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# Water Learning: Tapping the Educational Potential of Aquatics

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# Water Learning: Tapping the Educational Potential of Aquatics

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Water learning, using activities in an aquatic environment to enrich and reinforce learning in nonaquatic areas of child development, has the potential to provide interesting and success oriented aquatic activities for young children, as well as to contribute to cognitive development and academic achievement. Integrating water learning activities into existing traditional aquatic experiences is the focus of this article. Individualization through application of a problem solving approach and movement exploration activities to meet specific developmental needs is addressed. Water learning activities can reinforce classroom academics, provide a unique environment for children to apply knowledge, and stimulate engagement of reluctant learners. Additional research questions regarding the efficacy of water learning are outlined. The potential of water learning to enrich the education of children is stressed.

"Marco?" "Polo!" "Marco?" "Polo!" What lifeguard hasn't been driven to distraction by this age-old pool game? "The wheels on the bus go round and round, round and round, round and round," (and round, and round, and ROUND). Does this sound familiar?

Yes, we have a variety frequently used activities very familiar to aquatic professionals working with children. These are just two examples. But, do these activities provide the best learning experiences for children? Is this all we want for our young ones? Is the on-going repetition of "Marco? Polo!" the very best learning activity that the area of aquatics has to offer in the way of meaningful activity engagement?

The usual goals for children's participation in aquatics are to develop water safety and swim skills. Secondary to these, but equally important for life-long aquatic engagement, are to provide enjoyment and esteem enhancing experiences. Missing from the aquatic participation goals list are enhancing academic achievement and facilitating classroom learning. Aquatic professionals miss a very important opportunity when they perpetuate activities like Marco Polo, that of providing integrated, purposeful, and goal-oriented learning experiences for our school age participants.

There is nothing inherently wrong with" Marco Polo" or" Wheels on the Bus." When initially introduced, each can be a meaningful activity. Continual repetition, without modification and/or variation, serves little educational purpose, however. Designing new aquatic activities and/or modifying existing old favorites to con-

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sider cognitive development of school-age children, as well as enhance academic accomplishment of youth, can make a real difference in the lives of young children.

This article will present brief background on the place of movement experiences in education of young children. How aquatics fits into the contribution movement can make to child development will be considered. Most importantly, suggestions are provided for making any aquatic experience not only enjoyable, but cognitively meaningful. Aquatics can, and should, contribute to academic growth. When it does, the time a child spends in the pool will be time very well spent.

## Movement and Child Development

There are several well-recognized observations supporting the importance of movement education to child development and learning. First, in today's society, children are being exposed to formal, structured learning experiences at increasingly younger ages. Preschool programs for children ages 3–5 now include prereading, premath, language, and other academic topics, in addition to play, in their curricular formats. Research shows a wide variety of goal-oriented movement experiences can stimulate cognitive development. Interacting with the environment through movement provides information. Children know what they experience as they move (Leppo, Davis, & Crim, 2000).

This means enhancing preschool motor learning experiences has potential to support that knowing or cognition. The more children know, the more they will be able to bring to the classroom learning environment and use in completing learning tasks. Cognition, in turn, facilitates classroom learning and can reinforce academic accomplishment.

There are research-documented links between motor activity and learning. For the past several decades, we have known that movement education techniques implemented with elementary school age children can be used to enhance learning. Motor development can be the basis for later, higher-order developmental processes (Og140letree & Lillie, 1976). As an application example, children's creative and expressive movement abilities can transfer to enhancement of other academic areas, such as reading (Haslett, 1982).

Curriculum development for young children has followed the research implications regarding the importance of movement to child growth and development. Teaching units for physical education in preschool/kindergarten, grades K-3, and grades 4-6 outline a teaching progression including activities to reinforce cognitive as well as motor and affective development (Littman, 1979; Logsdon, Alleman, Clark, & Sakola, 1994a, 1994b, 1997).

Free time play activities can enhance learning of academics. Geiger (1996) applies this concept and documents that a preferred behavior or activity may be an effective reinforcer of a less preferred activity. As interpreted by this author, applied to aquatics, aquatic play as the preferred behavior could be used to reinforce learning of academic skills, particularly for children having difficulty in early classroom activities.

Diagnostically, some learning related disabilities are on a dramatic increase. For example, in 2009, according to experts in diagnosing and treating autism spectrum disorders, at least 1 in every 150 children had an autism spectrum disorder (Geier, Geier, & Sykes, 2009).


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Additionally, emerging neuroscience research data is detailing a direct connection between brain development and function and motor activity (Coyle, 2009; Diamond, 2000; Doidge, 2007). What motor tasks an individual performs on a regular basis can have a positive effect on brain structures and transmission of impulses within the brain. This includes restructuring pathways in brains that are damaged (Doidge, 2007).

## Aquatics and Movement

Locomotor activities are implemented by the musculoskeletal system, but they are controlled by the central nervous system (e.g., cerebellum, cerebrum). Typical large muscle locomotion in water can include walking, running, jumping, hopping, and kicking. Additionally, use of the arms in a stroke pulling action is a locomotor form possible in the aquatic environment. Those movements involve changes in direction, variation in level from high with the body mostly out of water to low under the surface, changes in velocity, and variation in form or shape. Fine motor activities in the aquatic environment involve handling objects in the water. More specifically, this might include grasping and releasing, lifting, carrying, placing, throwing, catching, and general object manipulation activities.

Many movements in water require additional force production to move against the resistance of water's density. This facilitates development of muscular endurance. Flexibility and joint range of motion is promoted as the body conforms to the buoyant liquid environment. Cardiorespiratory function is enhanced as the individual works to sustain the effort. Thus, physical fitness can be supported and facilitated when water activities are sufficiently vigorous and sustained. We traditionally accept and value aquatic activity as a potential facilitator of motor skill development and fitness.

Potential links between brain development and motor activity were discussed earlier (Coyle, 2009; Diamond, 2000; Doidge, 2007). Those links apply to motor activity regardless of environment. Based on the environment, the specific characteristics of an activity may change, but the physiological process remains the same. The brain and central nervous system control movement in water as well as on land. But what about the value of activity in water used to enhance cognitive development and application of cognition in academic environment?

## Aquatics and Cognition

Professionals in aquatics have failed to recognize and capitalize on the potential for aquatic activity to develop cognition. Thinking, processing, and enlarging the participant's knowledge base should be a part of aquatics for all children. Given the importance of motor activity to growth and development of children, and more specifically the importance of motor activity to academic achievement, it is important that this value be extended to participation in aquatics.

Using activities in an aquatic environment to enrich and reinforce learning in nonaquatic areas of child development is called *water learning* (Grosse, 2007). Water learning means using water activities to help children learn the alphabet, count, recognize colors, read, do math, and perform a host of other academic

tasks. The water learning process establishes a learning environment for children to problem solve, make decisions, obtain feedback, and move through meaningful progressions of activities. Through water learning, cognition can be facilitated.

## Background

Water learning began with the very first water safety instructor who integrated academic concepts with preschool aquatics. Like other wonderful educational concepts, water learning was developed by many different instructors, at many different times in history, coming to the fore when professionals recognized the broader value of the water learning concept and put information into publication.

Connie Curry Lawrence led the way with her movie *Splash* and her text, *Water Learning*, coauthored with Hackett (1975). Material in the American Red Cross' *Methods in Adapted Aquatics* (1976) further emphasized the value for not only water learning, but also for the pedagogy of movement exploration, problem solving, and application in aquatics of the emerging information related to perceptual motor development.

Water is a unique activity environment. The very circumstances of being wet, experiencing water evaporation on the skin, moving against the density of the liquid, hearing and feeling a splash, tasting the substance, and smelling the odor of a pool stimulate cognition. The brain must process this environmental sensory input. In comparison to a child's daily home, school, and community environments, where the child spends the majority of his or her time, the aquatic environment can be new, different, and challenging.

Activities performed within the aquatic environment take on new and possibly different characteristics. Moving against fluid resistance requires greater effort, while standing and walking may be facilitated through buoyancy. Perceived weight of objects changes as objects are either submerged or elevated in or out of water. Viewing an object visually changes as a child views that object through water, with eyes above and then through water with the face submerged. The very act of breathing changes dramatically when a child submerges.

The unique qualities of activity in water can provide a learning environment very different from a traditional classroom. For the child experiencing limited success in classroom activities, having a chance to try those same activities in water can open a whole new world of opportunity. Careful planning of water learning activities can stimulate cognition and support academic growth in spelling, reading, language, math, science, social studies, and creative arts. Children who have learned to dislike traditional academic tasks can experience enjoyment and success when those same tasks are taken to the pool, thus providing children a whole new perspective on academic mastery.

## Application

Given water learning has been a part of aquatic programming for over 35 years, we might ask why activities such as "Marco Polo" are so prevalent in aquatics? Speculation could generate the conclusion that these activities are familiar, easy to implement, and simple to pass on from child to child. But do these activities do justice to the potential the water environment has to provide meaningful experiences for children? Do they really promote water learning?


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The first time an activity with a water learning focus is introduced, it will not necessarily be familiar to the learners. Implementation will require planning and purposeful repetition. Children may or may not be able to pass on the activity to other children because it may be more complex than the more mindless "Marco Polo" and may require some adult facilitation. Repetition and variation are the keys to on-going success of defensible water learning activities. Just as jump rope rhymes can make children think as they generate lists of items to name while jumping, so can frequently implemented water learning activities generate similar degrees of familiarity. Once an instructor, parent, therapist, or group leader begins to think in the water learning mode, holding in mind the broader purposes and goals that water activities can attain, modifications will come more naturally and planning will be easier. Experiencing fun and success with water learning activities will encourage children to play them again and again, passing them from child to child. Table 1 contains examples of how academic factors can be built in to more traditional aquatic activities.

***Problem Solving Approach.*** A critical factor in water learning is employing a problem solving instructional approach. Participating children need time to analyze the task and/or directions and make decisions prior to implementing action. Phrasing the activity problem as a question sets the stage for successful responses. "Can you . . .?" or "How can you . . . ?" or "What would happen if . . .?" are typical exploration or problem solving questions. If the first problem question is broad and general in nature, something children almost certainly will be able to do successfully, they will be reinforced to repeat it under more challenging conditions. Progressing gradually to more complicated questions and tasks will provide a setting for children to refine their responses successfully. For example, to provide an activity to help children get used to moving through the water and orient them to the pool environment, after pointing out the boundaries of the activity, the instructor may ask . . .

> "Can you move around our activity space?" (This is a very general "starter" question and any movement the child makes can be praised.)
>
> "Can you move a little faster?" (This question refines the speed of the movement, especially useful for a child who may start out in a very timid fashion.)
>
> "Can you move even FASTER?" (This question further refines the speed of the movement, done with voice inflection.)
>
> "Can you move very slowly?" (This question is intended to help the child learn the difference between fast and slow movement pace, and is most effectively done with a very slow, extended speech pattern.)

This progression should end prior to children reaching a point where they appear frustrated, confused, or perhaps fatigued.

> "Can you move very slowly with your back to the side of the pool, your hands on your head, and your knees coming up to the top of the water?"

This last problem is clearly much more difficult, with many different problems to solve — speed, position in relation to the side of the pool, parts of the body, and location of the surface of the water.

**Table 1 Conversion of Traditional Aquatic Activities to Water Learning**

| Traditional Activity | Water Learning Enhancement | Cognition Reinforced |
|---|---|---|
| Submersion with eyes open. | Looking at pictures (laminated cards) underwater and coming up and saying what was seen. | Object identification and naming. |
| Picking up submerged objects. | From a larger group of random objects, picking up objects that match or go with each other or match a picture shown on deck. | Matching, purpose recognition. |
| Bobs and bubbles | Counting by letters of the alphabet, rather than by number. Spelling out a name to count bobs. | Alphabet recognition, spelling. |
| Moving around by groups (cross pool formations). | Call groups by color or animal name. | Learning names of colors and/or animals. |
| Water warm-up/orientation. | Move around like different animals. | Animal identification and movement recognition. |
| Repetitions of practice. | Present the number of repetitions as a math problem, i.e., "do 10 minus 3 kicks." | Math calculations. |
| Positioning for practice or activity. | Vary the relationship asked for when assigning positions, i.e., "stand with the wall behind you" or "stand with your back against the wall" or "stand in front of the wall." | Position in space, relationship of objects. |
| Floating. | Count by spelling, count by naming objects. | Spelling, categorization and naming. |
| Bubble blowing. | Speak name, address, phone number, names of family members and pets. | Oral communication and naming. |
| Breath holding. | Hold breath and perform some other motor task for a specific number of times, i.e., hold breath and clap hands 6 times or 6 plus 1 times. | Counting, math computation. |
| Cleaning up bottom of pool after a dump of lots of sinking toys. | Clear half the area or a quarter of the area at a time. | Fractions, sectioning. |
| Swimming laps. | Pick a destination and swim the distance equal to the destination. | Mapping, measuring distance. |


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A problem solving approach can lead children into including academic components in more traditional aquatic activities and games. For example, when diving for submerged objects, plan for objects that go together, offering the opportunity to emphasize relationships. This creates a typical matching activity. It might start with "Can you find something that goes with a sock?" at which point the children should select a plastic shoe from a collection of submerged objects. When children play together with a variety of objects without adult facilitation, they can try to challenge or stump each other in diving for specific types of matching objects.

Problem solving, when individualized, can mean children can progress at their own rate. Notice in the above samples, depth of water is not specified. The children could go where they felt most comfortable. Duration of the movement was also not specified. The children could stop and rest if desired. Nor was the type or precision of locomotion or other aquatic movement specified or determined. Swimmers could paddle or swim. Nonswimmers could walk. Faces could be in or out. Lots of choices were left to the children. Child-centered choices promote developing children's self-esteem. As children usually pick paths where they think they will be able to complete the task successfully, choice is a powerful motivation.

***Alternative Aquatic Environments for Learning.*** A swimming pool is not required for water learning. While some children happily learn and grow during activities in large pools, other children do better in smaller, more subdued or self-contained environments. A bathtub, wading pool, or large bucket has provided many successful swimmers with their first aquatic start. While a smaller, shallower self-contained environment may not lend itself well to promoting gross motor activity, it can provide an ideal venue for promoting fine motor development, along with water acclimatization and breath control.

In a smaller aquatic environment, water can be scooped, poured, measured, and dumped. Body parts can be water brushed, washed with a washcloth, or rinsed with a sponge. Words can be spelled underwater with alphabet blocks. Submerged objects can be counted and retrieved from a variety of bucket depths. Bubbles can be blown not only through the mouth and or nose, but also through a straw, plastic flute, or bubble ring. Interaction with water can take place almost anywhere. No special skills are needed to facilitate water learning aside from an openness to exploring and individualizing learning. Objects readily found at home can be used. Most important is a desire to provide purposeful, problem solving activities, with an academic focus based on engagement with water.

Just as water learning is adaptable to any water source, it is also adaptable to almost any age group. The examples provided here, for the most part, are oriented toward preschool and elementary school age children. Anyone can benefit from having to apply cognitive processing to a motor task. Cognitive tasks can be selected on the basis of age, developmental level, ability, or need. Problem solving works with any age learner. With creativity, the full potential of aquatic activity can be realized for anyone.

## Research Implications

Activity implementation of water learning is just a beginning. To be truly accepted as established aquatic curriculum, research must confirm the contribution water

learning makes to child growth and development. Research questions might include, but are not limited to, the following:

- Do children participating in water learning activities perform better on traditional academic tasks? At what ages? For what specific academic tasks?
- Does water learning facilitate learning in one specific academic area over another?
- Does use of a movement exploration/problem solving approach during water learning facilitate problem solving in other areas of cognition?
- Are there specific developmental stages during which water learning is most effective?
- Are there specific populations of individuals with disabilities that can benefit from water learning?
- Is there a specific frequency of participation appropriate to implementation of water learning?
- Are there differences in the results obtained from water learning activities implemented in a pool environment vs. an environment outside of a traditional pool?
- What environmental factors have the greatest effect on the water learning process?
- How do water learning activities affect classroom behavior of children having difficulty in academic tasks?
- How can we better prepare aquatic professionals to implement water learning activities within traditional aquatic programs?
- What types of water learning activities have the greatest transfer of learning potential?

## Conclusion

Readers might be wondering whether we must abandon "Marco" and "Wheels on the Bus." No, not really. But, if an activity—any activity—is destined for endless repetition, we can make that activity more educational. For example, "Marco Polo" is, essentially, a matching game. Marco, the first name, searches for a "match" with the last name of Polo, and, of course, Marco Polo was an explorer, searching for new lands. But, there could be other matches to search for. Almost everyone has searched for a mate for a lost sock or a missing glove. We might encourage children to play "Marco Polo" as a random matching game. The first person, the person searching, calls out any object. The person trying to elude capture must respond with something that normally can match with the object called. For example, "sock" can match with "foot" or "shoe." "Fork" can match with "knife." "Cup" can match with "saucer." Encourage children to expand the concept to actions. "Kick" can match with "ball." "Bake" can match with "cake." The seeking game stays the same, but by changing the concepts used, an additional learning factor becomes built in.

"Wheels on the Bus" is a familiar tune and is typically employed as an orientation game for young children in the water. What if the instructor kept the tune, but changed the lyrics? "The wheels on the bus go round and round," etc., can become a counting game:


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"One plus one will equal two, equal two, equal two" (and instead of circling round and round, perform single and then double jumps in place).

"One plus one will equal two, that's how we do math."

Working through all the arithmetic tables could provide lots of lyrics. Interjecting the appropriate number of movements (e.g., kicks, arm waves, bubbles, etc.) will reinforce the concept.

Aquatic activity has always been proposed as a means for developing skills and knowledge that might one day save a person's life when in or around the water. Through water learning, not only can this higher purpose be met, but also lives of individual children can be enhanced by facilitating cognitive development. Consider tapping the full potential of aquatics by building water learning into many more aquatic activities.

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