# STEM and physical education: Making connections for our students, building strength for our profession

By: Misti Wajciechowski and Michael Hemphill

Wajciechowski, M. & Hemphill, M. A. (2019). STEM and physical education: Making connections for our students, building strength for our profession. *Strategies: A Journal for Physical and Sport Educators, 32*(6), 43–45.

**This is an Accepted Manuscript of an article published by Taylor & Francis in Strategies: a Journal for Physical and Sport Educators on November 18, 2019, available online: http://www.tandfonline.com/10.1080/08924562.2019.1658435.**

**Abstract:**

The purpose of this article is to illustrate how preservice and in-service physical educators can advocate for their programs by connecting PE curriculum to STEM. Two specific examples are given related to developing a STEM in Sports Day and integrating STEM into the curriculum through courses taught in the teacher education program at a university.

**Keywords:** STEM | sports day | PE

**Article:**

Quality physical education is built on national and state standards and strives to develop physically literate individuals (SHAPE America –Society of Health and Physical Educators, 2014). Additionally, however, physical educators can help to develop holistically educated students and advocate for their programs by integrating information from other disciplines, including those related to science, technology, engineering, and mathematics (STEM; Erwin, 2017). For example, math is woven into physical education (PE) as students experience lessons on patterns of movement, create flight pathways with manipulatives, and utilize pedometers to determine mean, median and mode of activity levels. Physical educators can also integrate technologies, such as quick response codes, heart rate monitors, and mobile apps to create 21st-century learning experiences for students. The purpose of this article is to illustrate how preservice and in-service physical educators can advocate for their programs by connecting PE curriculum to STEM. Two specific examples are given related to: 1) developing a STEM in Sports Day and 2) integrating STEM into the curriculum through courses taught in the teacher education program at Virginia Commonwealth University (VCU).

## STEM in Sports Day

Misti is an assistant professor of health and physical education at VCU and prepares preservice physical educators and classroom teachers. Similar to all teacher education programs, we partner with schools and communities to provide relevant field experiences for students. The development of one community partnership, called STEM in Sports Day, has been particularly impactful. The partnership includes VCU's School of Education, University Athletics, and Richmond City Public Schools, and aims to introduce K–6 students to sport-specific technology and hopes to spark an interest in STEM fields. STEM in Sports Day is an annual event that serves over 400 students rotating through 20 STEM and Sports stations. The event has also grown to include professional development for elementary and middle school teachers. The professional development provides teachers with a more in-depth perspective on the connection between STEM in sports and its value in education. Physical education teachers are introduced to technologies that encourage skill development and reinforce content students are learning in science and math classes. For example, as students work on their basketball shot using a Bluetoothenabled basketball, they learn how to use an appropriate arch and angle to increase their success. Physical education teachers can utilize the scientific method to have their students develop a hypothesis around the impact of an individual's height and vertical leap.

STEM in Sports Day also provides opportunities for preservice teachers, as they prepare and facilitate learning experiences for K–6 students. One example of an activity at STEM in Sports Day involved virtual reality where students placed themselves inside professional football stadiums and were guided in conversations about the engineering and technology skills needed to build athletic facilities. At another station, students learned about how analyzing shot accuracy, defensive or offensive strategy effectiveness, and individual player performance can direct future coaching and teaching experiences. Preservice teachers led stations focused on sport technology that showed students how to collect and analyze data, as well as use the scientific method to make predictions on speed and rotation through a soccer lesson. This experience helped to expose these preservice teachers to not only what we as physical educators do in our classroom but to the possibilities of collaboration and support across all disciplines. Physical educators are often fighting against marginalization in schools and this experience gives them avenues to lead educational initiatives while building relationships with their colleagues.

**STEM and Physical Activity in the Classroom**

While the STEM in Sports Day is an effective annual event, it is only for one day and may not be enough to develop an understanding of physical education and how it connects to other curricula. Building on service-learning principles and experiential education (Furco, 1996), VCU's course on physical education for classroom teachers partners with 10 local elementary schools to develop and implement movement-based STEM lessons to connect classroom content through physical education. From the beginning of the fall semester, the preservice classroom teachers work with the physical education teacher to teach up to five STEM lessons. Although they are at times uncomfortable teaching in a physical education environment, these preservice

teachers come to value movement as a platform for learning. Reflections completed by the preservice teachers after their teaching experiences consistently acknowledged the importance of creating daily movement opportunities for students while in the classroom. Additional comments noted a recognition of how some students thrive when lessons, including movement, were taught.

The ultimate goal of this course for preservice teachers is to develop an appreciation for the added value, such as increased academic success, that movement brings to the classroom (Donnelly & Lambourne, 2011). Elementary students are typically taught about simple machines using worksheets or shown images of how simple machines provide a mechanical advantage for decreasing effort to perform work. Through an active lesson, students physically experienced how a lever and fulcrum distribute weight to balance an uneven load. These preservice teachers now have working knowledge on new technologies, such as a soccer ball or a basketball that connects via Bluetooth to provide data on performance, as well as an awareness for the magnitude of responsibilities of a physical educator. The elementary students also receive movement lessons designed to reinforce concepts on topics such as magnetism, electricity and sport technology. The increased community engagement through this service-learning experience brought excitement for the elementary students, teachers, and VCU faculty members and preservice teachers. These students had never seen or used a basketball or a soccer ball that connected to an iPad or phone that would give them personalized feedback such as arc, speed, flight patterns, and rotation.

**Conclusion and Final Thoughts**

While physical literacy should remain the cornerstone goal of effective physical education programs (SHAPE America – Society of Health and Physical Educators, 2014), physical educators can capitalize on the popularity of STEM disciplines to create cross-curricular programming that helps them to advocate for their programs. As physical educators we teach math and science all of the time. We ask students to engineer or develop ideas for improving physical activity and assess students through a variety of fitness-related technology. Physical education is one step ahead in connecting to STEM concepts. Regardless of if you are a physical educator, a classroom teacher, a teacher educator, or administrator, integrating STEM into movement has the potential to benefit everyone. A willingness to initiate or be part of a conversation is the first step. Second, look for what is already happening in your school and start making connections. The sport technology was impactful and definitely caught the eyes of all involved. However, if working on a tight budget, as many physical educators are, consider starting small. Begin by having conversations with the other content-area teachers in your building. Think about what you do that may align with STEM and invite your colleagues for an afternoon walk and talk, and you may be surprised at the connections and ideas that will begin to flow. Physical education class, especially in elementary school, is often offered only once per week. Engaging classroom teachers early to include movement opportunities, especially STEM initiatives hopefully will move toward the development of a more active learning experience for

all students in all disciplines. Rather than being viewed as a marginalized subject, physical education can be seen as the connector to all other disciplines. As the conversation continues about the importance of increasing physical activity opportunities for our youth, physical education teachers are in prime position to lead the way.

**References**

Donnelly, J. E., & Lambourne, K. (2011). Classroom-based physical activity, cognition, and academic achievement. Preventive Medicine, 52, S36–S42.

Erwin, H. E. (2017). Full STEAM ahead in physical education. Journal of Physical Education, Recreation & Dance, 88(1), 3–4. doi:10. 1080/07303084.2016.1249759

Furco, A. (1996). Service-learning: A balanced approach to experiential education. In B. Taylor (ed.), Expanding Boundaries: Serving and Learning (p. 5). Washington, D.C.: Corporation for National Service.

SHAPE America – Society of Health and Physical Educators America. (2014). National standards and grade-level outcomes for K– 12 physical education. Champaign, IL: Human Kinetics.

Misti Wajciechowski (muellermr@vcu.edu) is an assistant professor in the School of Education at Virginia Commonwealth University, in Richmond, VA; and Michael Hemphill (mahemphi@uncg.edu) is an assistant professor in the Department of Kinesiology at The University of North Carolina at Greensboro, NC