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What “Science” Can Tell Swimming Instructors

Back in 1994, without ever having met me, Professor Laercio Pereira and some of his colleagues invited me to travel to Brazil to present a week-long workshop to instructors and swim school owners on the long-delayed first edition of *Aquatic Readiness* and on my insights on the developmental perspective in aquatics. I could devote several editorials just regaling readers about all the “adventures” I had traveling alone to a new continent and a country where I spoke not a word of Portuguese and knew no one! Not only that, but I was such a “rookie international traveler” that I never bothered to consider whether I needed a visa to travel to Brazil (yes, I did, as I discovered much to my chagrin at the airport just before I expected to depart.).

More to the point of the current story, a few weeks ago, my old friend, Laercio, e-mailed me with an intriguing question. He inquired whether I was familiar with a long out-of-print document from either the American Swim Coaches Association or perhaps the American Alliance for Health, Physical Education, and Recreation entitled “What Science Tells the Coach about Swimming?” He also wondered whether anyone had written a similar summary document oriented toward scientific evidence for swimming instructors. I was not familiar with the original document, nor was I familiar with any more recent instructionally-based documents.

I found the topic and Laercio’s question to be interesting for a variety of reasons. As I have written previously, I had the great honor of attending and presenting at the most recent Biomechanics and Medicine in Swimming-2010 (BMS) conference in Oslo, Norway at the Norwegian School of Sport Sciences. This was the 11th quadrennial conference for the BMS group whose mission has been to promote the application of scientific theory and knowledge into the practices of swimming. The Oslo conference was marked by a diverse set of presentations related to all aspects of swimming including pedagogy and drowning prevention as well as the more typical competitive swimming topics. Even so, BMS 2010, like most previous conferences, heavily emphasized the application of science to *competitive* swimming. When one peruses the aquatic literature, indeed most of the “scientific” articles are focused on competitive swimming rather than on the pedagogy of swimming instruction. Every time I have done an online search using the search terms “science” and “swimming,” all the citations indeed end up referring to competitive swimming and how typically physiological and biomechanical principles apply.

What Developmental Science Should Tell an Instructor About Swimming

After contemplating the question of what scientific information WSIs ought to know to be effective swim teachers (i.e., to effectively and efficiently promote learning among their swimming students), I realized that the answer is either very complex

and worthy of lengthy volumes of work *or* it may be answered simply by drawing upon several tenets of *developmental kinesiology* (i.e., the study of how movement changes over time, also known as *motor development*). *Aquatic developmental kinesiology* could be identified as the study of how swimming and other aquatic movement changes over time.

To answer the question of what science a swim instructor should know, I propose three skills and one overarching assumption that I borrow directly from the ideas of my colleague and mentor, Mary Ann Robertson. At a conference in Toledo, OH back in 1993, Mary Ann proposed a fascinating definition for a term, “*developmentally appropriate practices*” (DAP), that was being strongly promoted by the National Association for Education of Young Children (NAEYC) (Bredenkamp, 1988). In proposing her definition, she suggested that instructors needed a trio of unique pedagogical skills in order to effectively engage in developmentally appropriate practices and they had to fundamentally accept a basic philosophical tenet of developmental teaching.

DAP

Although NAEYC has published several editions of their text, *Developmentally Appropriate Practices* (2006), I have always found it fascinating that they have never really defined succinctly what constitutes developmentally appropriate practices. Their text offers numerous “DAP principles,” but no straightforward definition. Robertson (1993), to my knowledge, is the only one to have made such an attempt to define DAP. She proposed the “radical idea” that a teacher uses developmentally appropriate practices when she fits a task (or activity) to the unique needs of that individual learner.

Upon first hearing her proposed definition, I was struck by its sheer elegance. I also recall asking myself, “Wait a minute. I can’t be that simple. There must be something missing.” Well, 19 years later, I still cannot come up with any better definition for DAP than that an instructor simply must figure out how to provide an individual with a task or learning activity for which they are developmentally ready and in which they may be successful. Of course, the challenge comes in figuring out what appropriate tasks are for each learner. Figuring out the challenge is where the three developmental instructional skills come into play.

Assess developmentally. The first skill Robertson proposed that an instructor needs is to be able to identify the current developmental status or competency of a person. Such a competency can be called the person’s *developmental readiness*. It presumes that motor skill competency varies along an ordinal lifespan continuum from rudimentary to advanced. Likewise, I would suggest the most fundamental skill a swim instructor needs is to be able to identify what a swimmer already can do and what they need to achieve next. This implies that we know a predictable order in which aquatic skills are best acquired. In fact, while order is often implied in various agency learn-to-swim programs, very little scientific evidence exists to support that order.

Fortunately, the strongest weapons in a developmental kinesiology’s arsenal are strong skills in observation of movement patterns and knowledge of developmental sequences as assessment instruments. Developmental sequences are predictably ordered series of tasks or changes within a single task. Developmental sequences

are not synonymous with teaching progressions, but some of the most successful teaching progressions tend to parallel developmental changes as described by developmental sequences. Unfortunately, the use of developmental sequences as assessment instruments are not commonly appreciated within aquatics, but several developmental sequence instruments have been proposed, validated, and published over the years (Erbaugh, 1978; Langendorfer & Bruya, 1995).

Individualize teaching. Robertson (1993) proposed that in order for DAP and developmental assessment to be effective, they had to be oriented toward individual learners, not toward an abstract or hypothetical group. Every group of persons, no matter how carefully selected, is heterogeneous across many different skills. Although developmentalists study common sequences of change across persons, it is readily apparent that each person is unique and characterized by a number of individual differences. The general strategy proposed by Robertson (1993) for individualizing teaching is to break larger groups down into smaller groups, pairs, or individuals.

Individualized teaching in swimming is not an instructional skill that is very widely prized or used. In fact for most swim instructors, command style teaching, that I refer to as "tell, show, do" teaching is the only pedagogy in their instructional toolboxes. Perhaps the closest thing to individualized teaching comes in parent-child swim classes or in the rare situations where someone is providing one-on-one tutoring. In order to adopt developmentally appropriate practices, one does have to intervene at the individual level and thus teaching has to be done to individuals, not to groups. The use of reciprocal (or paired) teaching, individualized task setting, movement exploration, guided discovery, and even task cards are all pedagogies that can facilitate individualized learning and teaching in swimming.

Modify task complexity. The final skill required for creating developmentally appropriate practices is to modify the difficulty or complexity of tasks that learners are attempting. A typical notion of teaching assumes that all persons learn skills by copying the way they see others perform them. Instead, developmentally we realize that dynamical systems theory predicts that all our movement is constructed from the relationships among our individual characteristics, environmental conditions, and task demands. Developmental theory requires a very different view of how learning occurs: It acknowledges that we construct our own movements rather than copy the ways others do them.

Because almost all swimming instructors still use an error correction approach to acquire swimming skills, it is difficult to appreciate advantages that dynamical systems offer swimming instructors. The error correction model assumes one single "best" way to swim and that teaching ought to eliminate the errors in most swimmers' skills. Most swim instructors do not understand how negative this teaching approach is and how frustrating it can be to young or inexperienced swimmers who are viewed as constantly swimming the "wrong way." Viewing swimming performance as a product of the interactions among an individual's unique physical characteristics (e.g., body size, body composition, fitness levels), the qualities of the aquatic environment (e.g., buoyancy, density) and modifications of task demands (e.g., self-paced vs. slow, with flotation or not) is quite foreign to most swim instructors. Nonetheless, when an instructor matches the swimming task difficulty to an individual swimmer's needs, the successful results can be almost

magical. Knowing how to gradually increase task difficulty becomes an important tool for designing novel teaching progressions and has a much stronger scientific basis than the traditional command style teaching.

Who is the teaching for, anyway? Perhaps the most profound element in Roberton's insights into the concept of developmentally appropriate practices and its complementary skills turns out to be the fundamental shift in what we are trying to accomplish. In physical education and sport, the sport form has gradually become its own reason for being. The rules and regulations associated with elite sport have become sacrosanct and fixed in person's minds. For example, even children are expected to play 11-on-11 soccer games or to field 9 persons in baseball or softball games. Roberton (1993) posed the fundamental question of whether instructors unthinkingly ought to make learners comply with all the rules and regulations of adult-oriented sport or whether it would be more productive to adapt sport rules so that any learner could experience more success than failure.

I have discovered that, like sport and physical education, swimming and swimming instruction also usually do not adapt to needs of individual swimmers to ensure success. Swimming instructors assume that there is only one right way to swim a stroke and that everyone, regardless of their age, skill or ability level, or handicap, needs to perform the skill in exactly the same way regardless of situation or goal. Our swim books and videos all show examples of what is called the "proper" stroke technique as if swimming in a pool doesn't differ from open water or surf; recreational swimming needs don't differ from competition. Even allowing the use of flotation or other learning aids often is viewed as not requiring a swimmer to do it the "right way." We seem to have lost sight of the basic notion that our fundamental purpose is to help all persons to be successful in learning to swim, to prevent drowning, and to encourage swimmers to enjoy the water, not to do strokes exactly as specified or to become a fast swimmer. It means modifying swim skills and strokes to fit the needs of each swimmer to allow them to be successful, not making swimmers fit a specific, and often arbitrary, technique.

What should science tell the swimming instructor? I argue that instead of relying on fixed principles associated with Newton's Laws of Motion, instead of always applying competitive swimming rules, or instead of insisting on every swimmer doing strokes the same "right way," that contemporary pedagogy tells us that *developmentally appropriate practices* are the scientific basis that should guide our instructional practices in aquatics.

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