prevention. Thus, the category of the student's level of knowledge is...

( ) from 0 to 2 points - very weak preventive knowledge;
( ) 3-4 points - weak preventive knowledge;
( ) 5-6 points - regular preventive knowledge;
( ) 7-8 points - good preventive knowledge;
( ) 9-10 points - excellent preventive knowledge.

Feedback:

1. Correlate: (3) No pushing; (6) Deep location; (4) No diving; (1) Lifeguard absent; (2) Emergency phone; (7) Lifeguard present and (5) No swimming.

2. Connect the columns: 1. green flag - place suitable for bathing; 2. yellow flag - risk of drowning and 3. red flag - high risk of drowning.

3. **Answer Yes (Y) or No (N):** 1(N); 2(N); 3(S); 4(S); 5(S); 6(N); 7(N); 8(N); 9(N); 10(N)