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The Teaching of Swimming Based on a Model Derived From the Causes of Drowning

Robert Keig Stallman, Målfrid Junge, and Turid Blixt

This paper proposes that the teaching of beginner swimming should be organized according to the causes of drowning. We surveyed drowning reports, interviewed drowning survivors, and observed simulated drowning victims to determine common characteristics associated with drowning. We also reviewed 25 swimming instructional programs offered by well-recognized national programs from 18 separate countries and identified 8 common beginning swimming skills. These skills could be closely connected with the causes of drowning. We proposed a definition for being able to swim that should be given common international acceptance so that learning to swim can actually provide skills needed for preventing drowning.

More than 400,000 people worldwide drown every year (Bierens, 2006). Many of these episodes are avoidable. The lack of basic attitudes, knowledge, and skills are often behind the tragedy. The causes of drowning should dictate the way we teach swimming, what children should learn. Yet the way we teach swimming has varied dramatically over time and still today there are many philosophies and methods that enjoy popularity. A post WW II phenomenon has been the commercialization of the teaching of swimming. Here the variety is even greater and an unfortunate number of teachers or schools emphasize that which is popular with parents (the paying client). While some research has been conducted, conclusions are vague and are not popularly known. After all, reason many, learning to swim is really quite simple; we all know what it means to swim or to be able to swim. But do we?

Yes, it is simple. In the 1930s the eminent anthropologist Margaret Mead, while studying the Manus people of New Guinea, observed that it was as uncommon for a Manus child of four to be unable to swim as it was for a Western child of four to be unable to walk. But what was the ingredient that dictated success? Again, the answer is simple. These children, of people who lived by fishing, were in the water every day, all day. No one tried to teach them to swim, it happened naturally. It never occurred to any one that it would not happen and therefore was not an issue. Some modern researchers and educators even classify swimming as

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a “basic movement,” like walking, something that is not learned but is part of development.

In the 1970s, the Canadian swimming educator and motor learning researcher Prof. Murray Smith (1971) reflected on Margaret Mead’s observation. In the developed countries, where admittedly we cannot all swim outdoors all year round, we have swimming pools, swimming lessons, swimming instructors, agencies that train instructors, ad infinitum. Yet we are happy with less than 100% success. Some are slow, some just don’t seem to get it. Smith asked rhetorically, “why do we not reach 100% success when we put so much effort into it, when people like the Manus achieve 100% with no effort?” Insightfully he concluded, “The way we teach often runs counter to the way people learn.”

We aquatic professionals still argue about which stroke should be taught first, about the part vs. whole issue, massed vs. distributed learning, which if any teaching aids should be used, floatation devices or not, which methodology, by which criteria do we judge that the child can swim, etc. It is remarkable that that these questions and issues have not yet been answered nor more seriously addressed. One of the purposes of this article is to refocus attention to these issues.

Wilbur Longfellow, the American swimming and life saving pioneer of pre-WW I days, had much of the solution when he said, “we must entertain them mightily and teach them gently” (American Red Cross, 1951). In the 1750s Benjamin Franklin had observed that the turning point in learning to swim is the recognition that “the water holds me up!” (Thomas, 1904). Today, fortunes are made by producers of a variety of devices designed to prevent the child from experiencing his or her own natural buoyancy. Shades of yore!

The relationship between swimming movement economy and survival continues to be overlooked. Swimming is learned indoors while drowning happens primarily outdoors. How many children (or adults, for that matter) have had the opportunity to experience swimming while clothed or in the discomfort of cold water? For all too many children, adults, and even swimming instructors, swimming is perceived as a matter only of performing a set of “correct” movements. We aquatic professionals believe and know swimming is much more than performing rote motions.

It is not the purpose of this paper to discuss the methodology of swimming instruction, although much about that topic has yet to be discussed and investigated. We admit that there is need for innovation and variety in teaching methods, especially given the concern of modern pedagogy for individualized teaching. At the same time, this must not be at the cost of essential content. It is our contention that there is learn-to-swim content that is so vital in terms of prevention of drowning that it should not and cannot be overlooked. There is much less room for variety and debate regarding the content of learning to swim than there is about methodology. The causes of drowning must dictate especially what we teach, content, and to a lesser degree, how we teach.

H.T.A. Whiting, noted expert in motor learning, characterized a person who can swim as “able to cope with an unexpected and involuntary submersion” (1971). A study in the UK showed that 40% of all drownings happened within 2 m of safety (e.g., dock, shore, boat), 60% within 3 m. Some may have been due to “cold shock” (Golden & Tipton, 2002) but others surely were due to missing or weak swimming skills. Experience also shows that many occur in relatively

shallow water, only slightly more than the height of the victim, i.e., with the toes only centimeters from the bottom. Can there be any doubt to the logic that it must be the causes of drowning that dictate what children should learn?

This paper then is about the content or what our learn-to-swim programs should contain and what nonswimmers should learn. The aims of our paper are to (a) identify causes of drowning, (b) show how these can be translated to “what children should learn,” (c) derive a definition of “can swim,” and (d) demonstrate that water safety is more than just rote swimming movements (see Figure 1).

Method

The Causes of Drowning

We used the following sources to attempt to identify the causes of drowning:

- Examination of accident reports
- In-depth interview with survivors
- Observation of simulated episodes

Accident Report Examinations. We analyzed accident reports from both local community authorities and newspapers. We recorded references to outcome, weather and water conditions, activity before the victim found him or herself in the water, distance from safety and water depth, and whether alcohol was involved. We included eyewitness reports sometimes in accident reports and more often included in newspaper articles. In this case, any description of the victims condition at the time of being first observed was noted.

Survivor Interviews. In-depth interviews were conducted with survivors of drowning episodes. In some cases, these were people who were victims of a single

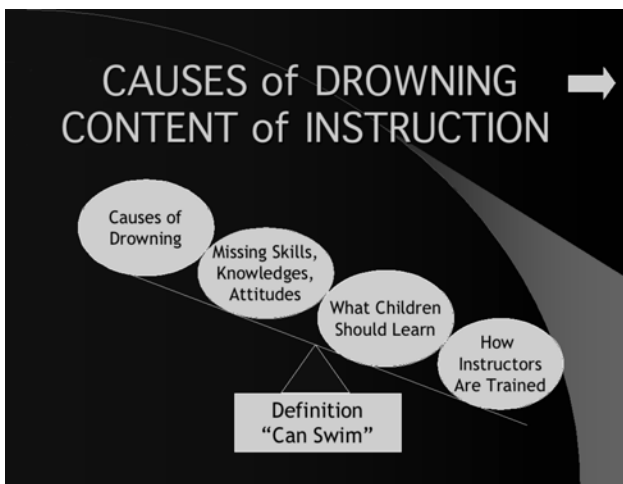


Figure 1 — From the causes of drowning to what children should learn.

episode, had either involuntarily or voluntarily gone into the water, had aspirated water and who would probably not have survived if not rescued. In several cases they were victims of a major catastrophe such as the Alexander Kjelland oil platform accident. While the interview was basically open-ended, several issues were consistently brought up if and when the interviewee indicated any willingness to discuss them. These points included (a) Where were you immediately before the accident? (b) What were you doing at that time? (c) Did you anticipate any danger? (d) What was your immediate reaction when you saw that the accident was unavoidable? and (e) What was your immediate reaction when you found yourself in the water?

Simulated Episode Observations. Students were trained to simulate drowning episodes. Then they were observed and interviewed immediately after. These were only moderately skillful swimmers and in some cases they experienced real stress. In most cases they could objectively relate what movement difficulties they encountered.

What Children Should Learn

We analyzed the literature from 25 leading aquatic organizations with particular regard to the content of their programs. In each case these were public or semi-public organizations (such as the American Red Cross) who offered swimming and water safety instruction as well as the training of instructors. The aquatic organizations analyzed offered nationwide programs in their respective nations and each had a long history of aquatic activity. We selected these organizations because of the advanced level of their professional activities and the professionalism of their publications. Eighteen nations were represented. We ascertained whether they had a particular course that they believed culminated in the participants "being able to swim." If the information we sought was not readily available from the published materials, we contacted directly agency representatives. In some cases the language contained a single word meaning "can swim." We analyzed the content of these courses from these organizations, noting whether some form of combined test used for final evaluation was recorded or whether another form of summary evaluation was used. Lastly, we noted the form of recognition (diploma, certificate) that was used, if any.

A Theoretical Approach

When considering the skills of swimming/survival, we believe a movement analysis approach also has considerable merit. This approach has figured strongly in the writings of several aquatic educators. Wilke (2007) and Madsen and Irgens (2006), for example, focus on the characteristics of the water and the relationship of the human body to the water. These authors described how the relationships involve coping with the temperature, texture, pressure and even the taste of the water. It involves developing a feel for the water to produce propulsion and reduce resistance. Prof. Fred Lanoue (1963) noted that people don't drown primarily because they can't swim but because they can't get air. Breathing, breath holding, and breath control in all their nuances are involved here. Closely tied to breath control and breath holding is the mastery of the control and regulation of buoyancy. Opening the eyes under water is obviously another essential skill (Figure 2).

Movement in all its forms, about the sagittal, transverse, and longitudinal axes of the body may save one's life in a drowning situation. Here we are obviously talking about the all-around development of the capacity often referred to in the expression "watermanship." Langendorfer and Bruya (1995) modernized this traditional phrase to the term "aquatic competence." They, in fact, also included in this concept all the related activities that take place on and around the water, e.g., canoeing. From a water competence perspective, swimming should not be thought of as just moving the body from A to B in the water but should include all the aspects of moving forward and backward, sideward, under the water, and at the surface. The concept of aquatic competence actually has long historical roots: Sinclair and Henry (1893) referred to "scientific swimming" or "fancy swimming" when characterizing the aquatic shows so popular in the UK in the late 1800s and to the desired skill set of any swimmer.

A Definition of the Ability to Swim

We combined the results of the above described investigations in an effort to delineate a definition of "can swim." We believe this definition of "can swim" is more comprehensive than previous attempts. Furthermore, it is based on a broad survey of empirical evidence. See the list of essential items in this definition herein.

Results

When considering the analyses of the drowning accident reports, the interviews of survivors and observation of simulated episodes together, several key elements constantly appeared. The list of these key elements include the following:



Figure 2 — Start early but do it right.

1. The victim didn't realize the danger. It looked safe to them (e.g., the victim did not know about the undertow).
2. The victim suffered an unexpected occurrence before or in conjunction with entering the water (e.g., fall from height, awkward landing, loss of breath, wind knocked out at landing).
3. The victim suffered an unexpected result or experience during submersion (e.g., deep submersion after fall, difficulty in regaining the surface, couldn't see where I was going, water was cold, clothes heavy).
4. Following submersion, the victims skills were inadequate to survival (e.g., unable to turn back toward safety, unable to roll over and change strokes, couldn't swim in waves, became quickly tired—couldn't swim far, couldn't stop and rest/float).

We deemed these weak or missing skills, attitudes, or knowledge to be causal elements in precipitating the drowning episode. It doesn't take much imagination to translate these reports to concrete skill items that demand attention in aquatic education programs.

Analysis of Course Content

When the items included in the first level course (or course designated as equivalent to beginner, nonswimmer, or novice) were analyzed, a pattern emerged. Most of the organizations examined, having been chosen because of their progressive programs, were concerned about attitudes and knowledge. They either had fixed topics that were systematically introduced in every lesson or they strongly advised their instructors to include pool side chats about safe swimming, safety at sea, boating safety, safety on the ice, etc.

Regarding swimming skill acquisition, a pattern of three elements repeated themselves in almost every case.

1. Children should be as comfortable and efficient under the water as they are at the surface.
2. They should be as comfortable and efficient on the back as they are on the front.
3. They should develop an all-around movement repertoire (i.e., the tradition of developing "watermanship" or "water competence" was upheld).

This pattern of elements was sufficiently consistent that we have chosen to consider these three points as guiding principles. In all but two cases, swimming on the back was equated to swimming on the front. Although many strokes had been imparted to their charges and while some strokes were more popular than others, there was a sense that each stroke had its primary purpose, its own innate value. There were no first and second class strokes. Sadly in some parts of the world and in the swim programs of certain organizations, the equivalence of strokes and skills is not the case.

At the beginning course level, we observed that about 20 skills repeated themselves systematically. Some were sufficiently similar to each other that they could be combined. Eight skill elements emerged finally as both irreducible and irreplaceable within beginner swim courses:

1. Entry (i.e., jump or dive) into deep water.
2. Upon submersion, regain surface, level off and swim.
3. Surface dive and swim underwater with comfort.
4. Acquisition of at least two rudimentary strokes, one on the front, one on the back.
5. Breath in a relaxed way and in a manner coordinated to the demands of the stroke.
6. Change body position in the water (i.e., roll over from front to back and back to front).
7. Change direction of travel (i.e., turn left and right both on front and back).
8. Remain afloat (i.e., stop and rest with minimal movement; no movement is necessary for prepubescent children and for women, all of whom can float; Stallman, 1997)

The reader should notice that there is a close match between the causal elements of drowning and the central items contained in the beginner swim courses analyzed. In addition, the items above reflect movement in every direction, as described in our section on a theoretical approach. Most programs included swimming with clothes and some organized their program such that if the teaching normally occurred indoors, a lesson or two were held outdoors at the conclusion of the session.

Nearly all of the organizations whose programs we reviewed practiced some manner of assessment and evaluation, either item-wise or through a combined test. The common attitude toward evaluation was that it was both necessary to assist in further planning and to keep a continuous overview of each child's progress. On the other hand, assessment was rarely used formatively to guide individualized instruction or to propose program revisions.

Water Safety

These 8 skill items, especially if performed while clothed and preferably outdoors in colder water, form a kind of conceptual definition of the most elementary ability to swim. We also believe that self dependence and self confidence go hand in hand and are an integral part of the learning-to-swim process. When combined with knowledge and attitudes, we believe we have defined the essence of water safety. The relationships among these concepts are depicted in Figure 3. Water safety education must strive to make teaching as realistic and authentic as possible. Making teaching and learning more authentic in no way implies it should be any less entertaining, as suggested by Longfellow's earlier quote. To the contrary, children and youth thrive on learner-centered settings along with the challenge and the variety provided by an all around, comprehensive approach to learning.

While the eight item definition is meant to cover the needs of safety, it is not really meant to be a pedagogical tool. The 3 principles and the 8 item definition have therefore been expanded to a 20 item progression. This is the tool that the teacher and instructor can immediately put into use.

Notice that the definition does not refer to either acquiring a specific stroke or being able to travel a specific distance. We believe that it is not "how far you

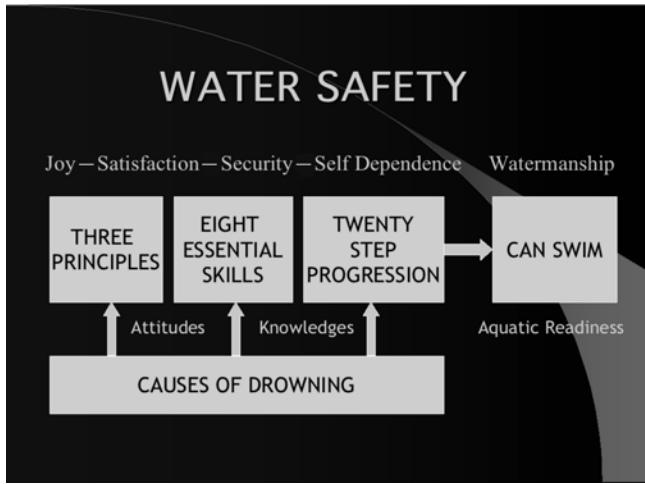


Figure 3 — Relationship between attitudes, knowledge and skills: A definition of “can swim.”

swim” that counts but “how you swim.” In one pilot study, children were scored on the distance they swam as well as a subjective assessment of their degree of relaxation while swimming (Junge, 1984). Children who managed only 10–15 m but with a high degree of relaxation/economy of effort were matched with children who managed 25 m but who expended considerable effort, due to personal motivation (e.g., they wanted that diploma; their Papa was watching). The first group arrived earlier at both 50 and 100 m than the second group. Not only did they arrive earlier, but the time interval was very short. Developing a proper swimming skill foundation, slow at the start of learning, pays off later. In some cases children who swam 25 m for the first time but very easily, managed 200 m only a few days later, sometimes on the very next attempt. One individual who started as a complete nonswimmer (although a bit older and very goal-oriented) managed 200 m after only 30 min of instruction. Another went from 50 m to 1500 m over the weekend with no swimming practice in between (Stallman, 1986).

A Graded Approach to the Definition

No one would consider a child who only can swim 25 m to be a good swimmer or to be particularly safe in an emergency. Remember, however, that our “can swim” definition does not specify either stroke or distance. What we do specify is the necessity of economy of effort and the demonstration of multiple skills (all around development). The child who swims 25 m by only moving the body in a single fashion, in a single body position, and in a single direction is far less prepared for an unexpected visit to Davy Jones than the one who swims the same distance but with the previously described skills built into the swim. In a study involving 200 school children, Junge (1984) found that although they had all managed 25 m by the traditional criterion (straight ahead, nothing else), and had been declared



Figure 4 — Watermanship at its best.

swimmers, only about 5% managed to satisfactorily complete a combined test (that included jump or dive, swim 12.5 m on front, turn, roll over, stop and rest 30 s, and swim 12.5 on the back). We have also observed that those with a more all around development not only manage to swim 200 m earlier, but they retain and improve on their watermanship capabilities (Figure 4). At the same time, some who manage to swim 200 m without developing the all around skillfulness, that is, only being able to perform a 200 m effort, using one stroke, turning on a wall, and not necessitating other skills, may be less safe than the swimmer with more all-around skills who is still only completing 50 or 100 m. The argument that 200 m is somehow the magic distance is, in and of itself, an unacceptable standard.

To encourage continuous and gradual swimming development while retaining the watermanship ideal, the concept of a “zone” of “can swim,” rather than a sharp line between can and cannot, is introduced. Meeting the “can swim” definition at a 25 m distance means that one can swim only at a minimal level. An all-around 200 m swim in a pool may approximate a minimal level of “can swim” when translated to an open water setting and from a “water competence” perspective, hopefully approaches a relatively safe level for activity in, on, and around water. Keeping the same pattern of performing multiple skills at 50, 100, and 200 m means that all elements of the definition progress in a balanced and comprehensive way. As the distance increases, new skills are introduced and the challenge and refinement associated with the previous skills are increased (see Figure 5).

Conclusions

In too many cases, children are not taught what is necessary for them to cope with an unexpected submersion that could lead to drowning. Perhaps because of a lack of communication, those who have had insights into the multiple causes and

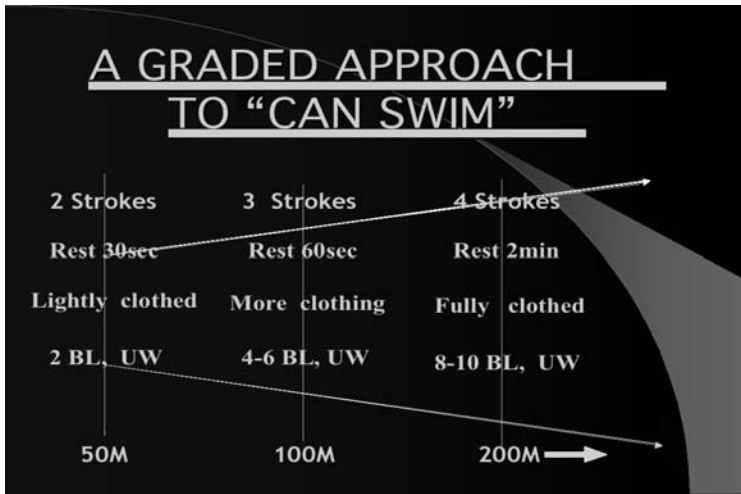


Figure 5 — A progressive approach to the definition “can swim.”

elements of drowning have had little contact with those who teach swimming, or more importantly, those who design instructional learn-to-swim programs. While logic tells us that what we teach should prevent people from drowning, we have often failed to make the correct connection. This failure is never more evident than when examining the content of many learn-to-swim programs and even some of the 25 national programs we reviewed for this paper. The great variation in “what” we teach from one program to another is evidence that we have not yet arrived at our goal of linking learning-to-swim to preventing drowning. Too often swimming is seen as only a matter of performing swimming movements in a “correct” fashion. True ability to swim is indeed much more. We believe the concept of acquiring aquatic competence or watermanship is as relevant today as ever. All around swimming skill development should be synonymous with optimal skill development for drowning prevention. While simple swimming skill is not enough to survive in all cases (e.g., the Indonesian tsunami tragedy) in many other cases, death by drowning is avoidable.

Our analysis of the causes of drowning was not finite and certainly can expand in the future. How our understanding of the causes of drowning translates to what children should learn in swim lessons may also require future adjustment. The real challenge is to promote this way of thinking among the teachers of swimming and especially among the organizations they represent and the instructional design teams for those organizations. We believe there should be a universally accepted definition of the ability to swim. After all, kids are kids and water is water. In this paper we have presented a suggested definition. We believe that swimming skill is only part of “water safety” and that both knowledge and attitudes must be part of any comprehensive program. We believe swimming is an art and teaching swimming is also art as well as science (Figure 6). Learning to swim may be easy but when for any reason children do not have continuous access to the water, we can still make great improvements on our “water safety” education programs.



Figure 6 — Aquatic competence at its best.

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