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Stephen J. Langendorfer
Bowling Green State University, slangen@bgsu.edu

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Changing Learn-to-Swim and Drowning Prevention Using Aquatic Readiness and Water Competence

Stephen J. Langendorfer, Editor

Bowling Green State University

When Larry Bruya and I wrote *Aquatic Readiness: Developing Water Competence in Young Children* (1995), we coined two terms: *aquatic readiness* and *water competence*. I continue to be surprised and humbled at the longevity and impact of these two terms on the field of aquatics over the past 20 years. In fact, the origins of these terms reflect several important philosophical perspectives that underpin their use and importance. Paradoxically, neither Larry nor I recognized the full potential of either term at the time of their origin.

Aquatic Readiness

The concept of readiness can be traced back at least to Edward Lee Thorndike, the father of educational psychology and the connectionist movement in behavioral psychology. Readiness was one of Thorndike's laws of behavioral learning. He intended it to explain why and how some behaviors can be learned more efficiently and readily at certain points in time than at others (i.e., when stimulus-response bonds for any behavior by a learner have a sufficient degree of probability) (Thorndike, 1932).

Interestingly, decades later, Jerome Bruner, a noted cognitive psychologist, also proposed the critical importance of readiness as part of his constructivist theories of learning and education (Bruner, 1966). Bruner proposed several cognitive learning-teaching principles that seem to me to have application also to the psychomotor domain, including aquatics. For example, he proposed that learners must experience tasks and situations that increase the likelihood that the learner will be motivated and capable (i.e., ready) to learn. Further, Bruner felt that the instructional curriculum ought to be designed so that students could learn in the easiest manner possible. The specific instructional model has been called the Bruner Spiral Organization for Learning. Finally, Bruner insisted that learning-teaching experiences should increase the probability that students will be able to achieve beyond the immediate information or skills learned. This suggests that students should be able to transfer their current state of learning to other contexts and at higher levels of understanding. I return to these key progressive concepts identified by Bruner later in this paper.

I specifically recall adapting the term *aquatic readiness* from a parent term: *developmental readiness*. My two graduate advisors, Lolas Halverson and Mary

Ann Robertson, defined readiness in their text, *Developing Children: Their Changing Movement* (Robertson & Halverson, 1984). They defined their notion of readiness as “the result of all the interactions that have formed the child, i.e., readiness is the child’s current state of development” (p. 3). Further, they hypothesized that “only this unique circle of interaction between the child and the environment will result in learning” (p. 2). In hindsight, I see the similarity to and influence of Bruner’s theory (1966) on their definition.

This integrated and constructivist vision of developmental readiness is a key principle in the developmental perspective. This world view expects that individuals will change their voluntary, goal-oriented human behaviors qualitatively over the lifespan in individualized, cumulatively ordered progressions. An individual’s current status (i.e., where her behavior falls along a developmental continuum; see Figure 1) indicates her developmental readiness which in turn reveals the probability for what subsequent behaviors may be expected to be acquired next.

Aquatic readiness, therefore, represents an individual’s unique set of aquatic experiences which may predict the most likely tasks a swimmer may be ready to acquire next in any aquatic environment. Subsequent to my initial rather simplistic and deterministic notions of aquatic readiness in 1995, it turns out that aquatic readiness ought to be understood as a set of probabilities akin to those proposed by the theories of Thorndike (1932), Bruner (1966), and Newell (1986) as well as the obvious developmental perspective described by Robertson and Halverson (1984). Unlike Thorndike’s simple behavioral connectionism, however, aquatic readiness abides by the progressive principles of constructivism (Bruner, 1966) and dynamical systems theory, particularly lending itself to an application of Newell’s constraints model (Newell, 1986).

Both the constructivist and dynamical systems models provide dramatic implications for the application of aquatic readiness to swimming acquisition and drowning prevention. From these models, we can appreciate that rather than understanding learning-to-swim as a predetermined one-size-fits-all set of aquatic skills, we ought to recognize that each swimmer has her own unique level of aquatic readiness based on her own personal qualities (e.g., body size, composi-

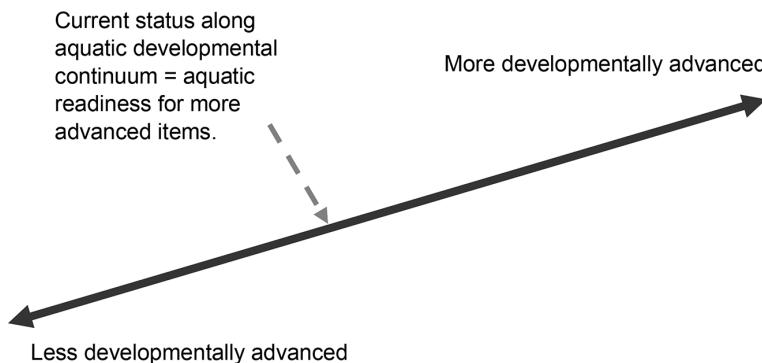


Figure 1 — Simple representation of aquatic readiness and an aquatic developmental continuum.

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tion, neuromuscular maturation), the prior experiences with various aquatic tasks (e.g., breath control, floating, changing body orientation) in different aquatic contexts (e.g., pool, open water, surf). These models propose, for example, that it is insufficient to consider the aquatic readiness of any swimmer based on the demonstration of any swimming task using only several trials in a single aquatic environment such as a pool. To be ready to survive in open water or surf especially at colder temperatures, a swimmer needs repeated experience in related environments. The constructivist and dynamical approaches remind us that the performance of swimming skills in one environment does not necessarily transfer easily to other aquatic settings.

Water Competence

The term *watermanship* has roots in an era of human-propelled water craft (i.e., small boats). A *waterman* was an individual skilled in propelling various small craft such as dinghies, rowboats, canoes, or even small sailboats. Those individuals (almost exclusively males) who were familiar with and skilled in a variety of water craft thus demonstrated watermanship. At some time in the early part of the 20th century, someone (perhaps even Wilbur “Commodore” Longfellow himself, who was founder of the American Red Cross Life Saving Corp and the early learn-to-swim (L-T-S) program in 1914) seems to have transferred the meaning of watermanship from “skillfulness with boats” to “general proficiency in all manner of aquatic skills, strokes, and sports.”

When Larry Bruya and I initially proposed to use the term watermanship in *Aquatic Readiness* to define a swimmer who had acquired broad proficiency in aquatic skills, our developmental editors at Human Kinetics, Sue Mauck and Holly Gilly, suggested *water competence* as a substitute term that was appropriately more gender-inclusive than watermanship. We agreed to the substitution and became the copyright holders of this new, unique term. Similar to my original simple conception of aquatic readiness, our initial use of water competence was limited to serving as a synonym for watermanship, i.e., to define a generalized proficiency in aquatic skills while in, on, or around the water.

Over the past 20 years since the publication of *Aquatic Readiness*, a group of aquatic scientists and researchers around the world began envisioning that water competence may have a heretofore unrecognized potential for more broadly considering skillfulness and proficiency in the aquatic environment related to drowning prevention. Interestingly, as I have gained a more detailed understanding of Newell’s (1986) constraints model and Bruner’s constructivist theory, I also have realized the more expansive possibilities inherent in the construct of water competence. For example, instead of viewing the performance of aquatic tasks as unchanging *possessions* of swimmers like their fingerprints or eye color, I propose water competence could represent complex interactions (a.k.a., constraints) among each swimmer’s personal qualities, the goals and demands of each aquatic task, and the general conditions associated with all aquatic environments as well as specific aquatic settings. Further, instead of accepting that swimming instruction is done best using a command style of pedagogy that assumes swimmers learn best by simply copying the instructions or demonstration of an instructor, the use of exploration, guided discovery, and task setting pedagogies each allow the swimmer to construct her own aquatic skill set.

Personally, I am pleased that aquatic readiness and water competence have gained a wider international popularity and are being more broadly conceived. For example, over the past several years in the *International Journal of Aquatic Research and Education*, a group of aquatic scientists have published a series of studies related to their international collaboration called “Can You Swim?” that has investigated questions related to what it means to be able to swim with sufficient proficiency to reduce individual risks of drowning as well as lower the population rate of drowning (e.g., Moran et al., 2012; Petrass, Blitvich, McElroy, Harvey, & Moran, 2012; Kjendlie, Pedersen, Thoresen, Setlo, Moran, & Stallman, 2013). As part of their series of studies, this international collaborative group has decided to embrace the concept of water competence as more appropriate than the more limited concepts of “swimming ability” or “swimming skill.” Along with embracing water competence as a more appropriate term than swimming, I have realized that the Newell and Bruner models challenge each of us to think very differently about aquatic skill acquisition and drowning prevention.

Impact of Aquatic Readiness and Water Competence on Learn-to-Swim

This issue of the *International Journal of Aquatic Research and Education* features a study conducted by members of the American Red Cross’s Scientific Advisory Council’s aquatic subcouncil (see Quan, et al. 2015 in this issue). Their stated goal of the study and paper is to identify current ways that aquatic professionals test proficiency in swimming (i.e., water competency) and based on that information to construct an operational definition for water competency that might eventually be recognized worldwide in an effort to understand how being competent in the water serves as a deterrent to drowning. As a member of the aquatic subcouncil and coauthor on the paper, my own thinking about aquatic readiness and water competence has been challenged and grown from our lengthy discussions during the writing (and multiple rewritings) of the paper. I provide this editorial to complement that paper as well as to further challenge my coauthors and other readers to continue to broaden their understanding about learning-to-swim and preventing drowning.

Bruner’s Spiral Curriculum Model

At the beginning of this essay in the section on aquatic readiness, I summarized three of Jerome Bruner’s learning principles. The second principle identified the developmental nature of learning as progressing from simple to more complex levels of teaching and learning. Bruner adopted the metaphor of an upward spiral comprised of multiple “strands” to help envision how a progressive curriculum and instructional strategies could increase a student’s success in cognitive learning. Although not intentionally using Bruner’s (1966) model, the American Red Cross’s L-T-S program has identified a series of skill strands (e.g., buoyancy, breath control, locomotion) across the L-T-S levels that could resemble a linear version of the Bruner spiral. Perhaps it would be worthwhile for members of the aquatic subcouncil to reread some of Jerome Bruner’s principles and propositions.

Primary Elements of Water Competence

In the Quan et al. (2015) paper, the authors identified what they believed are the key elements or items in defining a person's degree of water competency. They include several specific tasks that could be associated with the basic skill strands mentioned in the previous paragraph that already comprise the American Red Cross L-T-S levels. Their stated intention in mentioning these specific items was to provide an operational test or assessment to indicate when someone has demonstrated a minimum level of water competency. The challenge presented by their proposed items is that demonstrating a minimum level of competence in an optimal aquatic setting (e.g., warm, indoor pool) may not transfer to another setting with much different conditions (e.g., open, cold water surf). The authors have alluded to the need to consider interactions by swimmer with different tasks and environments, but they have not provided a concrete model for how the interactions may work.

Figure 2 provides a very simplified spiral instructional and curricular model (Bruner, 1966) of water competence comprised of five aquatic elements that I propose could be used to help swimmers progressively acquire water competence tasks. You will note that five different elements comprise the "strands" that make up the proposed water competence learning spiral. For example, the first and most fundamental strand is controlling breathing. Based on Bruner's ideas, the first breath control tasks would be simple such as simply getting parts of the face wet or blowing bubbles. As a swimmer progresses along the strand, the breath control tasks very gradually get more complex and challenging such as rhythmic breathing as part of a swim skill or stroke. Each of the subsequent elements (i.e., strands) represents another interacting component of water competency: buoyancy, changing body position/orientation, changing location in the water, and entering and exiting the water (see Figure 2). Each strand starts with simple tasks associated with that component and tasks progressively get more complex and challenging as proficiency and water competence advance.

Several other developmental principles drawn from Bruner's (1966) and Robertson and Halverson's (1984) works ought to be noted here. One key principle states that a swimmer's success with the tasks being taught and learned ought to be the primary metric by which one judges whether it is appropriate to move farther along the strand/developmental continuum. Unlike the predominant L-T-S model practiced by many instructors in which a lesson plan describes "what is to be covered" by the teacher, this model focuses on the successful achievement of tasks by individuals in each strand. Another related principle determines how and when an individual swimmer successfully has constructed tasks so s/he is ready to move along the developmental continuum (refer back to Figure 1). This principle means that different members of the class likely will be practicing different tasks along each strand. The instructor therefore has to teach to the individual swimmer, not the class. Finally, Bruner's third principle relates directly to the constraints model (Newell, 1986) in suggesting the need for repeatedly practicing many tasks across many different environments to maximize the likelihood that a swimmer will own her learning and to continue to construct proficiency in more advanced tasks with or without formal instruction. This principle relates to becoming increasingly more proficient and being able to do so in a variety of different aquatic environments is

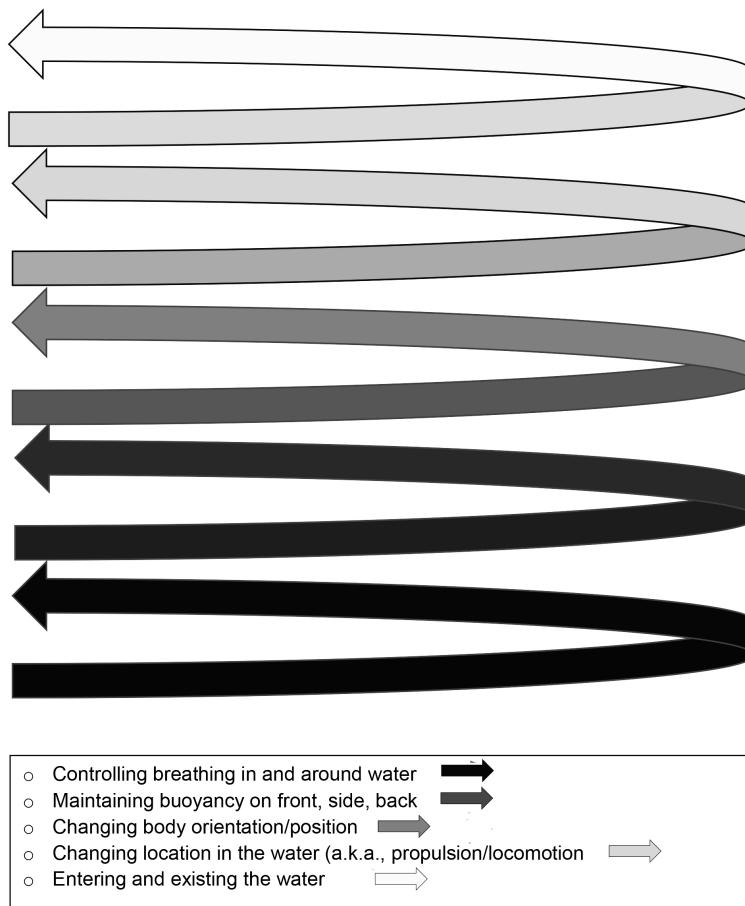


Figure 2 — A Bruner (1966) spiral learning curriculum applied to water competence.

the essence of how to facilitate positive transfer of current skills to more challenging levels of skills and in more challenging aquatic contexts.

Impact of Aquatic Readiness and Water Competence on Drowning Prevention

As hard as it is to believe, only recently have a few studies been published in peer-reviewed journals that document whether learning to swim relates to a reduction in the risk of drowning. And, currently, these studies have exclusively focused on the association of swimming (so far, not defined as water competence) and drowning prevention for very young children. There continues to be no evidence to support a similar “inoculation effect” on older children and adolescents. As the Quan et al. (2015) paper points out, more research is definitely needed.

As part of my conclusion to this editorial, I would like to propose that we could profitably view drowning and drowning prevention from developmental and dynamical perspectives as I have proposed for learning to swim, or acquiring water competence. One of the dynamical principles holds that events and human behaviors are not deterministic, but rather probabilistic and emergent in nature. In a manner similar to weather forecasting which describes weather events as probabilities, drownings also ought to be viewed as probabilistic in nature. If drowning was deterministic, someone would have already created an algorithm to identify all the weighted factors that contribute to drowning. Using those weighted factors, it would be a rather simple matter to create a deterministic formula for preventing drowning. Fortunately or unfortunately, drowning is a very complicated process and outcome that lend themselves more to probabilities than determining factors.

I recall one example of how these probabilities may be used. About 20 years ago, the American Red Cross in one of their previous lifeguarding texts which is now out of press, included a table intended to help lifeguards identify persons who were at highest risk of being a victim of drowning. I was intrigued by the table because the descriptions of the high probability of drowning behaviors were very similar to my descriptions of rudimentary levels of swimming that I had published in *Aquatic Readiness* as part of the Aquatic Readiness Assessment (ARA). Subsequently, a Red Cross staff member admitted that they had drawn the items from my ARA descriptions (albeit without attribution) as well as from the work of Frank Pia in his "On Drowning" videos. What struck me at the time was not the plagiarism, but the fact that the drowning process so strongly resembled my ARA sequence *in reverse!* Instead of watching a person progressively employ more advanced aquatic behaviors (e.g., arms, legs, body position), the drowning victim appears to be regressing to more primitive or rudimentary levels. Importantly, that regressive progression can indeed be useful to the knowledgeable lifeguard to assist them in early identification of persons with a high risk of drowning.

I strongly encourage readers to carefully examine both of the Red Cross papers published in this issue and to consider engaging in the continuing debate about how to envision learning-to-swim and drowning prevention, especially from different paradigms (e.g., Bruner's constructivism, Newell's dynamical constraints) from those traditionally used (e.g., command style instruction; deterministic models of learning). As always, I welcome and encourage the submission of letters to the editor as well as other reviews or educational manuscripts. If readers do respond in these ways, then I consider this editorial to have done its job to be provocative!

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