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Digital Device Use in Urban Elementary Physical Education Classrooms: Viewpoints

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Digital Device Use in Urban Elementary Physical Education Classrooms: Viewpoints

From Practitioners

by

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Abstract

Elementary physical education teachers and the use of digital devices in their classrooms are evolving. From simple step counters to Apple Watches to track the movement and skills of students, the digital tools available for physical education teachers are more prominent than ever before. This case study looked at how urban elementary physical education teachers use digital devices in their classroom, pre-covid-19, and during covid 19. In an upper-Midwestern setting, this research used a qualitative case study to find examples of digital device usage by urban elementary physical educators from one school district. Data collection methods included an online survey, a questionnaire, and semi-structured interviews. Participants were selected from the online survey and those chosen were based on criteria of geographic location in the district, the number of years teaching in the district, and interest in being a part of the case study. Areas of future research include other geographic locations in the state to cross-analyze how different elementary physical education teachers in rural, urban, and suburban school districts use digital devices.

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KEY TERMS:

Digital devices: Handheld electronic/battery-operated devices used by teachers and students in physical education.

Equipment: Non-digital device pieces used by students and set up by the teacher to use in games, activities, and play.

Exergames: "to combine exercise and digital gaming engagingly" Lindberg et al. (2016) (p. 329).

Global Positioning System: an accurate worldwide navigational and surveying facility based on the reception of signals from an array of orbiting satellites (https://www.google.com/search?q=gps+definition&oq=gps+de&aqs=chrome.1.69i57j0i433l2j0l7.3580j0j7&sourceid=chrome&ie=UTF-8).

Physical education: An academic subject, planned and sequenced K–12 curriculum (course of study). The curriculum is based on national standards. Physical education provides cognitive content and instruction. The content is designed to develop motor skills, knowledge, and behaviors for physical activity and fitness. Supporting schools to establish physical education daily can provide students with the ability and confidence to be physically active for a lifetime. (Physical education, cdc.gov. https://www.cdc.gov/healthyschools/physicalactivity/physical-education.htm)

Technology: A combination of digital devices and electronic equipment that physical education teachers use in their classrooms.

Urban elementary physical education teacher: A physical educator in a school district with 30,000 or greater students.

Urban school district-student population: A school district with 30,000 or greater

students.

CHAPTER ONE

Introduction

"If you have a body, you are an athlete!"-Bill Bowerman, co-founder of Nike.

Dissertation Overview

My primary research question is: how are digital devices being used in urban elementary schools by physical education teachers in their classrooms? This constructivist case study used surveys and then interviews with elementary physical education teachers in an urban school district about how they used different digital devices before covid-19 and during distance teaching. Following the primary research question, five guiding questions allowed for unpacking information on the teachers.

- **Primary research question**: How are urban elementary physical education teachers using digital devices in the classrooms?

- **Guiding question one:** What are elementary teacher's primary purposes for using digital devices in their physical education classes to support the attainment of learner outcomes?

- **Guiding question two:** How do elementary physical education teachers describe the current usage of digital devices in their classrooms?

- **Guiding question three:** What are possible descriptors and factors that either support or form barriers for the use of digital devices in the urban elementary physical education classroom?

- **Guiding question four**: How do urban elementary physical education teachers describe their perception of their role in physical education class during the coronavirus of 2020?

- **Guiding question five:** With digital devices, what role do urban elementary physical education teachers serve regarding motivating their students to participate in physical education? And is the self-determination theory part of providing motivation for students with digital devices?

How do urban elementary physical education teachers use digital devices in their classrooms? This is a question that has been on my mind for the past seven years being in an urban school district as an elementary physical education teacher for almost two decades, I have seen the comings and goings of physical education curriculums. With the increase of digital devices, my inclination is digital devices in physical education are a fad and would go away after a few years. However, the trend of using digital devices in the district I work in took hold as every student is issued an iPad. Immediately, I pushed back on the use of the iPad in my classroom. I had three reasons for this pushback: the first is a personal philosophy against devices in my class, the second is the amount of time to train using digital devices, and the third on how much movement time is taken away from students to teach physical skills.

My philosophy regarding digital devices is that they are not needed in physical education, specifically at the elementary school level. Our school district puts focus on student use, and in particular, iPads, to improve equitability amongst all students (Thieman & Cevallos, 2017). Originally, I wondered how students would be able to learn

motor skills with an iPad in their hands. This gave me pause to any digital device used in my classroom. The second issue was the amount of time to establish a curriculum that included digital device learning and implementation as learning and implementation time is only during professional development meetings and is rare for physical education teachers as we meet only once a month and after school. My learning of digital devices was limited by how much training I was allotted to utilize the devices due to my teaching schedule. The third and most prevalent reason is learning about using the devices and the time taken from students to learn physical skills. Students need to move and play; not stare at screens while a ball then strikes them in their head. The concerns I had for using digital devices outweighed the potential for providing a better pedagogy. All of these concerns are discussed in detail throughout this study. These thoughts stem back to my youth where any devices were scarce and rarely utilized in the 1980s, which I will discuss later in this chapter.

My case study research aimed to find themes from urban elementary physical education teachers' digital device use in their curriculum through surveys and interviews. The paradigm selected to answer my research questions was through a constructivist lens. The constructivist paradigm allowed teachers to be interviewed and an opportunity to generate their narratives. The teachers participating are all in the same school district, same content, and teach the same grades. Therefore, a case study was selected as the methodology. But why choose this topic? Why investigate what you do not want in your classroom? Because I wanted to know what others thought and the impact devices may have in their settings.

Determining to investigate my thinking, I decided to interview elementary physical education teachers in the school district to find what digital devices they use and how the device is used. At the beginning of the case study, a survey was emailed to all 41 elementary physical education teachers. I wanted five to ten teachers to interview. Each teacher in the district, myself included, teaches approximately 150 students a day; kindergarten through fifth grade. Knowing the similarities between the teachers and me, strengthened the reasoning for a case study to investigate device usage.

Chapter Preview

This chapter includes sections and topics related to digital device usage in physical education—hand-held technologies for students using and receiving feedback. I am researching digital device use by elementary physical education teachers in an urban school district and how those teachers use them in their curriculum. I reflect upon my digital device use throughout my life, specifically my career as a physical education teacher.

The first section is my personal experience with digital devices. Then, how my dad was integral to my development as an athlete through his work as a sports broadcaster on the radio and his use of technologies and digital devices. Next, I write on my work as a physical education teacher and how digital devices fit into the curriculum. Finishing with how new technologies improved my teaching students. Throughout the chapter with device application via professional learnings, I discovered how to use digital devices from the national physical education teaching and learning standards and that provided a framework on how digital devices can be incorporated into my physical

education curriculum. I provide examples of challenges and supports associated with digital device integration followed by how the context and importance of my research topic are to the field of physical education. I discuss how digital devices are relevant to physical education and the importance of using digital devices to enhance learning. Lastly, why I chose this research topic and the meaning behind it. Establishing how chapter one is laid out, the beginning of my experience with digital devices began on a dirt road in a small midwestern town where I was free to wander and play until dinner time; never knowing the time, only when we were hungry we had to return home for dinner.

Rationale for Research

Being an elementary physical education teacher, my students use more digital devices than I ever did growing up in the 1980s and 90s where digital devices were rare, expensive, and not user-friendly. I was raised in a rural town (which I will unpack later in this chapter); a stark contrast to my urban students growing up in the 21st century.

Digital devices and their use are vastly different than in the world I grew up in and have recently been prevalent in physical education. New devices continue to make their presence known in schools like Fitbits, iPads, heart rate monitors, or pedometers. As a physical education teacher, I slowly introduced digital devices in my classroom over eighteen years to enhance my curriculum. Examples included music from my smartphone to a Bluetooth speaker, using YouTube videos with a projector for learning skill development, and having my iPad to record student skills for them to review.

Seeing how digital devices were well received by my urban elementary school students, I was interested in how the implementation of digital devices with other teachers in the district was going. As I began my research, the verbal receptiveness from peers for the applications used and approved by the school district in pieces of physical education curriculum has been mixed. Many admitted not using any applications. When reading articles on digital device integration, there are more issues than successes and will be discussed in chapter two. For receptiveness or problems for digital devices, being able to interview my peers provided insight into where devices use in my district the elementary physical education classrooms occurs.

My school district is diverse ethnically, economically, and intellectually. Each student in the district has an iPad yet the use of that iPad in classroom settings varies. With 41 different elementary schools, the amount of diversity amongst all degrees across the district is expansive. Knowing from exchanges with colleagues a large number of teachers in other schools, different elementary physical education teachers use digital devices similarly, differently, or not at all.

While in the physical education classroom, there are topics I considered using with digital devices: Accessibility, new digital devices and their role of expanding, enabling, or constraining teaching practices, accommodating for differing physical bodies of students, motor skill capabilities, and cognitive development. Each is tied to physical education yet how do I address each of these needs for students? These will be addressed throughout this case study.

Over the last seven years of teaching elementary physical education, the shift into using digital devices in my classroom has created new methods of assessment, curriculum, and opportunities for students to be actively engaged. Assessment of student skills is done through my iPad and linked to the student's grade account. Students can see their grades on their iPads anytime. This allows them to have a dialogue with me about their grade. Accessibility to scores provides clarity and transparency for all stakeholders. My curriculum has a daily digital device component. Whether I have an exit card or Padlet (see Appendix B) for students to fill out when they leave, or a video to demonstrate how to swing a bat, digital devices are used. Their engagement improves when a pedometer or a stopwatch is used for the day. I was pleased with how active students are when they have a pedometer. I gave students a pedometer team color (black, blue, pink, or gray), and the competition flourished. The amount of extra work the student did with the pedometer was greater than without. Students wanted to keep moving; they were sweating and disappointed when it was time to leave. However, while I started to improve with digital device use, I began to have opinions on how difficult digital devices are introduced to new methods of learning to 5-11-year-olds at the beginning of a school year.

Biases and a Factor

One bias that I felt most elementary physical education teachers would agree with me is the difficulties of using digital devices. Another is I wanted students to move more than to look at a screen, play games more than analyze angles, and be social with their peers. A third bias is the expense of digital devices. An example is in 2019, I was

awarded a grant of $2,500 for 45 FitBits. Knowing I had limited resources, attempting to pair a FitBit with 500 student iPads was daunting and overwhelming even before opening the boxes. Those FitBits are still in their boxes; unopened because I am befuddled with the set-up and have no time for an in-service to have someone come and help—or asked for help.

Yet my main bias with digital devices is the time they take away time for students to acquire new physical skills. The concern is digital devices do not help students catch, hit, kick, throw, or any other physical skill. While videoing students and reviewing their skill practices over time may help in assisting in learning how to perform the skill correctly, I believe the devices do not produce results over the physical practice. When rewatching the video with the students and their performance, the time it takes to view, hold the student's attention, decreases the amount of time there is to work on the skill physically. Knowing these biases with the use of digital devices in my classroom, then having twenty-five students who are five years old, my position regarding digital devices is against their use in physical education.

Another factor is the time it takes to set up physical education equipment. Examples of setting up the equipment included cones, goals, or volleyball standards. Then tear down, set up for a new class; set up again, and tear down for a different grade. Tear down and set up occurs in my classroom while a while class leaves and the other is entering the gym. Elementary physical education teachers have no time in between classes. Now add twenty-five devices to collect from students and the stress level increases throughout the day. My opinion of individual digital devices for elementary

students is they take more time than what is needed. The outcome along with the amount of time for me to set up the usual equipment for class and get their devices ready is too much to incorporate devices.

My thoughts narrow on the device's issues and obstacles. Pyle and Esslinger (2013) investigated the technological obstacles in physical education. Their thoughts revolved around how digital devices and physical education tend to be on "opposite ends of the educational spectrum—one sedentary and the other requiring movement" (p. 35). They believed it is challenging to establish that bridge from physical education and activity to digital devices and screens. Two specific obstacles presented themselves in their research were educational administration and self-imposed roadblocks by physical education teachers themselves.

Educational administrators and committees associated with digital device budgets tend to rebuff any digital device needs in physical education Pyle and Esslinger (2013) found. An example is the implementation of an interactive whiteboard, which is found in all of the classrooms at my school. The feasibility of having an interactive whiteboard in the gym does not justify having one due to "a lack of internet capabilities, wiring, and safety concerns and because the gym is a multipurpose facility-often used for lunch, assemblies, interscholastic competitions, band, and choral concerts, and so forth" (Pyle & Esslinger, 2013, p. 35). I can attest to this list as other activities take place in my classroom that would cause damage to the whiteboard.

Another obstacle is teachers having self-imposed roadblocks even when, as suggested, that most physical education teachers do see the strong relationship between

digital device use in their subject area. The concern for some physical education teachers is not knowing how to fully implement devices, namely due to inadequate time for teachers to understand the full potential and use of digital devices as a curriculum tool. Pyle and Esslinger (2013) found that beginning with a basic webpage for physical education teachers provides them with an opportunity to slowly develop the importance of digital devices as part of the pedagogy. Even with some positives, there are more challenges. If teachers and school administrators work together, a joint initiative could produce positive results similar to my experiences.

Personal Significance

My use of devices over forty-two years of life is described in three categories: rural life, my dad, and growth with sports and devices. The first category describes my journey as a young athlete growing up in a rural, low socioeconomic town attempting to improve my athletic skills. Next, I describe my dad and being a sports broadcaster forced him to integrate technology into his career. Lastly, I explain moving from rural life to the city as a college athlete and how devices influenced my capabilities as a collegiate runner.

Rural Life

The small town I grew up in has a Catholic school where my parents sent me from kindergarten to eighth grade with only eighteen students in my grade. In physical education class, we never used digital devices. We played games that relied on our sweaty feedback. Occasionally we monitored heart rates by counting out loud six seconds from our carotid artery. I did not know what a pedometer was, an iPad was 35 years away

from development, or any use of a video camera to capture my skills in physical education. Since then, the use of devices has changed and become more prevalent.

My family had a house on a dirt road on the west side of town where there was and still is, little economic commerce. We finished chores early in the morning then we loitered outside, playing with the neighborhood boys throughout the day until evening when my family gathered around the dinner table. My dad, who grew up on a small farm, had dreams of playing college sports but was sidelined by an injury from a high school football game. He loved sports and gave me guidance growing up on how to improve, specifically through his time broadcasting high school sports on the radio.

My Dad

My dad was a radio sports broadcaster in rural communities for 45 years. He would tell me about the high school basketball and football games he broadcasted; his voice was crafted for radio. It was a different tone than the hardened voice I heard after his workday. I believed his voice mellowed for the love of sports—its competitiveness, work ethic, and comradery. I used his voice in my head as the play-by-play announcer as I worked on my jump shot in the dirt driveway, pretending he called my practices like games, picturing him watching his son drilling the open three-point shot to win the game. His love of sports got me hooked on the ones he broadcasted. I relished being involved with my dad. One day, I hoped he would call my games when I was in high school namely football and basketball. Sadly, he retired due to health concerns early and passed away from heart disease in 2010.

As an elementary student, my dad and I traveled in his blue, 1982 Ford Fairmont with a hole in the driver side floor to small high school gyms and stadiums packed with fans from the neighboring small towns. Scores of people wanted to talk with him. They tried to get his opinion on the prospects of each team and if a state tournament bid would be on the horizon. He had a knack for being accurate on how the season would go for each of the teams he covered. I loved it when the locals talked to him. I felt like a celebrity too! That continued when we made a move from the northern part of the state to the central region. His digital devices up north were antiquated. Compared to the devices he had up north, these new digital devices, while smaller, better, and updated, still gave him problems.

Being on the radio meant my dad dealing with technology which consisted of hooking up the transmitter into a phone jack, dialing the number to the radio station from the transmitter, and establishing a signal. Once the signal was set, he was able to talk to those in the studio and broadcast the game. Often the signal was lost so he would start the process over again. I remember how upset he would be when anything would happen to that phone jack cord. Digital technology never came easy to him.

My dad never really learned about the internet or the use of a smartphone. What he used to teach me was his keen sense of movement with his eyes, watching me throw to targets over and over in our backyard. My dad knew sports and what physical skills and intangibles meant to athletes. He had pride in seeing my mechanics improve as I listened to his adjustments saying, "Elbow up!" or "Eyes down and follow through." He slowly groomed me for a multitude of sports.

When he was working, I had to have something to demonstrate my progress, specifically for basketball. The only method I had was paper and pencil as the ink in the pen would freeze up shooting hoops in -15°F. Those evenings in the dark, rain, or snow, every 50 shots I recorded my makes on a yellow legal pad in our garage. Eventually, I began recording from different areas on the dirt driveway and created charts to specify where I was making more shots or missing them. Reflecting on my work, I realized recording data on the legal pad was time-consuming as taking off my gloves in the wintertime was cumbersome. As a young athlete, the value of recording my shots on paper with ownership of each shot was high yet the time and energy to do this took the effort to improve.

Growth with Sports and Devices

Each night, through every Minnesota season, I recorded data. For football, I threw passes against 6' targets in our backyard. In golf, I chipped golf balls over the garden to a flagstick 50 yards away. During baseball season, I tabulated how many home runs I hit, tossing the ball to myself and smacking it over the fence three houses down. My family could not afford a video camera in the late 1980s so documenting my progress was my own.

When I practiced, the feedback I received was the results of a made basket, a smash of the baseball off my wood bat into the neighbors garden, a golf ball I struck landed near the pin I made up with an old flagstick. Any feedback was self-driven through and recorded on that yellow legal pad. When I was called into the house late into the evening, I would tally up the hits or make baskets against the number of attempts to a

percentage. Then the variable of weather was recorded and plotted days of similar temperatures and wind. The information was pertinent to my progress as I honed my skills outside in the wind, sun, and other factors Mother Nature threw at me. This intrinsic motivation derives from the self-determination theory research in the literature review in chapter two.

I grew up physically faster than others my age. My birthday is in mid-July which helped me in kindergarten through tenth grade where I was bigger, faster, and stronger than most. Athletically and academically, I felt superior to kids my age. I had a sweet yet tough persona due to our family being on food stamps in the 1980s We did not have any luxuries; renting a video cassette player from the video store until 1992 when we bought our own. As I practiced, no devices indicated the number of steps I had taken or the use of a video for a jump shot. The only device I had was a Timex watch I would use to bike to friend's houses, attempting to better my time in any weather condition. By the 1990s, I was one of the most athletic students in high school and moved up in the ranks of varsity football and basketball.

I had to improve my skills because I wanted to be better than the neighborhood boys. The older kids on the block pushed me, literally and metaphorically. If I worked harder, I learned I would eventually win. Skill and size were key and by eighth grade, I was the best athlete in my grade of 350 students (in my own opinion)—I was 6'2", 160 pounds, and lifted daily. There were few things I could not do on the court, field, or arena. I wanted to be a professional athlete. The drive to improve came from my self-determination and motivation and the other piece was from good coaching.

The self-determination theory is a range of intrinsic or extrinsic motivation in individuals. When used in physical education, motivation moves from those who have the intrinsic motivation participating without nudges to those who need nudges to large extrinsic motivators needed to do the most basic tasks. With my students, I question if each student needs to be nudged to be motivated, or do they have the drive to be intrinsically motivated?

I have noticed with many students in the different areas where I have taught are fairly intrinsically motivated to be active in physical education. I look back at growing up in the 1980s with no digital devices documenting the accuracy of my shot, the speed at which I ran, or analyze the flight pattern of a ball struck off my old wooden bats. How was I motivated to improve? The answer: because I was driven to improve and still am intrinsically motivated to improve.

As high school went on, other students caught up with me physically in football, basketball, and baseball. One evening before my tenth grade football season began, I went for a five-mile run with my friends, Noah and Steve. During the run, I felt challenged. I struggled yet finished with them. That night, I decided to be a cross-country runner and quit football. My parents were furious! "You will hurt your knees! Why switch after putting in all this work?" My cross-country coaches though focused on my hard work and did not use digital devices like cameras, step counters, or heart rate monitors. The only form of feedback from a device I remember was that Timex I had. From sports to academics, as a high school student, I was becoming aware of the forms of digital devices like global positioning satellite devices or cameras to analyze stride

length. Now, 20+ years later as an educator, digital devices made their way in my daily

life as a teacher and runner.

Running took me away from the small-town life as I needed to leave. I felt

squished by the lack of resources and diversity of people. Luckily, I was recruited to run

for a few universities. They wanted my email address and in 1996, I first learned what an

email was. Being recruited to run collegiately and how these written communications

were instantaneous to others across the country was bizarre to me.

Moving on to college, I focused on being a cross country and track runner and a

student was second. My first year was at a division two school in the northern part of the

state. I transferred to an urban university where coaches used video stride analysis to help

me improve and my hard work with their coaching. Here I began to acknowledge the

attributed success from video work to learn about my stride frequency and stride length:

two critical areas for distance runners to improve in. Through four years of

self-determination, good coaching, and digital devices, I made two national cross-country

meets. When my time was up, I moved on to a teaching career.

My first job was at a charter school where I taught health and physical education

in 2002 with students aged 10-18 in the suburbs. There, I had a large budget and decided

to use most of the budget on developing a curriculum with digital devices. As I started

my journey into teaching using these devices, I reflected on my dad, a man who was

entrenched in the old style of life.

Professional Motivation

I have had three teaching positions in eighteen years as of this dissertation. The first was at a small charter school where I was the only physical education teacher. My second teaching stint was at a larger urban school district where I coached girls cross-country and track. Here I felt I would stay until I retired. However, I moved on to an urban school district where I currently teach. Each stop had different motivations for using digital technology in my physical education and health education classrooms.

First Teaching Position

This charter school took a chance on me. I had no professional experience teaching and I spent the summer before my first job, doing nothing constructive. So when the school hired me, I was nervous. I saw the large budget I could use and thought about what to spend it on. I decided on heart rate monitors for health and physical education classes. The school was sixth through twelfth grade and I was the only physical and health education teacher for 300 students. The curriculum, scope and sequence, and purchasing of equipment were up to me. During my time at the school, I found students not athletic; few played sports let alone played on their own. There was a perk of teaching at the school: having an athletic facility across the street where technology devices were abundant.

The facility was a Young Men's Christan Association (YMCA) with classroom space that had a small gym and a decent-sized workout area. Although I had to share space with the members at the YMCA was challenging. I quickly figured out a schedule to have time in the gym to conduct classes. Since my school had no gym, I walked

students back and forth across a busy street even in the winter with snow and wind during the 8-minute walk. At the YMCA, the older students used elliptical machines, exercise bikes, or treadmills. Many machines were too large for them yet those who used the machines showed such enthusiasm. They were excited to see the constant electric feedback from the elliptical: heart rate, time, speed, and distance. The use of heart rate monitors demonstrated areas of effort via heart rate zones for students. And seeing how useful the machines and monitors were, I taught students about heart rate zones and exertion scales from their workouts.

Students at the school were curious about exercise and data from the machines and devices. Many had high intellects (the average American College Test [ACT] score for the school was 28) but lacked motor skills. When lifetime activities became an option, students wanted to be more active. I adjusted my curriculum to the student's interests rather than what I wanted. While I taught motor skills like throwing, catching, and kicking, I wanted the students to be active and engaged with activities they enjoy. During my time at the school, I purchased stopwatches, heart rate monitors, body mass index devices, and even mechanical babies programmed to cry and even relieve themselves. However, after four years, it was time to move on to a bigger and better-paying school district with greater personal opportunities such as coaching. Married at the time, my wife and I both were offered to teach at the same school in a large, northeastern suburban school district. I was offered a position as a junior high school physical education teacher, head girl's track and field, and girl's cross country coach which I held for eight years.

Second Teaching Position

At the larger school district, I had smaller classes and my pay doubled after a few years. Unbeknownst to me, the school district and others were going through a financial crisis in the late 2000s. A school levy had not been passed in a decade and per-pupil spending was the lowest in the metropolitan area. During each of the eight years the annual budget shrunk for physical education, we reused old, shotty equipment. Any money went to regular equipment such as basketballs, floor hockey sticks, or tennis racquets. What I wanted were the digital devices I had used at the charter school: heart rate monitors or mechanical babies I had been with at the charter school. The only digital devices added in eight years were three heart rate monitor sticks for 900 students. The five other physical education teachers and I shared space. We had three gyms with partitions, a small weight room, and ample space outside to teach. The lack of a new and innovative curriculum, particularly no new digital devices was frustrating.

An example of how digital devices could have been used at the junior high was during Workout Wednesdays. Each Wednesday, we brought our classes together to perform a fitness workout. Some days focused on cardiovascular fitness, other days were strength training. However, no digital devices were used. If the weather was decent, we would take students to the track. Students were required to run/walk eight laps in thirty-five minutes. Each teacher would count laps for their students on a sheet of paper. There were no other methods used to monitor students. We could have videoed students running form or taking pictures to document their work. Or used heart rate monitors to

determine effort. Yet we did none of that. As time progressed, I decided to use digital devices to enhance my curriculum.

On weight room days with mine on Fridays, I slowly implemented new activities that utilized digital devices with labs that used heart rate monitors, an automated blood pressure cuff, and exercise physiology activities required by the computer lab. I loved the weight room days as it provided an outlet of new technology for students to learn from. My last three years at the school were better as I went against the grain set by previous teachers. However, the principal and other teachers disagreed and I was reprimanded for trying something different. I decided to leave the district for an urban one closer to home.

At the charter school, I had digital devices at my disposal. Going from there to a school district that appeared not to value digital devices in physical education was difficult to adjust to. I believe this jaded me from using digital devices simply because others did not. I was dismissed in meetings when any change to the curriculum was brought up. Feeling like an outsider, I sought somewhere closer to my home and found a physical education position a mile from my house in an urban school district; beginning with a middle school I was not quite ready for.

Third Teaching Position

Leaving a school district after eight years with unknowns was difficult. My first year at the new school district was at an urban middle school and we used no digital devices. The nine months there were stressful and mentally taxing. I remember little about teaching and I focused on surviving each hour. At the end of the year, I was cut due to budget issues yet the next year, I was hired at an elementary school in the same district.

I was the only physical education teacher at the school that had two schools in one building. So I was tasked with teaching all the students for both schools which meant twenty-three classes to teach. During my second year in the district, each student in kindergarten through twelfth grade was given an iPad to use throughout the year. At the elementary school level, I had concerns about students bringing the iPad to class. I was slow to implement the iPad in the curriculum. Yet it was during my first year at the elementary level, I began to use devices again. This was based on knowing the students better, having better pacing with teaching, and students asking for activities that involved using the iPads. A few of the applications were easy to use and I implemented them into the curriculum which I have continued to use.

Just Dance

One application was Just Dance (Just Dance, 2020): a video game I played from my iPad through YouTube (2020) to the projector, and onto the wall in the gymnasium. The video game has dance movements from actors and the students followed the dance movements. In my class, no controllers are used as students follow the dancers on the wall as I check for participation. I was skeptical of Just Dance as I felt it did not help students be as active as I would like. But the research and observation of students provided clarity.

Reynolds, Benham-Deal, Jenkins, and Wilson (2018) investigated if Just Dance influenced the amount of physical activity fifth-grade students performed during a regular 30-minute physical education class. Their research had students move and were recorded through a camera, which detected if a student moved according to the video game. As the

video game is shown, music and dance moves were on the wall. Only four students

received direct feedback from the controllers, yet an entire class could participate.

Reynolds et al. (2018) had a purpose: to unpack the physical activity of

fifth-grade students in the thirty minutes of physical education through Just Dance. Did

Just Dance have a direct impact on physical activity levels? This was determined via a

pedometer each student wore during the class. Another question was do physical activity

levels increase while playing Just Dance without being monitored by the game or the

game detecting the movements of four students who had the only four controllers? What

Reynolds et al. found was while Just Dance increased the number of steps taken by the

students monitored by the game, the number of steps between unmonitored students was

not statistically significant meaning the step count between the two was found to be

similar. However, students were actively engaged for 16% of their daily recommended

amount of steps of 12,000 (Colley, Janseen, & Tremblay, 2012) during non-monitored

Just Dance. When my students use Just Dance, there are mixed results. Some students

want to continue to dance while others are ready to move on. Validation for activity in my

class with steps is not feasible with the lack of a device such as a pedometer, yet most

enjoy the time to dance and move as opposed to the same routine. Using Just Dance was

a small addition to my curriculum to engage students to be active.

Physical education national standards—How digital devices address the standards

Just Dance and additional apps such as SworkIt (a workout app for students)

(2020), Balance It (an app for balance activities, 2020), and Team Shake (an app to

randomly assign groups for teams, 2020) (see Appendix B), provided options for my

curriculum to address the SHAPE national physical education standards (Society of Health and Physical Educators, 2020) through digital devices. From the Minnesota Department of Education (MDE, 2018), students in grades k-5, in physical education will:

1. Demonstrate competency in a variety of motor skills and movement patterns.

2. Apply knowledge of concepts, principles, strategies, and tactics to movement and performance.

3. Demonstrate the knowledge and skills to achieve and maintain a health-enhancing level of physical activity and fitness.

4. Exhibit responsible personal and social behavior that respects self and others.

5. Recognize the value of physical activity for health, enjoyment, challenge, self-expression, and social interaction. (Minnesota Department of Education, 2018)

Each standard has a focus area, and the criteria students are required to perform. Based on the grade level, the tasks increase in difficulty. For grades K-2, some activities though do not have a focus area. These areas are addressed when students reach the third grade as they are too difficult to perform. In grades 3-5 for standard one as an example, there are 30 physical activities and skills which need to be performed. Narrowing the focus for these three grades, the amount of time I put into this one standard is more than the others combined which I will discuss later.

A kindergartener for this standard must "jump a single jump with a self-turned rope" (p. 12). From there, the skill increased in difficulty through fifth grade where students "combine jump rope skills to perform a routine using either a long or short rep, with a partner" (p. 12). The use of a video device, such as an iPad, can work between pairs in kindergarten to small groups by fifth grade. This allows students to self-assess their skills or have a peer review of their abilities. Students would video their peers and upload to a data platform like Flipgrid (2020, see Appendix B), and watch their and other's work. Having the capability to use digital devices in my classroom is beneficial to the curriculum. Acknowledging the students are having fun was the most helpful for me. This is similar to my first students while we were at the YMCA, working out and improving on their own.

Knowing the amount of time I spend on observing skills, I used digital devices to decrease my time observing to allow for more student movement. I had students use their iPads as video partners for certain activities. An example is focus area three: manipulative, standard one. In this focus area, students demonstrate competency in a variety of motor skills and movement patterns. Each standard has an explanation per grade. In kindergarten, the first standard has a total of twenty-one physical skills students need to perform and achieve. I began to upload physical standards and videos such as turning a rope with myself demonstrating the skill. I asked the students to do the same. The application I use is Seesaw (2020, see Appendix B), by our kindergarten through second-grade students, teachers, and staff. Parents and students can see progress and ask questions through email from the platform. Each of the skills I have students

perform in class comes from the national physical education standards: the society of

health and physical education teachers (SHAPE, 2020).

SHAPE described what form or forms of digital devices with the standard may be

utilized in elementary physical education settings (more details on SHAPE in chapter

two). Garwish, Richards, and Killian (2020) stated that "a recurring barrier is a lack of

physical education-specific digital devices proficient teacher educators" (p. 272). I feel

this obstacle is ubiquitous for individuals working in physical education wanting digital

devices. As the world becomes more technologically advanced, physical education has

attempted to turn to digital devices to aid in the curriculum as chapter two will show.

Context and Importance of the Research Topic to the Field

How digital devices are used to increase physical activity, particularly with k-12

students is unknown, even with "high-quality studies now emerging...research in this area

still suffers from theoretical and methodical weakness" (Kardefelt-Winther, 2017, p. 25).

But can digital devices improve physical fitness motivation? I answer this question here

and in chapter two with authors researching that question. Being aware of this, how do I

as a physical education teacher need to unpack the relevance to researching devices with

other teachers?

Digital Device Concerns in Physical Education

This topic provides a glance at the rationale for the selection of this case study.

Beginning with my and others' concern that children are not getting enough physical

activity in their daily lives, regardless of a digital device or not. According to Guthhold,

Stevens, Riley, and Bull (2019), 81% of the 1.6 million students they surveyed from

around the globe are not getting the World Health Organization (WHO) recommended

amount of moderate to vigorous daily physical activity. From their findings, accounting

for income, the rate of students not achieving moderate to strenuous daily physical

activity is high worldwide. Their analysis included 146 countries and 298 schools. The

authors' cross-referenced surveys, collected and analyzed, demonstrated that across all

income levels and countries, students ages 11-17 are not being active enough to maintain

proper health as determined by the WHO. While this was not specifically stated as

causality as "there was no clear pattern in prevalence, according to the country income

group" (p. 4), the data is worth noting with all income levels of children are still not

receiving enough physical activity. Acknowledging the low levels of activity, I question

how digital devices may provide adolescents with the motivation to be active, or does

digital devices become a hindering factor as an extrinsic motivator? Chapter two will

provide details through researchers attempting to relate these findings.

   In addition to worries about the lack of physical activity for students globally, the

impact of digital devices on physical activity and physical education debated their

benefits. Gard (2014) claimed that digital devices would negatively impact

"measurability, accountability, performativity, and standardization" (p. 833). Williamson

(2015) asserted the approach with digital devices in physical education is based on

evidence-based results rather than teaching students subject matter. His research found

that using digitized health and physical education (eHPE) created students to be more like

software rather than individuals. Meaning fewer being able to know how to perform

skills that required physical awareness and abilities. Also, "the digitized future of health

and physical education is likely to mirror the wider development of data-driven schools"

(p. 149). Overall in education, using digital devices may provide an increase in student

engagement and overall learning along with a teacher's ability to plan curriculum through

motivation, but at what cost to the physical health of students simply for using a device

due to being forced to by administration?

Implementation of Digital Devices

In physical education, numerous digital devices are being implemented by

teachers include pedometers, heart rate monitors, physical activity watches, iPads, video

games, and various mobile apps, described by Beighle, Morgan, and Pangrazzi (2004),

Block (2008), and Phillips, Rodenbeck, and Clegg (2014). Some physical education

teachers have adopted these technologies as tools. Each digital device, when

implemented through school in-services or time with experts, may be used "to monitor

students' physical activity, to motivate students to practice, to correct skill execution and

performance, and to add new strategies for learning" (Baek, Elliott, & Keath, 2018, p.

28). The research demonstrated that using digital devices provided physical education

teachers with better tools for their digital-aged students. Motivation with digital devices

is described in-depth in chapter two as well as motor development for students and how

some students lack physical abilities even with digital devices even when implemented

properly. Chapter two does demonstrate how digital devices can be effective tools for

improving motor skills through motivation.

Positives with Digital Devices in Physical Education

      In my work with students in physical education, there are ranges of motor abilities to teach as demonstrated in the SHAPE movement standards (see Appendix A) with students, there is a spectrum of abilities from having excellent to lower. A study by Legrain, Gilet, Gernigon, and Lafreniere (2015) found positive impacts with students who have lower motor skill development when digital devices were used and integrated into instruction. They noticed student interest in physical activity and engagement improved through digital devices-integrated physical education lessons that influenced pupil's perceptions regarding autonomy support. The study had pretest measures of a motor test (tone, coordination, upper limb explosion strength, and balance). Then, lessons where students practiced gymnastic movements using information and communication technology (ICT) against traditional teaching (TT). The ICT lessons had students using technology— reviewing errors and successes in their four movements. With the TT scenario, students were taught using "diagrams and written instructions that described the daily exercises to perform" (p. 389). Students who were in the ICT group increased in motivation over TT methods. The motor performance also improved in the ICT group over the TT group.

      Three results were revealed from Legrain et al. The first, autonomy was supported through basic needs, meaning when student's basic psychological needs were met, "the more their motivation toward physical education was self-determined" (p. 395). Second, ICT is embedded in the lessons. This leads to increased student interest in physical education courses, more attention to the activity, and was found more attractive to

students. Finally, the self-determination theory (SDT) (discussed in detail in chapter two) aligned with students and their cognitive and motor skills. The results demonstrated support for the SDT, meaning having motivation improved their positive efforts towards physical activity and physical effectiveness of self.

Student-Centered Learning with Digital Devices

In my 18-year teaching career, the evolution of the student-centered model of teaching and how it is tied into a digital world has been ever-changing. With students navigating their paths in class, many found ways to become independent through personal physical activities than group activities. A study by Calderon, Merono, and McPhail (2020) looked at how a digitally student-centered approach may improve intrinsic motivation, learning climate, and academic achievement in physical education pre-service teachers. Their findings were a "lack of research in physical education teacher education (PETE) on the relationship between the use of digital devices and the pre-service teachers' engagement and subsequent learning" (p. 242). The outcome of their research is a curriculum with a student-centered approach by using digital devices by implementing a purpose in undergraduate training. The curriculum is effective for both the student and the teacher as digital devices gain in popularity in physical education, the inclusion of digital devices into the curriculum does not often appear in the scope and sequence within the PETE programs, however.

Misseyanni, Lytras, Papadopoulou, and Marouli (2018) proposed the term "active learning" as being learner-centered rather than direct instruction for capacity with learning in the 21st century. From their research, teaching needs to be provided for

students to perform and reflect rather than be stood over and delivered information from the direct teaching method. Four traditional methods equate to deeper learning environments and are "studies in meaningful and information-rich context, encourage the growth of student initiative and decision-making, promote an atmosphere of learning that utilizes collaborative learning through a student-centered approach, and use assessment for learning to measure student progress through authentic tasks" (p. 244). Using active learning to enrich student knowledge, the idea of using constructivism as the paradigm for the case study was at the forefront of my thinking.

Active Learning, Constructivism, and Self-Determination Theory

With active learning, there is a tie into constructivism as learning is a process. Students use their new knowledge and construct their thinking through active learning and apply their learning to authentic, real-life applications. Constructivism aligns with the self-determination theory (SDT) and is discussed in chapter two, provides an environment for active learning to flourish through choice and opportunities for new challenges through self-motivation. Through SDT, adaptive learning through behavior alters students to become more autonomous as the outcomes applied are from the cognitive and affective domains. Having this knowledge, Calderon, Merono, and McPhail (2020) concluded there is a tie-in with student-centered digital devices, intrinsic motivation, the learning environment, and academic achievement of physical education pre-service teachers. They attest that all of these items must be included in the student-centered digital model of learning. Yet there are hurdles for digital learning to be incorporated into the physical education classroom.

One hurdle is the limited use of digital devices in the physical education setting either for classroom management or as a communication tool (Gibbone, Keath, & Elliott, 2010; Juniu, 2013; Krause, Franks, & Lynch, 2017; Kretschmann, 2015). A study by Baek et al. (2018) noted some physical education teachers avoided using technologies because of their beliefs that digital devices would distract students from the core purpose of the subject (e.g., keeping kids moving; discussed in chapter four). While effective teaching can occur without digital device integration, it may take away physical activity time for students. However, considering the purpose of physical education is not only to increase physical activity but to keep developing physically literate individuals who have the knowledge, skills, and confidence to enjoy a lifetime of healthful physical activity (SHAPE America, 2013). This includes the supplementary roles of digital devices (e.g. providing visual information, feedback to students on performance, and objective measures of physical activity), and has the potential to help teachers and learners achieve the goals of physical education. Chapter two discusses how digital devices and physical education can have a marriage together but with challenges of implementation of digital devices in physical education.

Summary

I grew up without digital devices for a physical education class, unlike my students have in 2021. My physical education class digital device option in the 1980s and 1990s consisted of having a scoreboard with time remaining in our games. Skills were taught through teacher demonstrations and verbal feedback. Being a student with a higher motor skill-set, I received greater attention than others. One reason was my dad, who

worked with me. Whether on a gravel driveway where I perfected my jump shot, in our large backyard throwing footballs, or playing catch with him as a pitcher, I worked tirelessly to improve. The researchers in chapter one see the value of digital devices through proper training and implementation which I acknowledge as the importance of devices in my teaching.

Children are motivated to play. By adding a digital device to help them attain skills through play, students who are low on the skill end tend to become more motivated to work on their abilities. This can increase those abilities with those students who have low motivation to then be motivated to be active. Self-determination theory ties digital devices and physical education together as SHAPE has determined that digital devices are crucial for active learning. As I continue to learn about digital devices and how to better implement them into my curriculum, I reflect on those cold winter days of shooting baskets on an icy gravel driveway with a pencil and yellow legal pad. I wonder how much better I could have been with digital devices giving feedback on those jump shots with my mittens on.

A Look Ahead

The research I conducted was with elementary physical education teachers in an urban setting and their use of digital devices through a survey and interview. I first surveyed potential teachers, then set up interviews. My dissertation aimed to determine how and what types of digital devices the teacher uses in the classroom, and for what purposes. Also, what are some hurdles and supports they found that do not allow them to use the devices? (see appendix C for interview questions and see appendix D for survey

questions) By interviewing urban elementary physical education teachers, coding their interviews, and finding themes, allowed me to narrow their answers to my research and guiding questions. Digital devices are in our everyday world. I wonder: How will digital devices alter the way elementary physical education teachers teach in the future?

Chapter two provides a framework through the literature review from experts who know digital device use in physical education. The literature review topics include the history of digital devices in physical education, digital devices in the curriculum, challenges of using digital devices in physical education, use of digital devices in physical education to promote motivation in students, the self-determination theory feedback on motivation with elementary physical education students, and the technological pedagogical content knowledge and how its use in physical education.

Chapter three presents the methods and through the constructivist paradigm, the teachers provided their own experiences beginning with a survey to provide an overview of teacher's use of technology pre and during distance learning, and the interview through google chat which dove deeper into teacher's prior learning of technology pre and during distance learning. Through semi-structured questions, teachers provided their answers and experiences using digital devices. After the interview was transcribed and a narrative analysis provided themes that stood out. The themes went through content analysis for coding and formulated into results to determine how the teachers are using digital devices.

Chapter four unpacked the results from the transcribed interviews and analyzed them. Themes are found in which areas of digital device users are going well or not.

Chapter five included the conclusions and future research possibilities from the data through analysis and my learnings from the process of the dissertation. This section connects the data and literature review in chapter two. Included are the limitations of the study and implications for practice in urban elementary physical education classes.

Chapter five gives recommendations for further research into digital devices and physical education, unpacking my major learnings and recommendations, then additional research needed based on this case study. Next is chapter two and the literature review with six different topics revolving around the research being done on digital device use in physical education.

CHAPTER TWO

Review of the Research Literature

Overview of the Literature Review

Chapter one provided a rationale for studying the topic of digital device use in urban elementary schools by physical education teachers. The changes in the curriculum from teaching students without digital devices to one which blends digital devices with methods of teaching through direct instruction is impactful as this chapter will demonstrate. With the focus on digital devices, the literature review dives into areas of how urban elementary physical education teachers used devices and on their and students' use of devices. The aims of the literature review include the history of digital devices use in physical education, use of digital devices by teachers, how digital devices can promote motivation in students, the challenges of physical activity and digital devices, self-determination theory: feedback on motivation in elementary physical education, and technological pedagogical and content knowledge. These topics are the framework around the primary research question and guiding questions. The topics selected were influenced by the interview questions (see Appendix C). The primary and guiding questions are:

- **Primary research question**: How are urban elementary physical education teachers using digital devices in the classrooms?

- **Guiding question one:** What are elementary teacher's primary purposes for using digital devices in their physical education classes to support the attainment of learner outcomes?

- **Guiding question two:** How do elementary physical education teachers describe the current usage of digital devices in their classrooms?

- **Guiding question three:** What are possible descriptors and factors that either support or form barriers for the use of digital devices in the urban elementary physical education classroom?

- **Guiding question four**: How do urban elementary physical education teachers describe their perception of their role in physical education class during the coronavirus of 2020?

- **Guiding question five:** With digital devices, what role do urban elementary physical education teachers serve regarding motivating their students to participate in physical education? And is the self-determination theory part of providing motivation for students with digital devices?

The primary question is the overarching issue that this case study attempts to answer. Then the guiding questions provide a framework for the survey and interview questions that were asked of the teachers. First, a survey was sent out to all elementary physical education teachers to gauge interest. Those filling out the survey and allowing for their consent were interviewed two weeks later. When the interview was completed with video and audio recordings (due to the pandemic of covid-19), the interview was analyzed and provided data for the case study. Beginning the literature review is the topic of the history of digital devices in the physical education curriculum. There is limited research available on digital device history in physical education with this topic will hopefully expand in the future.

History of Digital Devices in the Physical Education Curriculum

The physical education curriculum has progressed in digital device use since the 1960s when a minimal amount of literature began to emerge. Examples include pedometers, heart rate monitors, and handheld chronograph watches for teachers. The lack of a historical timeline for any devices made things difficult to pinpoint what has been implemented into the physical education curriculum. Digital devices used in physical education are minimal compared to other areas of education. For example, since the 1960s, the types of digital devices in the physical education classroom have changed from pedometers and heart rate monitors (Woods, Karp, Goc, & Pearlman, 2008) to iPads and video projection units. These are the primary methods physical education teachers give health and skill feedback to their students even in the twenty-first century. The first piece is to establish what is physical activity and exercise. Each has different and specific definitions.

Physical activity and exercise are two distinct categories and the World Health Organization, (WHO, 2020) defined being active as "any bodily movement produced by skeletal muscles that require energy expenditure" (Physical Activity section, para. 1) and exercise as a subcategory of physical activity that is planned, structured, repetitive, and aims to improve or maintain one or more components of health. Those components are flexibility, muscular strength, cardiovascular endurance, muscular endurance, and body composition (fitnessgram.net, 2020). WHO recommended school-aged children (5-18 years of age) attain 60 minutes of moderate to vigorous activity per day. Physical activity provides children other health benefits including increased bone density and muscle

growth. For students to attain 60 minutes of physical activity each day, many of those minutes tend to be performed in physical education classrooms.

The WHO provided (2019) a news release that children under five years of age to specifically spend less time sitting watching screens. From ages 1-4, the recommended amount of screen time to an hour or less. When there is less screen time, the WHO found that children became more active, had increased quality sleep, and lack restrained time such as being in a stroller was the main statement of the press release.

Digital devices have been enhanced over the decades with their ability to hold data and provide students with the ability to learn from their recorded skills. Nmungwun (1989) wrote that since the 1950s, video cameras have the means to store images and view them at a later time. Apple (2012) believed in the autonomy that digital devices provided and presented how they had a life of their own in the classroom. The autonomy Apple addressed was his thinking of how digital devices would be "something of a savior through pedagogy" (p. 106). However, the use of devices may stunt how learning occurs as before introducing digital devices to the masses, the development and analysis of digital devices would have to occur before allowing education to use its potential.

Selwyn (2014) had angst for educational digital devices. His thoughts were devices created "a gulf that persists between the rhetoric of how digital technologies *could* (emphasis his) be used in education and the realities of how digital technologies are *actually* (emphasis his) used in education" (p. vii). Both Apple (2012) and Selwyn (2014) concluded that decisions on implementing digital devices in education are typically made too rapidly; prognostications on the future without the use of evidence are unclear and

need to be resolved before decisions are made. From video cassette recorder carts to heart rate monitors and pedometers, the current digital devices are smaller, more reliable, and cost-effective. Applications, like those found on the iPad, have activities like exergames and options available for most physical education teachers.

In physical education, digital devices are used to enhance student learning and engagement. Trout (2013) researched that in past physical education classrooms, teachers would roll a television on a cart with a video cassette player (VCR) for demonstrations on a cassette of skills into the gym. The teacher would expect students to practice their skills from the video. The VCR provided opportunities by starting, stopping, and going over the skill. Having digital devices like the VCR gave teachers benefits to analyze performance. This digital device has given way to the iPad and Bluetooth technologies. These new technologies are smaller and give physical education teachers the ability to move about their space to video students easier. Trout acknowledged the instantaneous feedback with the new technologies like the iPad. Examples of instantaneous feedback include heart rate monitors, pedometers, and global positioning devices which give students feedback individually. While changes have been made in digital devices in physical education, it is clear that device use is lagging. Moving in the future, new authors and their research may provide a better understanding of how the history of digital devices use and their effectiveness or ineffectiveness in physical education.

Summary

Many digital devices used in physical education decades ago are still in use in the twenty-first century like pedometers, heart rate monitors, and stopwatches. While these tools have a purpose and function, new digital devices include iPads, Bluetooth speakers, and exergames from a screen that use a device to work, enhancing the curriculum and classroom environment. The WHO found that children need 60 minutes of activity each day and physical education provides a portion of that time to students ages 5-18 yet not daily as recommended by the WHO. Engagement with devices has changed from large televisions or record players to iPads and Bluetooth speakers, providing instantaneous feedback through video or music to motivate them to be active. The next section determines how the current use of digital devices in physical education is constantly adjusting and improving the curriculum.

How Digital Devices Influence Physical Education Curriculum

Digital device use in the physical education curriculum has increased in the past few years (1980s-current). Beginning from the 1920s with pedometers to the series six Apple watch in 2020, these devices allow students and teachers to monitor individual fitness progress. That progress can be from an individual's heart rate, steps taken, or distance traveled using a global position system (GPS). While these and other options are available for use in schools, there are numerous possibilities for additional usage influencing the physical education curriculum. However, there are potential problems with those devices.

Physical education teachers have national standards which are established by the society of health and physical educators (SHAPE) is the national organization for health and physical education teachers. Their vision statement is "a nation where all children are prepared to lead healthy, physically active lives" (About SHAPE, 2020) and their mission statement is "to advance professional practice and promote research related to health and physical education, physical activity, dance and sport" (About SHAPE, 2020). Regarding how SHAPE and the implementation of digital devices in the curriculum, the organization stated five ways to use digital devices as a tool to enhance learning and teaching (as cited in Baert, 2015):

1. Identify grade-level outcomes, skills, concepts, focus, and objectives of the lesson.

2. Select appropriate tasks, instructional supports (including technology), and assessments that align with the learner's needs, learning outcomes, focus, and objectives.

3. Plan the unit and decide how to manage the lessons, including the protocols for the use of technology.

4. Implement the plan, observe, and then collect and record evidence of student learning.

5. Finally, evaluate the implementation of the less and the usefulness of the instructional tool, and make appropriate modifications to the next plan.

Even though SHAPE has standards to implement digital device use in physical education curriculum, Baert (2015) stated that "teachers should not design their lessons

based on what is in the equipment room; rather, they should design their lessons based on the national and state standards, the grade-level outcomes, and their students' specific needs" (p. 41). Meaning standards for each state and student need to take precedent over equipment and digital devices.

Standards-Based Teaching with Devices

Yet if teachers do not have the technology, how are they able to attain the standards presented by SHAPE? Notably, Laughlin, Hodges, and Traggiet (2019) warned about using digital devices as a curriculum tool and not as a replacement. "As with any technology tool, teachers must remember that video analysis can only support and is not intended to replace or downgrade good teaching" (p. 29). By following that logic, using the standards, outcomes, and student needs, all physical education teachers are capable of handling all types of equipment they have at their disposal. The national standards are implemented in all states as their standards based on this researcher's knowledge.

There are five national standards in physical education (see Appendix A). The first two standards focus on movement and application of those movements. These are specific to student movement and performance (SHAPE, 2020). Standard one is the linchpin as its focus is for students and their ability to demonstrate competency in a variety of motor skills and patterns. Standard two takes those motor skills and patterns to how students use the knowledge of concepts, principles, and strategies utilizing those movement patterns from standard one. The third standard has students demonstrating knowledge and their motor skills to "achieve and maintain a health-enhancing level of physical activity and fitness" (National PE Standards, 2020). Standard four has students

learning how to move safely and responsibly when being physically active. Lastly, standard five seeks how students find value in physical activity "health, enjoyment, challenge, self-expression, and/or social interaction" (National PE Standards, 2020).

Each of the five standards have outcomes. Standard one has 27 movement outcomes, five-movement outcomes for standard two, six for standards three and four, and four for standard five for 45 total outcomes for elementary physical education students. None of the standards specifically discuss the use of digital devices; however, Baert (2015) wrote on how physical education teachers may use digital devices in standards one and two are achievable.

From each standard, Baert (2015) provided two different methods to achieve outcomes for elementary physical education students. The first is for students to demonstrate their skills. A second is to catch students using that skill via a cue, meaning to apply the skill, video record it, and include the entire boundary of the gym being recorded. These strategies by Baert are optional for teachers to use where physical education teachers may put the five standards to use with digital devices as tools to enhance learning and teaching from SHAPE.

Consideration of Devices

When using new digital devices, Laughlin, Hodges, and Traggiet (2019) found that the need for these devices has to be understood by all physical education teachers, from kindergarten to twelfth grade, is greatly understated. The authors contested that teachers need to consider three specific topics on digital devices: Knowing the physical education applications through trial and error, the device and its tool capability, and the

device's mobile capabilities. When using the device and application, the physical education applications for video analysis need to be widely accessible over a variety of operating systems. Some applications allow teachers to video their students as an example. Through the video playback option, the activity options such as voice-over narration, side-by-side comparison, angle measurements, and drawing on the screen. Applications like CoachNow, Coach's Eye, Hudl Technique are free applications while others may cost a fee (see Appendix B. Laughlin et al. provided questions on the rationale for an application: "what is the goal for using video technology, does the application work on my mobile operating system, and what level of technology acceptance do I and my students possess" (p. 25)?

Devices Used as Tools

The immediate feedback from mobile video devices is crucial for skill acquisition and evidence of learning. Laughlin et al. (2019) concluded that "if utilized effectively and appropriately, video can generate assessment data across each domain and national standard" (p. 27). Permission must be attained by physical educators before using digital devices and to be aware of the Family Educational Rights and Privacy Act of 1974 that "mandates students education records remain confidently unless permission is granted by the student or their parent/guardian(s)" (p. 28). Additionally, teachers would be advised to delete video clips after feedback is provided.

Having a clearly defined purpose for video analysis as a tool for learning as opposed to replacing the curriculum is necessary. "Technology cannot supplant a well-designed curriculum or the reliance on effective instructional and assessment

strategies" (Laughlin et al., 2019, p. 28). Learning curves are natural when acquiring new knowledge. Yet having students play with the application may help the teacher better understand the application. "Teachers and students will benefit from continually exploring how video analysis can supplement instruction and assessment" (p. 28). Many new digital devices are expensive and difficult to replace. Students need to be taught how to handle digital devices carefully and responsibly. Social responsibility is through student use and their demonstration of digital devices.

The final issue is on teacher responsibility for physical digital device maintenance. Teachers must take care of the downloading of clips or uploads to the internet. Laughlin et al. (2019) stated that sharing videos must be done with caution and great responsibility amongst students and fellow peers. Then the cost of video devices tends to be expensive if not cared for properly. Teaching the students to video their peers in a tumbling unit, for example, includes where to stand and how to properly hold the device. With digital devices come topics of if students can use them, specifically accessibility, new digital devices and how they can expand, enable, or constrain teaching practices, and the influence of how devices are used with motor skills and student cognitive developments.

Device Accessibility

Accessibility for digital devices for physical education teachers is becoming widespread. While many teachers want additional devices into physical education, Jones, Baek, and Wyant (2017) found schools try to keep up with devices outside the classroom yet often fall short. Knowing this, Hill and Valdex-Garcia (2020) performed a study in

three areas to help teachers understand devices to improve accessibility: "(1)what specific technologies available for teaching, (2) the availability of technical help for teachers, and (3) specific obstacles to incorporating technology in classrooms" (p. 31). Regarding specific technology, most participants in the study had availability with devices such as a laptop, individual devices like a heart rate monitor or an accelerometer are not available for recreational use outside the classroom. For technical help, a lack of support was an issue with a quarter of the participants as they stated they had no technical support in their school. Lastly, obstacles included "time, incentives, understanding, and access were the primary obstacles to utilizing technology in the classroom successfully" (p. 36) The outcomes from their study indicated that due to the rapid pace of digital devices in the world outside of the classroom, the authors strongly positioned their thoughts that when new devices are introduced, the focus would be on "measuring student physical activity outcomes" (p. 38). This means not using the newest devices but ones that have a focused objective of measuring physical outcomes. This leads to research into teaching practices with digital devices and if they expand, enable, or constrain teaching practices.

Devices into Methods within the Curriculum

A study by An (2018) dove into how new physical education methods are being based on digital devices (see Figure 1). Her work focused on teaching practices through expanding curriculum via devices within teacher's abilities, enabling new devices to be used, and constraining teaching practices. Using digital devices like an iPad includes visuals and audio keeping students engaged. This differs from what was taught in

traditional teaching theory classes where "only by virtue of a teacher's mouth, a piece of chalk, a blackboard" (p. 2117) do students participate. After theory courses, methods courses were taught through "modeling, teachers' explaining and students' practice" (see Figure 1, p. 62; p. 2118) Next, the enabling of new devices which Marttinen, Landi, Frederick, and Silverman (2020) found through the exploration of teachers' perceptions of the use of digital devices in physical education. The authors explained that teachers were willing to alter their lessons with the new devices but not replace the traditional hands-on approach of physical education lessons. This is confirmed in the case study in chapter four.

Figure 1

The student's information digital platform is a multimedia platform.
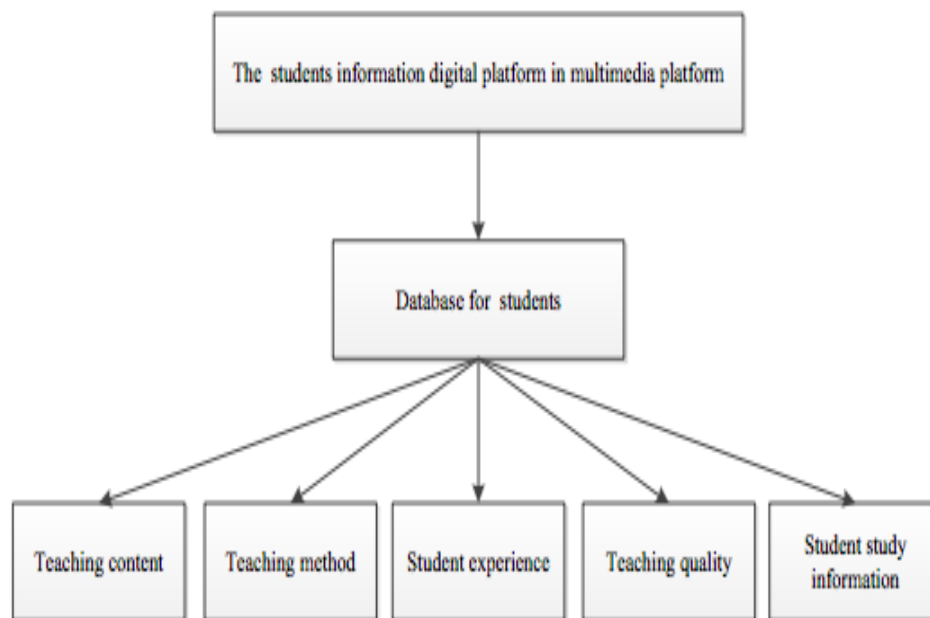
Note: From An, 2018, p. 2118

Marttinen et al. (2020) determined when teachers are given a new device, those teachers tended to use the device to enhance their teaching, not replace it. Lastly is the constraining of new teaching practices as part of a study by Baek, Keath, and Elliot (2018). Their research looked at "technologies being used by K-12 PE (physical education) teachers for teaching and their learning sources to integrate technology" (p. 30). The purpose of their study was threefold: the types of devices used by physical education teachers, the source for technology integration, and which factors go into influencing the use of technology in a teacher's curriculum. From the study, Baek et al. confirmed that digital devices were used mainly for a school's website updating and e-documents rather than evaluation or assessment. There was a lack of integration of any devices in the physical education elementary school level curriculum. Their data concluded that digital devices constrain teaching practices when not being trained properly. Influential factors included lack of access, training, time to learn the devices, and value of device integration by the teachers.

Motor Skills and Academic Learning

Digital devices and their influence on motor skills have not been researched as readily as other technology and curriculum in regarding other content areas. Green (2016) and the faculty at Texas A&M discussed methods on how digital devices may offer assistance in "specific eye-hand and visual-motor skills, but its value is limited" (p. 1). One professor stated for parents to "connect the technology to their visual-motor skills" (p. 1). Another is how digital devices have influenced a student's cognitive development. New devices continue to come forth and additional research is needed for groundedness.

A study by Lucena, Belmonte, Cabrera, Torres, and Sanchez (2019) focused on student learning based on how to use digital devices in class, then using the devices outside of the classroom and the academic effect. The authors determined that when students do indeed take their learnings from the devices outside of the classroom, there was an increase in their commitment to skill development, greater participation, and self-motivation to achieve improved skill development. Practicing skills with a device in school and taking the device out of school to improve has a marketed difference in skill improvement. An item of note was Lucena et al. helped out the students due to the teachers not understanding the content of the digital devices. The authors believed this was due to a lack of training for the teachers on the devices, yet another instance of the lack of training for physical education with digital devices which is discussed throughout the case study.

Devices Leading to Transformation

When teachers have a sufficient amount of time, they can use devices readily to improve their teaching. One instance is a case study conducted with Rick, a thirty-two-year veteran teacher in physical education. Jones et al. (2017) wrote how Rick, a teacher who began his career in 1983 and retired in 2015, saw different technologies implemented in his curriculum throughout his teaching career. Jones et al. (2017) add that Rick's ability to transform from not using digital devices to being on the front lines in using them in the classroom. Four areas of transformational leadership (Bass, 1985) included idealized influence, inspirational motivation, intellectual stimulation, and individual consideration. Mhatre and Riggio (2014) found a link between those who are

transformational leaders and having others become engaged in the opportunities presented by the leader.

Rick was both a leader and providing engaging new opportunities for his students as he learned about the new technologies. By "challenging others to think outside the box and begin doing physical education differently" (p. 164), Rick embraced the new technologies and allowed students to embrace them as well. This case study demonstrated a large number of teachers that had limited digital resources in the early stages of their careers and now use them fluidly in their curriculum. Some teachers flourish while others do not. The ability to be transformational is critical with the types of digital devices that continually are being produced.

The infusion of digital devices is in almost all content for physical education, yet not been introduced as well in universities with physical education teacher education (PETE). Bechtel (2010) investigated the use of digital devices in the PETE program at her university. Specifically, addressing the national standard 3, outcome 7 for physical education teachers: "Teacher candidates will demonstrate knowledge for current technology by planning and implementing learning experiences that require students to appropriately use technology to meet lesson objectives" (SHAPE, 2020; Juniu, 2011, pp. 41-42). Her research found the lack of digital devices being implemented into the PETE program prompted the program to be altered as they added digital devices of pedometers and heart rate monitors. That simple addition of low-cost pedometers and heart rate monitors changed the program which now affects every teacher and subsequent student whom they teach.

Instructional Use

Juniu (2011) expanded on Bechtel's (2010) work that an effective physical education curriculum uses digital devices and tools that need to link instructional approaches to the learning goals with outcomes for students to be able to achieve. When digital devices are used, their function is dependent upon the "context in which it is used and should be thought of in those terms" (p. 42). Her advice is for physical education teachers to use data-tracking digital devices, specifically when fitness testing. This is particularly key for students to be able to track their progress rather than the teacher, who typically has a large number of students with multiple classes to teach daily.

When designing a lesson plan with digital devices, Juniu (2011) provided a nine-step instructional design model from Morrison, Kemp, and Ross (2000) which five planning elements provided the structure for a unit plan with digital devices. Using a heart rate monitor as an example, the first planning element is an essential question (instructional problems, identify the subject matter, and state instructional objectives). Second, an analysis of context (examine learner characteristics, and consider classroom structure and configuration of the educational context). Third, are pedagogical decisions (instructional design strategies for physical education via digital devices). Fourth are learning activities and implementation (select and sequence appropriate learning activities, plan the instructional implementation and delivery). The last is assessment (develop evaluation instruments to assess objectives). These five elements provide the framework of a unit plan using digital devices. With lesson planning, physical education teachers must consider the environment when teaching. Whether outside playing flag

football or soccer, to indoors with badminton or volleyball, the classroom environment is

a factor. The space of the gymnasium, a grass field, or a tennis court with cracks, along

with the content, and possible environmental changes. When it comes to using digital

devices as a tool, physical education teachers should "infuse technology in a way to

support the pedagogical strategies used in those settings" (Juniu, 2011, p. 41).

Assessment

Acknowledging teaching and assessing with digital devices is the topic of a case

study by Parker et al. (2017). Their case study focused on an elementary physical

education teacher and his use of digital devices for assessment, with child development,

literacy, and pedagogical perspectives. The teacher, Jaime, used a constructivist approach

to "generate an active, meaningful, relevant, and social pedagogy of technology" (p. 31).

Parker et al. (2017) discussed in the case study how digital devices were used for

assessment and in physical education classes, assessment tends to be focused on

performance, not on theories of learning. The authors note how Jaime overcomes the

"barriers of assessment" (p. 35) by using his digital devices as tools. Parker et al. labeled

his use of digital devices as an assessment for learning (AFL). They defined AFL as

situations "where students are given opportunities to demonstrate their knowledge, skill,

understanding, and application of content in a context that allows continuous learning and

growth" (p. 35). AFL has five characteristics and includes how assessment and

instruction are linked, second is how assessment is learner-centered, third the assessment

is an ongoing part of teaching, not an end or afterthought, fourth the assessment is

comprised of meaningful tasks performed in context, and fifth, the criteria for assessment are known in advance.

The case study of Jaime and his work using digital devices in physical education concluded with, "Technology didn't make my physical education class a success. Technology simply created an opportunity for me to help students reach their potential" (p. 45). Parker et al. (2017) advised that through Jaime's use of digital devices, they will have a place in other physical education classrooms yet it will not replace teacher knowledge and teachers must act consistently with their beliefs by potential student learning with or without devices.

iPads

Other digital devices are iPads and their applications for physical education teachers. From assessment to video, playback for student feedback, with bringing in a different voice from YouTube (see Appendix B), the iPad is versatile for teachers and students to use. Before the iPad, Eberline and Richards (2013) attested that physical education teachers relied mainly on observing students attain assessment, particularly at the elementary school level. They found that iPads have a place in the physical education curriculum, assisting teachers with "many applications that deliver content and help with teaching" (p. 39). The iPads are capable of classroom management tools, lesson plans, student data, amongst other information that is being developed. A component the authors found impressive was the use of video capture and replay. The video can show students their progress, a new cue to perform, and then reinforce positive student behavior while replaying the video.

When teachers use an iPad, Armour, Evans, Bridge, Griffiths, and Lucas (2017), found it "is portable and can be used to access a range of apps and that includes a camera and video function" (p. 216). Their case study used the iPad with a physical education teacher named Gareth. Incorporating the video altered brain development in students. The authors presented perspectives of neurophysiology, motor learning, situated learning, and pedological for their study. Each perspective gave an insight into how iPad use is altering teaching in physical education through the brain makeup. The first is neurophysiology and the focus of brain plasticity.

Brain Plasticity

Armour et al. (2017) wrote that while researchers continue to ponder on how the brain adapts to motor learning and what that means for function and performance in the physical education classroom, their intent is on how the brain can respond and adapt to new and challenging learning experiences. They state that teachers "should maximize learning environments to take advantage of the brain's plasticity" (p. 218). Brain plasticity and its development are linked to being physically active. Regular physical activity has shown to be a massive factor in improving one's brain functionality throughout one lifetime. Thus, physical activity increases brain plasticity.

Research by Cotman and Berchtold (2002) indicated that brain plasticity supports the idea of digital devices having a role in the physical education context. The authors found brain plasticity in humans can retain the capacity for functional and structural changes throughout their lifetime. Having physical education in schools connects experiences in the brain, even those with consequences while doing physical activity in

physical education like challenging activities. According to Hillman, Erickson, and Kramer (2008), these experiences and even those with consequences lead to improved academic performance, brain health, and disease prevention in one's lifetime. Lulic, El-Sayes, Fassett, and Nelson (2017) discussed how physical activity provided the brain with additional plasticity, where the brain can increase cellular and molecular processes. Their study detailed the ability of physically active individuals to increase their executive functioning abilities. Examples include the processing speed of the brain and better response for physical skills. Also, individuals who perform regular aerobic exercise have increased metabolic efficiency, a higher stroke volume in their heart, and an ability to handle stress, anxiety, and perceived effort during exercise (Petriz, Gomes, Almedia, de Oliveria, Ribeiro, & Pereira, 2016). Lulic et al. (2017) found that even one bout of aerobic exercise can create "short-term neuroplasticity within the human motor cortex" (p. 18). Using these studies, performing physical activity with digital devices can help improve brain plasticity, functionality, and executive functioning.

Knowing the brain and its ability to make new motor learnings into long-term skills, Taubert, Villringer, and Ragert (2012) described the unknown of learning successes after two weeks of complex motor learning, meaning while learning a physical skill, how that skill stays in the brain is still unknown after their research. However, the skills are replicated in the student's brain when called upon even within two weeks of learning the skill from their study. This demonstrates that learning physical skills stay in the brain even after not performing those skills over time. Taubert et al. concluded with how the use of digital devices increases learning from their interviews after their study

with students. The students remembered how the devices helped them learn and improve their skills.

Summary

Digital devices measuring fitness have been around since the 1920s and have evolved into powerful data trackers. SHAPE has come out indicating how physical education teachers can use digital devices in their curriculum with five methods. Yet authors push back by stating teachers need to use digital devices carefully and not use devices as a substitute for hands-on teaching, specifically for learning skills. Case studies of physical education teachers demonstrate the lack of training teachers receive in their college programs for devices and they then learn on the job with trial and error. Devices like the iPad are changing the physical education curriculum and students using them have shown through studies to have brain adaptations to their motor learning ability with the devices. As the brain learns new challenges, it adapts and learns through these experiences. When new digital devices are introduced, the brain in students and teachers will be creating new learning through motor skills. Fletcher (1996) used the metaphor that digital devices can be a tool for teachers to use:

> When you go to the hardware store to buy a drill, you don't want a drill, you want a hole, they don't sell holes at the hardware store, but they do sell drills, which are the technology used to make the holes. We must not lose sight that technology, for the most part, is a drill and it should be used in applications that address educational concerns. (p. 66, as cited in Okojie, Olinzock, & Okojie-Boulder, 2006)

Benefits and Challenges of Exergames

Exergames, games using different technologies with digital devices, incorporated tracking the activity of students who wear sensors that monitor their heart rate and movement. These activities have spurred researchers to look into exergames and found some benefits. Along with these benefits are challenges for physical education teachers. This section details studies regarding exergames and how they are used in physical education classes.

Benefits of Exergames

First are the benefits of exergames including fitness levels in students and elderly individuals by Lindberg, Seo, and Laine (2016) with motivation to exercise due to those exergames improved. The authors saw increased enjoyment and socialization from the competition even with virtual teammates or competitors. Challenges with exergames included long-term motivation to get the needed benefits for activity through regular physical education. Another challenge was equipping numerous students with sensors for games. This created issues from time, cost, and the devices not working.

Implementing digital devices through platforms of exergames into the physical education curriculum has concerns. Lindberg et al. (2016) zeroed in on the challenges of exergames when attempting to implement digital devices into a physical education curriculum. The study investigated how mobile exercise games in physical education classes affect student motivation in activity levels. Their focus was to determine if exergames that are wearable and can "effectively enhance learning, exercise, and motivation" (p. 328) in a third physical education classroom. Exergames are new to the

physical education curriculum and are defined "to combine exercise and digital gaming in an engaging manner" (p. 329). Lindberg et al. concluded the study on how wearable digital devices while growing and improving in quality and function, in physical education classrooms would not replace the traditional methods of teaching in physical education. This is about the "traditional hands-on approach" (p. 338).

Lindberg et al. (2016) discussed that while wearable digital devices have improved in the quality and features of their capabilities recently, the digital devices "are not yet ready to replace traditional education" (p. 338). One of the main reasons is physical education "will require a traditional hands-on approach" (p. 338). They continued with no matter how many sensors are on a student to monitor them, it is still necessary to teach a student motor skills like kicking, throwing, and volleying. However, the authors found that physical skills provided a baseline for possibilities for exergames, namely the expansion of "rules, learning topics, and activities" (p. 340) and include cross-curriculum participants such as science, or language skill acquisition. As this study indicated, there is progress being made towards incorporating exergames into physical education (see Table 1, p. 73). Yet, the problems at the time of this research indicated the challenges outweigh the positives. Examples of problems that may affect the quality or quantity of physical education curriculum included a lack or reduced time for physical education during the school day, a reduction of skilled physical education teachers, an increased amount of overburdened physical education teachers, and a lack of interest in physical education amongst students. For now, while exergames have some benefits, the challenges need to be fleshed out more before full implementation into a curriculum.

Table 1

Review of Mobile Exergames

Name	Genre	Exercise focus	Sensors	Social	Physical activity recognition
GeoBoids [25]	Location-aware AR shooter	Running	Camera, microphone, GPS	No	Movement tracking using GPS
Calory Battle AR [26]	Location-aware AR puzzle	Running	Camera, GPS	No	Movement tracking using GPS
Exergame [27]	Sports	Soccer	Accelerometer, gyroscope, magnetometer	Yes	Various soccer activities
Dokobots [20]	Location-aware AR geocaching	Walking	Camera, GPS	Yes	Movement tracking using GPS
CodeRunner [20]	Immersion, location-aware	Walking	Camera, GPS	Yes	Movement tracking using GPS
Coke Zero LiveCycle [20]	Location-aware racing	Walking, running	Accelerometer, GPS, compass	Yes	Movement tracking using GPS
Degree Confluence Project [20]	Location-aware	Walking	Camera, GPS	Yes	n/a
GeoDashing [20]	Location-aware racing	Walking	GPS	Yes	n/a
Ingress [20]	Immersion, location-aware	Walking	Camera, GPS	Yes	Movement tracking using GPS
Zombie, Run! [20]	Immersion, location-aware, exercise	Running	GPS	No	Movement tracking using GPS
Foursquare Turf [20]	Location-aware board game	Walking	GPS	Yes	Movement tracking using GPS
Tourality [20]	Location-aware, treasure hunt, racing	Running	GPS	Yes	Movement tracking using GPS
Turf Wars [18]	Location-aware, capture the flag	Walking	GPS	Yes	Movement tracking using GPS
Fish'n'Steps [24]	Step counting, digital pet	Walking	Pedometer	Yes	Step counting using pedometers
Can You see Me now? [23]	Location-aware, tag	Running	GPS, PDA	Yes	Movement tracking using GPS
Running Othello 2	Board game, quiz	Running, jumping, spinning, shaking	NFC, accelerometer, magnetometer, heart rate monitor	Yes	Accelerometer and magnetometer detect the movements of players in some missions

Note: From Lindberg, Laine, and Seo, 2016, p. 3.

Another example of exergames used in physical education classes was demonstrated in a study by Vernadkis, Gioftsidou, Antoniou, Ioannidid, and Giannousi (2012). They analyzed studies that had exergames in a physical education class with the use of the Nintendo Wii's balance board. Their results were that exergames are effective in health and physical education classes specifically in learning balance and agility against the traditional physical education curriculum. Sun (2013) found exergames improved motivation in elementary physical education students. However, this was only in the short term as he found in other studies. Then the exercise intensity held steady over the study when the exergames were used. A key concern though was how motivation was situational at best, as the carryover outside of school did not occur even though the intensity was consistent during those situational times.

Gao, Gerling, Mandryk, and Stanley (2014) found an issue with the difficulty to appropriately equip the number of students in a physical education classroom. The number of students in classes for their study ranged from single digits to several dozen. Also, the prior knowledge level for students with and their use of exergames ranged from novice to advanced. Having one teacher attempting to fit that many students independently with a digital device resulted in a distraction from the objective of the activity with students able to not stay on task while some equipment was damaged.

Table 2

How Exergames and Wearables Could Address the Challenges of Physical Education

Challenge	How exergames could help
Lack of time	Exergames cannot increase the time dedicated to PE classes in schools, but they can encourage students to perform exercise during recess and outside of school hours.
Lack of skilled teachers	Well-designed exergames with wearables can provide pedagogical instructions to student on topics that might not be familiar to the teacher (e.g., how to perform a golf swing). However, exergames also require training before they can be used efficiently in PE classes.
Overburdened teachers	If exergames provide appropriate guidance, they can be used independently by the students, which would free the time available for teachers to create content, observe, and make interventions only when necessary.
Lack of extracurricular PE	Mobile exergames such as RO2 can easily be set up in different contexts, such as yards, parks, and sport clubs, thereby extending the reach of PE outside the school environment.
Lack of support from home	If the exergame technology is simple to use and affordable, it could motivate parents to change their yards or living rooms into exergaming environments. For example, the Nintendo Wii game console has brought exergaming to millions of living rooms since it was introduced in 2006.
Lack of financial resources	Exergames require an initial investment on technology. However, following that investment, many sports could be incorporated into an exergaming platform. If the budget is very limited, some exergames such as team-based treasure hunts can also be played with the students' own smartphones.
Lack of PE facilities	Mobile exergames can be played outside the ordinary PE facilities, thereby freeing up space for traditional PE classes.
Lack of equipment	After the required technology (e.g., wearables, smartphones, and sensors) has been purchased, it can be used for many types of exergames. Some exergames could detect moves from sports such as golf, archery, and javelin, which are normally difficult to perform in limited PE facilities.
Violence and safety	Exergames could teach a safe way of doing exercise. Violence cannot be prevented completely but situations that might escalate into violence could be avoided by providing the students with engaging exergaming experiences.
Lack of contextualized instruction	The contents of exergames could be tailored to the target contexts. For example, an exergame played in South Korea could detect taekwondo moves, whereas the same game could ask the player to mimic cross-country skiing postures in Finland.
Lack of personalized instruction	Exergames can utilize the data acquired by wearables (e.g., biosignals) to personalize various elements of game play, such as the difficulty level, type of physical activity, and duration of the activity.
Lack of games	Exergames can integrate various elements from digital and non-digital games into a single environment.
Lack of PE policy	Exergames cannot change PE policies, but their positive outcomes could inspire decision-makers to act. Acquiring exergames without support from appropriate policies may result in sporadic use or even the abandonment of expensive technology.
Lack of interest among students	RO2 and other exergames can increase the motivation of students to engage in physical exercise. Theoretical book-based content can be expressed in a fun manner using exergames.

Note: From Lindberg, Seo, and Laine, 2016, p. 339.

Exergames and Motivation

Exergames and their use were the focus of Ennis (2013) who reviewed studies of physical education curriculum based on exergames. Three categories emerged from his work with the first on recreational physical education curriculum, which aimed at "limited skill and tactical development with light-to-moderate intensity" (p. 331). His

findings for the first category was exergames would improve the curriculum with fun options focusing on students who would be limited in physical skills. The second was on the overall public health curriculum, where moderate-to-intense physical activity could be the focus. Ennis determined that heart rates for this category would be zoned based so intensity would be higher. Also, exergames may improve these categories by "preventing boredom, increasing students' ability to play effectively, providing appropriate challenges based on the students' levels, and providing exciting novel experiences" (p. 331). His final category was on the physical education curriculum to improve the learnings of different mental challenges and physical opportunities outside of the physical education classroom. Ennis' conclusion was exergames would be ideal for blending physical, knowledge, and emotional outcomes.

Exercise efficiency was the focus based on heart rate data from the students to determine the effectiveness of the exergame. The heart rate data indicated that the game had heart rates near or at 100 beats per minute. One part was the level of exertion was based on the game and how quickly the students were able to complete each physical activity task given to them. Yet there were delays due to pedagogical tasks such as the combination and the intensity of spinning or jumping during the game. These combinations had the student's heart rates vary between the movement and learning. The third section, confirmed by Ennis (2013), was motivation and engagement. The authors saw that exergames are capable of motivating lower-skilled students. The researchers observed numerous positive behaviors with students that played the game. One was a higher level of engagement even to the point where students were becoming dizzy.

Another was that wearable digital devices were a motivator where one student stated they were imagining himself as a secret agent and demonstrated how a secret agent would move. The interview questions after the completion of the data collection provided insight that the digital devices were the "coolest" (p. 337) thing about the game. Yet one issue the teacher mentioned the novelty of the digital devices would likely diminish. The researchers determined that "although technology and gamification may be powerful motivators for young pupils, creating games that maintain excitement during the pedagogical content is still a significant challenge for educational game designers" (p. 338).

In the last section of the study. Ennis (2013) reported some technical difficulties. The accuracy of the physical activities was discussed by the students and teacher mainly due to the physical activity recognition sensor not registering the student's movements accurately. A few students did not follow the instructions of the activities, and the researchers addressed that issue with additional video clips before the physical activity for improved comprehension. The last piece was interviewing the teacher about potential issues with digital devices. The teacher included the cost, maintenance, storage, research training, material preparation, finding a place for the game to occur, and setting up the game before class.

Summary

Exergames use sensors on students to track their physical progress in physical education classes. In addition to tracking fitness, the element of fun through games provided additional motivation for students to become active. Yet studies from this

section detailed how while these games are popular, they will still not supplant the traditional teaching of physical education in the immediate future. These are outlined as challenges such as the number of sensors to track students, lack of monitoring all motor skills, reducing time to be active with putting on and off the devices, or lack of interest by both students and teachers.

Even with the challenges, studies indicated that putting time into learning the new digital skills can alleviate prep time, improve student motivation to be active, and ease of feedback from students with a push of a button. From this section though, the appearance that digital devices may be more work than it is worth doing at the moment.

Barriers of Digital Devices in Physical Education Curriculum

This chapter has unpacked some history of digital devices in physical education, how digital devices are used in the curriculum, and exergames and their influence on physical education. This topic focuses on the obstacles and barriers teachers are finding with using digital devices in their classrooms from case studies and researchers in the field. Key items are concerns from teachers with implementing devices, new teachers not handling device integration with curriculum well, and how to integrate devices into curriculum even with veteran teachers.

Obstacles

In chapter one of this case study, Pyle and Esslinger (2013) researched obstacles for physical education teachers and implementing digital devices into their curriculum. Noted were two main concerns: administration and self-imposed constraints by the teachers themselves. Those self-imposed constraints included a lack of time for teachers

in the implementation of digital devices and a lack of funding for adequate digital devices, specifically for the teaching space. The authors did mention an interactive whiteboard which is not feasible such as the number of other activities that take place in the gymnasium. The other self-imposed constraint was how "administrators often overlook how technology and PE (physical education) can be partnered, physical educators may also overlook obvious links that could create this needed relationship" (p. 35). A strategy was discussed to integrate the positives of digital devices used in physical education, rather than to involve administrators and digital devices committee members in a school to provide adequate funding for digital device use in the curriculum. This meant many physical education teachers provide their funding for digital devices that involve administration and red tape with school purchases.

Pyle and Esslinger (2013) continued with additional categories to improve the abilities of physical education teachers to best integrate digital devices and methods to use digital devices in pedagogy. Those categories included the improvement consistent with class preparation with digital devices, classroom management, communication, instruction and feedback, and assessment. Classroom preparation means teachers establishing their curriculum for the year through scope and sequence. A multitude of web pages offers an array of curriculum options such as https://www.shapeamerica.org, which is the national governing body of physical education teachers. From there, teachers can use the standards from shapeamerica.org and search for lesson plans online that fit the criteria for their student population. Pyle and Esslinger stated on classroom management that "keeping students meaningfully active is the primary goal of physical

education teachers, but this is sometimes a difficult task." An idea they suggested for helping with classroom management is music and the use of the application GarageBand (see Appendix B) that allows teachers to create music and set timers or indicators on tasks for students. Music is one way to create motivation for those to exercise and has been around for "at least 35,000 years" (Smithsonian, 2021) and motivates students to move. Studies have shown (Barney & Prusak, 2015; Benham, 2014; Thackeray, Mehrotra, & Singh, 2017) that using music can improve the motivation to move. By using this application with music, the authors did see an increase in motivation to move by students.

The third category is communication via web pages that provide teachers a method of getting pertinent information out to all members of the school community. Pyle and Esslinger (2013) stressed that keeping the webpage up to date is crucial as "reading information that is two years old will not give others, including administration, the impression that technology is important" (p. 36). Fourth is instruction and feedback which "are often their own worst enemies when it comes to digital devices because they sense digital devices operate the very soul of their mission: to help students be physically active" (p. 36). Recently though, the number of options is more considerable and increasing.

Assessment, as category five, included video games such as "pedometers, heart rate monitors, iPads, active apps, interactive whiteboards, digital video recorders, and so forth" (p. 37) which allowed students to comprehend how digital devices and the relationship with physical education. Feedback with video is easier with cameras built

into iPads and in phones. Students can receive feedback quickly during skills and workouts. Pyle and Esslinger concluded their findings by students and teachers, both learning new digital device skills, are similar to learning physical skills. Time is invested into learning how digital devices can improve their lesson prep, classroom management strategies, communication with stakeholders, instruction, feedback, and assessment "can save enormous amounts of time and energy" (p. 38). The authors stressed that developed and improved partnerships with administrators and teachers are crucial for physical education curriculum with digital devices and their continued growth for their students.

Concerns for Physical Education Teachers and Devices

Krause, Franks, and Lynch (2017) discussed how teachers in today's world are facing numerous challenges no teachers before had to face. Those challenges include meeting the needs of students who have digital devices available to them throughout their development. The authors contended that schools "upgrade technological infrastructure and future technological innovation, these lingering issues will undoubtedly affect the entire dynamic of the educational environment, as students are accustomed to and familiar with technology as one of the primary tools for receiving information" (p. 165). The tie to physical education is how themes and trends in physical education are adjusted through the infrastructure of digital devices. In health and physical education (HPE), there are "pedometers, accelerometers, heart rate monitors, active video gaming, and handheld technologies" (p. 165). The use of these devices and others allows practitioners to give their students objective and more accurate measures of activity data.

Krause et al. (2017) contended that HPE teachers need to have a degree of confidence with digital devices and have competence when implementing digital devices into the curriculum. The governing body of health and physical education, the National Association for Sport and Physical Education (NASPE), initiated HPE teachers to have the tools to use digital devices in the ways and means to assess student's learning. That would lead to improved teaching methods for students to learn, "thus contributing to a quality PE (physical education) program" (p. 166). Another resource is the Society of Health and Physical Educators (SHAPE). SHAPE was created in 2014 and provided HPE teachers a forum to discuss and share ideas. The most popular forum topic was digital devices. While colleges and universities prepare teachers in areas of teaching from theory to methods, digital devices in physical education are at the advent of becoming relevant. Krause et al. did a mixed-methods study on "the current trends and issues revolving around instructional technology implementation among professions in physical education" (p. 167) through practitioners and obtaining the online forum from SHAPE.

From the discussion, Krause et al. (2017) believed that having access to knowledge on implementing digital devices and digital devices used for student learning allows practitioners to fend for themselves. For all the resources available, additional requirements on HPE teachers have a positive effect on many of the teachers not versed in digital devices. Questions though remain on the threads related to the beginnings of how to implement digital devices. Unpacking the results, the authors found that questions asked in the threads were answered mainly by other physical education teachers who wanted to help each other. "If teachers can use the support offered in the online forum, it

may increase comfort levels, thus facilitating a potential increase in technology

integration" (p. 177).

In conclusion, Krause et al. (2017) stated the HPE practitioners are having to

work with "standards-based, student-driven, and societal expectations to implement

technology in their teaching" (p. 178). There are resources for HPE yet from Krause et

al., many HPE practitioners still need assistance in digital devices in implementation and

use. While the study may not be an atypical group of HPE and the demographics of the

participants were not fleshed out well, the study does suggest these findings are likely

amongst most HPE. Krause et al. provided a study that is likely true amongst HPE

teachers nationwide and where this study could determine if individuals in an urban

school district have similar conclusions as this case study commences.

Fundamental Problems with Device Integration

Silverman (1997) discussed four problems with using digital devices in physical

education, before many of the technologies now available, were even fathomed. The first

was school districts with funding for digital devices and school districts that do not. He

stressed that many school districts attempt to provide digital device funding for their

students for general needs, echoed by Mehlinger (1996), Peha, (1995), and Weiss (1996).

Even from one school to another within a district, funding is unbalanced.

A second problem is performing physical activity versus using digital devices

while performing physical activity. Meaning, Silverman (1997) presented the notion of

the "reduction of physical activity and be counterproductive to the goals of physical

education" (p. 312). He presented the idea that while digital devices may be appealing,

does the use of digital devices diminish the goals of the physical education program? A third problem is using devices the best way to teach? Silverman posed the notion of having "a dynamic and interesting teacher with less interesting video or computer application" (p. 312) as a potential problem. Lastly, Silverman concluded on how the teacher needs to learn about the applications and the use of digital devices before full implementation in the curriculum.

Van Dusen and Worthen (1995) along with Solomon (1992) found even with good software, instruction is diminished with an inadequate teacher and does not improve their teaching abilities. While some teachers are capable of integrating digital devices with ease, others have difficulties and may choose not to integrate the digital devices with the primary issue of a lack of training in the devices. Combined with being technologically literate, Ritson (1995) looked at teachers who want to use digital devices in their physical education curriculum and concluded they still have to have training in physical education digital devices implementation. This is easier said than done as indicated in prior studies in this chapter. Another study by Graham, Holt-Hale, and Parker (2013) found that physical skill assessment in physical education takes much of a teacher's time while teaching. Yet using cognitive assessments through school-issued iPads are methods that teachers could use for students to give themselves feedback through video quizzes and create their videos to share and have others give meaningful feedback.

Summary

Many different challenges are facing physical education teachers with digital devices. Obstacles from Pyle and Esslinger (2013) included administration issues and

self-imposed by the teachers themselves, mainly the amount of time it takes to equip students and learn the nuances with devices. Additional challenges are the devices and how they can provide data and objectives for students. Four problems from Silverman (1997) consisted of funding, lack of performing activities for skills, best practices, and the lack of knowledge students will acquire when devices are in play as opposed to learning from the teacher. Next is the use of devices in physical education classes to create motivation for students.

The Use of Digital Devices in Physical Education to Promote Motivation in Students

Digital devices are ever-changing and yet with all the changes, digital devices do break, are not useful to the user, as issues persist. But when used properly, allowing users time to learn how to use them, and have a purpose, digital devices can help promote motivation in students. This section dives into how digital devices help to be a motivator, getting students to be more active, in-class, and outside of the classroom.

For many students, particularly in their tween (10-12 years of age) and teen (13-19 years of age) years, digital devices are a larger part of their daily lives (Lambert, 2016). Students in these age ranges are quick to pick up new digital devices and Lambert advocated for physical education teachers to incorporate digital devices in their curriculum. The use of digital devices by students between 10-19 is grounded by research from the Pew Research Center (Lenhart, 2015) indicated that 92 percent of students between the ages of 10-19 were on social media at some point during their day and almost 75 percent have access to a smartphone. This indicates a point of motivation to be connected to others through devices.

Motivation, whether intrinsic or extrinsic, is valued to have a positive learning outcome. When using digital devices for underachieving students, Casey and Jones (2011) reported a positive learning outcome using digital devices integrated into lessons via a small project. The study found that video-analysis software programs in physical education instruction with underachieving students lacking in ordinary gross-motor skills improved their motor skill abilities. Students in the study had "a deeper understanding of the core skills (throwing and catching), enhanced ability to connect their performance to the performance of an elite athlete, and increased engagement in physical education" (p. 58).

Biofeedback with Devices

Another study from Nation-Grainger (2017) looked at biofeedback and the possibility of improved physical activity due to digital devices. He researched the use of a wristwatch that tracks physical activity movements including sensors for heart rate and a gyroscope in a physical education class. The wristwatch provided biofeedback with 14-15-year-old students in the United Arab Emirates. His study had three areas of focus with improving physical activity with students. The first was if biofeedback intervention would raise physical activity levels; second, to find possible connections between physical activity and using the device, and third, to improve overall motivation with students in a physical education class. Framing the aims, four questions were attempted to be answered: Does biofeedback influence student motivation, the student's exercise levels, a change in motivation while exercising, and how and why getting biofeedback changes exercise behavior?

Nation-Grainger (2017) concluded that the use of watches with biofeedback improves student's motivation to exercise, yet there was no significant correlation between identified regulation and the increase in exercise intensity. Using the watches did increase the competition between students which increased the activity levels, answering question two. Another study by Rodgers, Hall, Duncan, Pearson, and Milne (2010) found intrinsic motivations affected students positively with low motivation, an intervention provides a likelihood of long-term exercise patterns meaning question three is a yes to a positive change in motivation. Lastly, that "interventions might be developed to make the foundations of identified and intrinsic regulations more salient to initiate exercisers to enhance their development and increase the probability of long-term adherence" (p. 384). Choe, Lee, Munson, Pratt, and Kientz (2014) alluded to biofeedback. When the user has biofeedback on their performance, there tends to be a higher amount of self-awareness and self-efficacy. Then if the feedback is positive rather than negative, the individual performs tasks with more skill and effort.

The use of biofeedback through the smartwatches had a positive effect according to Nation-Grainger (2017). By bringing in digital devices increasing the feelings of fun into physical education class that some students may not find enjoyable, "has appeared to have a huge influence on the behavior of the students with some demonstrating characteristics such as competitiveness that they would not normally experience in physical education" (p. 475). Finally, his acknowledgment that when students devise their learning through goal setting via self-assessment, a positive change in motivation occurs. The next study focused on digital devices and achievement in physical education.

Information and Communication Technology

Legrain, Gilet, Gernigon, and Lafreniere (2015) looked at the impact of information and communication technology (ICT) on achievement in physical education. The authors used ICT against traditional teaching methods in a gymnastic lesson. All students completed six, two-hour lessons with the same exercises and teacher. The authors found by incorporating ICT into lesson plans "leads to higher psychological need satisfaction" (p. 395) and "adolescents are more likely to display motivated behavior according to the pedagogical environment, teachers did consider camcorders, pocket computers, and computer software to be useful for their work in physical education" (p. 395). Legrain et al.'s findings indicated that ICT has "conveying knowledge about dynamic movements. This "would encourage PE teachers to use ICT to help pupils build a mental model of what they have to perform" (p. 395). Legrain et al. pivoted though and stated with a comparison with a traditional learning environment, "ICT would not directive favor immediate motor benefits in movement execution" (p. 396). They concluded by acknowledging the physical educator's motor outcomes via a different conduit of ICT. "The results suggest that the integration of ICT could be an interesting alternative strategy to enhance children's self-determined motivation for learning, and help them acquire new motor skills" (p. 397).

Do Devices Decrease Motivation in Students?

Regarding motivation in students' use with digital devices, Attig and Franke (2017) studied the effects of using digital devices to track one's physical activity and if using the digital devices decreased motivation. The authors had 210 users fill out a

questionnaire and then a scenario activity. Attig and Franke were aware that some activity

trackers provided external rewards such as acknowledging when one attains a certain

number of steps or calories burned. Also, they felt these habits may create a dependency

on the activity tracker. "Whereas these rewards might boost motivation to be physically

active in the early stages of usage, they might create a dependency over time" (p. 2).

Their concern was the user may receive positive feedback only from the device rather

than seeing the benefit of health from the tracker. While over 100 million activity trackers

were sold worldwide in 2016 (International Data Corporation, 2017), any research on the

motivation of their users is unknown or in the early stages. Attig and Franke found a

dependency effect on the activity trackers and in particular, to try and prevent not using

the activity tracker to have a long-term behavioral change in physical activity levels.

Their work was grounded in the self-determination theory work of Deci and Ryan (1985)

and Deci (1971) amongst the "undermining effect of external rewards on intrinsic

motivation" (p. 3).

The second piece in Attig and Franke's (2017) study was with four items related

to personality differences that each user has with being motivated in an activity. Using

the work by Bartle (1996) and Tondello et al. (2016), Attig and Franke first found an

ample amount of differences for motivators; next, whether the motivators are intrinsic

with customizing the device or extrinsic with awards like badges. Third, a need for

cognitive closure (NCC) is a stable "personality trait reflecting the desire for clear-cut

answers, predictability, order, and the avoidance of ambiguity" (p. 6). Having the desire

for structure and how feedback provides clarity, those with NCC, and who have access to

an activity tracker, had an increase of intrinsic motivation to be active. Fourth, an affinity

for technology interaction (ATI) that pertained to individuals finding new digital devices.

When using these devices, individuals with a high ATI have an increase in intrinsic

motivation, likened to achievement motivation (Atkinson, 1957) which is described as

individuals who "tend to approach or avoid situations that can result in success or failure"

(p. 7). There are balances with outcomes of performances based on patterns and how each

individual does or does not approach each situation. Patterns that Attig and Franke (2017)

found with devices and were extraversion, agreeableness, and conscientiousness are

"positively related to intrinsic motivation" (p. 9) where neuroticism would be extrinsic.

Results from their (Attig and Franke, 2017) study concluded from question one

was the technology dependency effect had three areas. The first was a slight increase in

the loss of motivation without the activity tracker. Question two saw participants who had

higher extrinsic motivation for using their tracker then had a greater loss in intrinsic

motivation to be active when the tracker was not available. The third question,

antecedents of the dependence effect, found that using the tracker did not mean there was

a relationship to the dependence effect. Yet, intrinsic motivation to be active was

decreased to the "dependency effect while the extrinsic motivation for tracker usage,

extrinsic motivation for physical activity, and the need for cognitive closure were

significantly positively related to the dependency effect" (p. 19). The fourth question,

predicting intrinsic motivation for tracker use, was found to be not significant. Finally,

factors that predicted intrinsic motivation for physical activity and intrinsic motivation

through physical activity were based on a "hope for success" (p. 20). This meant there

was an indirect effect for individuals who tended to be motivated intrinsically to be active. Therefore, the tracking device showed positive results between being active and not active.

In closing, Attig and Franke (2017) found that extrinsic motivation was prevalent for physical activity trackers being used by the participants in everyday settings. Additionally, the need for cognitive closure and extrinsic motivation were related to being active and with the device. Hope for success played a role in the motivational costs of intrinsic motivation. In the end, "activity tracker feedback can be perceived as externally rewarding, can create a dependency, and can impair users' motivation for physical activity when feedback is not available" (p. 26). When individuals have higher intrinsic motivation, it often creates long-term possibilities to be physically active, which is a positive conclusion to steer from the dependency effect. This aligns with Hagger and Chatzisarantis (2008) who stated that intrinsic and extrinsic motivation has a relationship with physical activity. This relationship is due to being intrinsically motivated to be active and has long-term positive effects.

Hagger and Chatzisarantis (2008) attest that when physical activity is viewed as self-determined and rewarding, more healthful behaviors are likely for the individual who uses a tracker. Another finding was the need for cognitive closure. Hagger and Chatzisarantis determined cognitive closure was positively related to those with higher intrinsic motivation regarding tracker use and the dependency effect. "Users high in Non-Cognitive Closure are intrinsically interested in their activity data but tend to reduce their physical activity when the tracker is not at hand" (p. 24). If an individual has a

higher need for cognitive closure, the tracker may provide better stability for being motivated through ritual and routine activities as the tracker detects such as steps, heart rate, and calories. To reduce the need for cognitive closure, physical education teachers need to remind students that all steps matter even if there is no tracker available. This ties into the mindsets of individuals and how they shape personalities.

The Mindset in Physical Education

Researcher Dweck (2006) wrote on how individuals have fixed or growth mindsets. She found two types of mindsets: fixed and growth. A fixed mindset is having the belief that one's mental qualities are set in stone, and an individual must prove themself time and time again to others. Someone with a fixed mindset theorizes as only having a certain amount of "intelligence, a certain personality, and a certain moral character" (p. 6). The other mindset is a growth mindset and "based on the belief that your basic qualities are things you can cultivate through your efforts" (p. 7). When someone has a growth mindset, they can "grow and change" (p. 7) from their baseline of "talents and aptitudes, interest, or temperaments" (p. 7). Much of Dweck can be interpreted as physical education. If students and teachers have a similar mindset, say fixed, there will be minimal growth by all. Establishing a ceiling of potential growth negates the potential use of digital devices too. A growth mindset provides classes with an idea of improvement and the ability to strive for the betterment of oneself and others, based on the self-determination theory (SDT) which is the focus of the next section. SDT has gained in popularity with physical education recently. Teachers with knowledge of different mindsets have the capabilities to understand intrinsic motivation. This can lead

to increased student play with digital devices or without and encourage movement. Although extrinsic motivation is deeply tied to digital devices from the previous study, the research in self-determination theory suggests a turn for students to be more active with digital devices as tools for teachers when teachers have a growth mindset.

Summary

The use of digital devices in physical education classes are more prevalent in the past decade. 92% (Lenhart, 2015) of 10-19 year-olds have a digital device so that demographic knows device usage. Having devices are achievable based on student engagement and the school's ability to obtain devices. A study by Nation-Graniger (2017) found that watches used in physical education classes had a positive effect on a student's motivation to be active. Information and communication technology (ICT) by Legrain et al. (2015) in physical education classes lead students to have greater satisfaction with their class when the digital devices are used to give feedback. Lastly, Attig and Franke (2017) studied motivation with digital devices.

When personal quantification is incorporated while using digital devices, issues may arise with intrinsic motivation (Etikin, 2016; Mekler, Bruhlmann, Opwis, and Tuch, 2013; and Mekler, Brulmann, Tuch, and Opwis, 2017). These studies indicated that digital data decreased the overall enjoyment levels of activities as the results determined students found the game (extrinsic control) was less desirable. Etkin's study established when there is no quantified feedback available, students found activities more enjoyable. This is pertinent to teachers to become aware of how to provide qualifiable feedback as

opposed to the quantifiable to move the pervertible needle to intrinsic motivation to be physically active.

Without device use, students lost motivation. Without having the tracker, students were not as active. When motivated extrinsically via a device, students were more active and without a device, not as active. The next section is on the self-determination theory (SDT) with layering on motivation (intrinsic and extrinsic). SDT looks at how to get students from being dependent on devices to be motivated to self-driven motivation to be active.

The Self-Determination Theory (SDT)

Being motivated in physical education through digital devices may benefit students and teachers, as described in the previous section. Options of digital device availability with physical education include pedometers, heart rate monitors, or reviewing skills via an iPad. While having digital devices for students tends to bring up their motivation for activity, this is motivation mainly extrinsic. The goal of the self-determination theory is to have individuals be intrinsically motivated to be active in physical education. This section unpacks the self-determination theory (SDT) and how critical being intrinsically motivated to be active, with or without digital devices, and how activity through the SDT can improve a student's well-being.

First, the definition of SDT is from Goodyear, Blain, Quarmby, and Wainwright (2017) as "individuals who are highly motivated when they fully endorse their actions and take part in activities for intrinsic interest and enjoyment" (p. 17). This is the focus of how SDT ties into physical education. Knowing a student's desires when they are

motivated plays into a teacher's strengths; which having every student be active in class. This is opposed to finding a student's weaknesses and attempting to improve them. Creating awareness of the strengths and weaknesses of each student is one challenge for physical education teachers. By having students improve their skills in class, in combination with motivation, actions of students, intrinsic interest, and enjoyment, teachers, and students can work together in unity for the betterment of the class. A key component of improving student motivation is the development of digital devices in the curriculum; which is unveiled later in this section. Yet what are the important items to consider when implementing SDT with digital devices in physical education?

Those items are what Deci and Ryan (2008) found in their study; when students are motivated in academic learning, teachers see improved engagement and constant activity. In a physical education class, even for the outcome of fun in the activity, students benefit. SDT helps students become more autonomous in their motivation by having more adaptive responses than the controlled, extrinsic forms of motivation.

The authors found three psychological needs related to SDT: autonomy, competence, and relatedness. Autonomy demonstrates individuals feeling they are responsible for their actions. In physical education, a student times another student using a stopwatch. Competence has the student using the watch well and gains satisfaction by giving one a feeling of efficacy. Lastly, relatedness forms around how someone feels connected and accepted by others. The student with the watch telling their partner their time, then switching tasks enables relatedness. In physical education, a teacher uses an application from their iPad for example, to choose teams. Then students get to know each

other as new teammates. How SDT, digital devices, and physical education are in triangulation has a profound effect on students and motivation to participate in physical education with the use of digital devices. Autonomy, competence, and relatedness make classroom work with others improve to become more self-determined.

SDT was presented by Ryan and Deci (2000) as "an approach to human motivation and personality that uses traditional empirical methods while employing an organism metatheory that highlights the importance of humans evolved inner resources for personality development and behavioral self-regulation" (p. 68, as cited in Ryan, Kuhl, & Deci, 1997). SDT research has been guided by three factors of environment, social functioning, and personal well-being. Ray and Deci, guided by SDT, focused on three outcomes from those factors

The first outcome was how intrinsic motivation and the human drive for learning and creativity work together. The second was an analysis of self-regulation that viewed how individuals take in "social values and extrinsic contingencies and progressively transform them into personal values and self-motivation" (Ryan et al., p. 69). Finally, a focused take on studies that impacted psychological needs for health and well-being attainment.

The Rationale for the SDT

One rationale facet is based on student activity time. There are correlations between the student movement and a physical education teacher's basic needs are met for their work. A study by Ball, Malijak, Bice, Valley, and Parry (2019) investigated a relationship between the self-determination theory, schools, and their physical education

teachers if students achieved the required amount of minutes for physical education. Ball et al. began by stating the main issue of childhood obesity is due to lack of exercise as a child ages, the less likely the individual will partake in daily physical activity. The National Physical Activity Plan (NPAP, 2016) concluded that a lack of daily physical activity for students in grades k-12 that "attend a minimum of one physical education class weekly, attendance drops significantly from elementary into the high school years" (Ball et al. from NPAP, 2016, p. 1309). Going from elementary school to high school, the authors and other researchers agree that schools can be a place for new physical movement. Yet in the *Shape of the Nation Report* from SHAPE, found that activity time is not near what students in grades k-12 need daily, which is 150 per week. The number of minutes of physical education recommended by the Centers for Disease Control (CDC, 2019) is 60 minutes per day for students aged 5-17.

Before their research, Ball et al. discussed a possible solution to higher obesity rates: provide quality physical education during school. They suggested additional moderate-to-vigorous activity levels. SHAPE (2020) defined its mission statement as "to develop physically literate individuals who have the knowledge, skills, and confidence to enjoy a lifetime of healthful physical activity" (Ball et al., 2019, p. 1309; SHAPE, 2020, p. 1). Aware of their mission statement, Ball et al. determined that physical education teachers need to have "a range of knowledge; the autonomy to implement a diverse curriculum, the competency to provide a variety of activities such as individual and team sports, adventure dance, and fitness education; and the support of administration, staff, parents, and students" (p. 1308). Then relatedness for the SDT and physical education

teachers. Specifically is the amount of time they can have with students to attain the recommended number of minutes from the CDC. What Ball et al. (2019) researched through SDT is if schools do meet the recommended number of physical education minutes based on physical education teachers' autonomy, competence, and relatedness, an increase of teacher happiness was present.

The authors determined a majority of teachers in the study who taught in a school that met the recommended weekly physical education minutes felt more competent than those who did not meet the recommended minutes. Teachers who did not attain the recommended minutes felt there were fewer resources (equipment, funding, and digital devices) made available to them. This leads to feelings of less competency and was unable to have the ability to fully implement their curriculum.

From the discussion, the state where the study took place mandated physical education be taught in every grade but not to the recommended weekly minutes (SHAPE American et al., 2016). Ball et al.'s opinion was since teachers are meeting minute recommendations, they are better able to reduce childhood obesity. This ties together with having the physical education teachers "feel more competent in their ability to teach an effective physical education class" (p. 1315). Concluding the study, Ball et al. described how when teachers have time to give students the recommended number of minutes in physical education, teachers feel autonomous, competent, and respected in the teaching community. They and other researchers attest that "the importance of having all three basic psychological needs met in the work environment for employees to be the most effective" (p. 1316).

How the SDT works

SDT works in physical education to have activities students perform and learn why individuals lack motivation or need an extrinsic motivator. From figure two, a student begins with behavior and is either self-determined or not. Next, the type of motivation one would demonstrate from motivation comes from the regulatory style. The perceived locus of causality is tied with the style yet can be unpacked to process each student demonstrates. The complexity of processing each student in a class can be challenging and time-consuming. In physical education, students could identify how motivated they are with a Likert scale using six points of reference with numbers or faces. Using an iPad, teachers have faces to provide a visual for students to give feedback for the teacher based on their effort after class. As an example, using digital devices to learn the skill of shooting a basketball into a hoop. A question of how motivated a student is to use video to record their body language at the beginning of class then shown after. Once class begins, using a prompt to students such as how to shoot a basketball. Then after class, check-in for their motivation. The well-being of the student in the environment that is physical education class, related to motivation, will evolve through concentrated efforts to monitor and adjust the techniques used to motivate students.

Having students with a positive feeling of their well-being can move the motivation needle from extrinsic to intrinsic. Ryan and Deci (2000) concluded their work with the statement for those in leadership positions could use is "the social contexts in which such individuals are embedded are responsive to basic psychological needs, they provide the appropriate developmental lattice upon which an active, assimilative, and

integrated nature can ascent" (p. 76). The authors asserted that teachers must be aware of the knowledge and emotional development of each student as both address encouragement of motivation. By adhering to those two areas, teachers may motivate students lacking intrinsic motivators in their lives and attain new achievements through improving their well-being.

Motivation with the SDT

Motivation, defined by Ryan, Kuhl, and Deci (1997) is based on "energy, direction, persistence, and equifinality-all aspects of activation and intention" (p. 69). The key factor in motivation is if it produces those who can motivate others. Motivators are usually associated with professions such as teachers, coaches, or managers. These motivators get individuals to follow them by first valuing something and having their students, athletes, or employees buy into their value process. Individuals are motivated in a variety of ways extrinsically (coercion or bribery) or intrinsically (community or belonging). While the values differ, individuals are motivated through different means and ways. The SDT approach is to use the type of motivation that is being demonstrated at a time, pinpointed differently with types of motivation, how each is developed, maintained, or thwarted, and with an unrealized outcome.

Figure 2

The Self-Determination Continuum
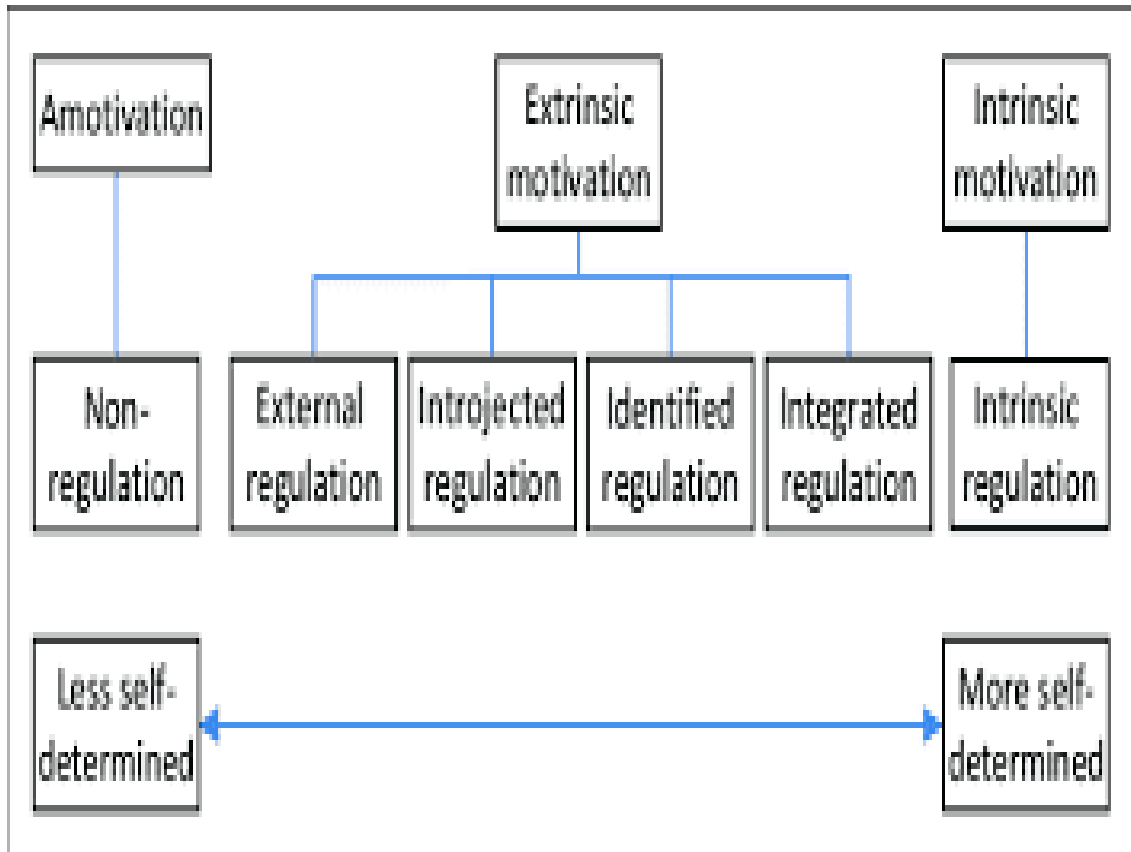
Note: Ryan and Deci, 2000.

The figure above shows three types of motivation. First, intrinsic motivation and the human drive for learning and creativity cause an "inherent tendency to seek out novelty and challenges, to extend and exercise one's capacities, to explore, and to learn" (Ryan & Deci, 2000 p. 70). Ryan and Deci stated that intrinsic motivation is a matter of conditions as opposed to concerns. When conditions are studied and sought out, this creates intrinsic motivation, comprehending the methods on how intrinsic motivation is revealing.

The authors contend that intrinsic motivation enhancement occurs when "choice, acknowledgment of feelings, and opportunities for self-direction" (p. 70) had greater feelings of self-worth. When a framework for SDT is in place through social environments, like a physical education classroom, the environment allows people to be empowered by individuals, to be autonomous, and the activity is desirable which can improve one's intrinsic motivation. The second component of SDT is self-regulation that viewed how individuals take in "social values and extrinsic contingencies and progressively transform them into personal values and self-motivation" (p. 69). As in physical education class, when a student is valued with influences from a teacher, they can demonstrate additional value for themself and be motivated.

Extrinsic Motivation with the SDT

Extrinsic motivation, defined by Ryan and Deci (2000), is "referring to the performance of an activity to attain some separable outcome" (p. 71). There are four regulatory styles of extrinsic motivation: external, introjected, identified, and integrated regulation. Beginning with motivation, the behavior is non-self-determined and is little self-motivation for an individual to do physical activity, for example. The perceived locus of causality for the behavior is impersonal and relevant regulatory processes include non-intentional, non-valuing, incompetence, and lack of control. Students in this style would likely not comply with rules in physical education and have little value in learning any skills.

Next is an extrinsically motivating style that starts with external regulation. An example of this in elementary physical education may be running the mile when a student

has no interest in running. The perceived locus of causality is external (a teacher) and relevant regulatory processes (a student running a timed mile) that are being compliant and external punishment and rewards (a reduction in a grade or a higher grade). A reward must be in place for the student to run.

Introjected regulation is somewhat external regarding the perceived locus of causality. The regulatory processes are self-control, ego-involvement, and internal rewards or punishments. Self-control has the student engaged in running, hopefully to the best of their ability. Ego is substantial, where a student running the mile would need to be the best in their class to be motivated. A rewards or punishment system is where running the mile would be attaining a goal time or place, driving the student to improve on their own volition. The last external behavior regulatory style is integrated that is internal for the locus of causality. Moving towards intrinsic motivation is an identified regulation that is somewhat internal, is personal, important, and conscious valuing for relevant processes. The relevant regulatory processes include congruence, awareness, and synthesis with self. In this case, a student will run a mile as they were asked and understand that the mile may help their health and the challenge is attainable.

Moving towards being intrinsically motivated comes from one's inner drive and sense of self-worth. The use of SDT and how it can move individuals to the intrinsic motivation from extrinsic is "through internalization and integration that individuals can be extrinsically motivated and still be communicated and authentic" (p. 74). SDT attempts to nurture the inner human potential that can grow, integrate, and have well-being. Then to determine how to navigate conditions that provide "healthy

development and effective functioning of individuals, groups, and communities" (p. 74).

How SDT takes into account students is through not valuing school norms, Ryan and

Deci (2000) explained. Those norms are by having the individual find their social context

first then their environments where they are developing. Doing so has the individual

determine the degree that their "needs for competence, autonomy, and relatedness are

being or have been thwarted" (p. 74). If those traits are not supported, the individual will

be left out and feel unvalued.

Intrinsic Motivation and the SDT

SDT for teachers is helpful for students to improve their intrinsic motivation. Yet

with the implementation of SDT, teachers need to know there are three methods. Berghe,

Vansteenkiste, Cardon, Kirk, and Haerens (2014) provided three specific methods for

students to ensure improvement in their intrinsic motivation. They stated it "is critical to

support the satisfaction of individuals' innate, psychological needs for autonomy,

competence, and relatedness" (p. 99). To establish motivation as a baseline, a 19-item

Behavior Regulation in Exercise Questionnaire (BREQ-2) was given. This questionnaire

provided researchers and others with self-determined motivation, specifically for

grade-level students in physical education. The other measurement used for physical

activity was a Samsung Gear smartwatch that "monitors heart rate and uses a three-way

accelerometer gyroscope to track movement" (p. 468). Their study used these two data

pieces for feedback.

Ten sixth-grade male students, identified with low motivation were involved in

the Berghe et al. (2014) study over six weeks. Five students were in the experimental

group and five in the control group. Those in the experimental group used smartwatches to provide biofeedback, while the control did not have the watches. At the end of the study, the post-study interview questions and quantitative data indicated a significant "increase in calories burnt and distance run in the experimental group" (p. 473) with biofeedback. Additionally, the self-determination motivation for students in the experimental group increased over the control group. In the competence portion of the self-determination theory, themes from students formulated a need to work harder from biofeedback. For relatedness, the watches gave feedback such as distance run, calories burned, and time spent moving. Students now had a baseline of data and wanted to better their marks from the prior week. Berghe et al. also found autonomy with watches influenced students to do more physical activity. Those without watches did what their teacher asked them to do and nothing more. When provided a digital device, students targeted with lower motivation tended to improve their intrinsic motivation to be active. Having teachers use their skills to improve curriculum and knowing the needs of lower motivational students, autonomy even for teachers can plan their curriculum and be independent physically.

Autonomy for teachers is overlooked in most schools and crucial for them to have in their classrooms. Teachers, through studies by Deci & Ryan (2000) and Skaalvik and Skaalvik (2014) found those who had autonomy correlated strongly to career satisfaction. When teachers can select their own goals, curriculum, teaching strategies, the teacher's own beliefs, and values come forward through their teaching. When physical education teachers are not in autonomous environments, the outcomes included "burnout, emotional

exhaustion, depersonalization, or feelings of reduced accomplishment" (Skaalvik &

Skaalvik, 2014, p. 1309). When teachers have autonomy, competence, and relatedness,

Deci and Ryan (2000) found these three constructions are tied into motivation. If teachers

have those constructs met, with basic psychological needs also, self-determination

motivation can be tangential by then giving students the support and help they need

(Taylor, Ntoumanis, & Standage, 2008). Teachers are likely to have foundationally strong

teaching abilities with all of the mentioned included in their profession.

Summary

The self-determination theory (SDT) in physical education occurs when

individuals are motivated to do activities and see improvement, they take pleasure in

doing more of the activities and possibly beyond. When three psychology needs are met

in physical education class (autonomy, competence, and relatedness), students may

demonstrate improvements in self-motivation. Yet for these needs to be met, teachers

need to motivate students to do more or the student's motivation may lessen. A study by

Ball et al. (2019) found when teachers have their three psychology needs met, they are

better teachers. Conversely, when those needs are not met, teachers felt incompetent, less

effective, and incapable to teach. Knowing the value of motivating students, the SDT

may boost a teacher's motivation to give their students additional time to move, possibly

lowering the obesity rate. One way teachers could use this is through a digital device for

motivating their students to be active. The next section is on the use of digital devices

through the means of technology, pedagogy, and knowledge of content and is used to

provide teachers with ways and means on how to implement technology and digital devices into their curriculum.

Technological Pedagogical Content Knowledge (TPACK)

Having digital devices in the classroom means teachers need to use the devices correctly through training, trial and error, and applicability to their students. In physical education, this via applications if a teacher has multiple grade levels as an elementary physical education teacher does. The model of technological pedagogical content knowledge (TPACK) "delineates teachers' knowledge of digital devices and describes the situated and complex knowledge required by teachers for digital devices integration in their teaching in a digital age" (Chambers, Sherry, Murphy, O'Brien, & Breslin, 2016, pp. 59-60) (see figure 3, p. 108).

Figure 3

Technological Pedagogical Content Knowledge
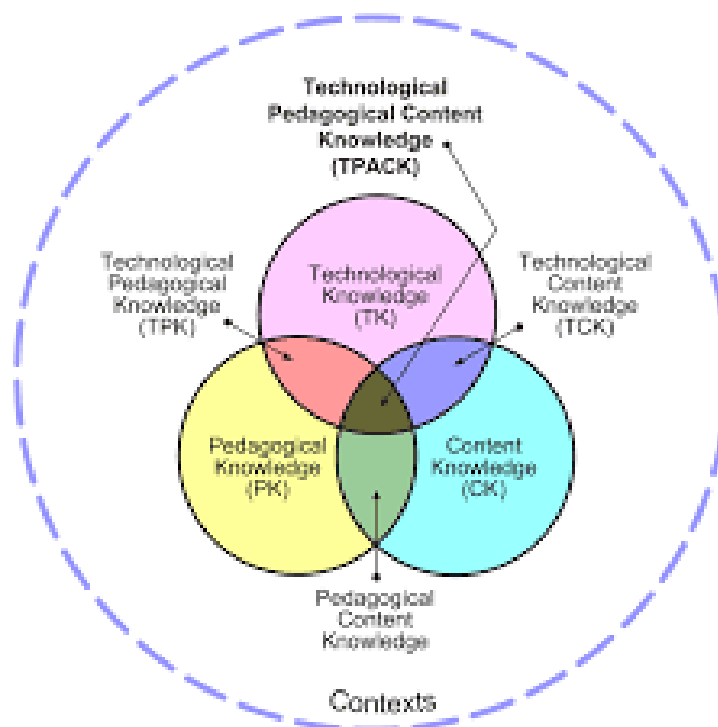
Note: The TPACK Framework From Casey, Goodyear, and Armour, 2017, p. 207

Using digital devices with students, teachers must have a background in technology implementation. Key facets in technology implementation are three core areas: what the content is with the digital devices, how digital devices align with the pedagogy, and if the digital devices work for those individuals using the digital devices. This final section explains each of those three core areas and how the implementation of digital devices can happen in the physical education curriculum.

TPACK, created by Koehler and Mishra (2009), is "an emergent form of knowledge that goes beyond all three 'core' components (content, pedagogy, and

technology)" (p. 66). The authors focused on TPACK within areas of effective teaching: using digital devices, establishing an understanding of concepts within digital devices, how to construct digital devices knowledge for learners, the difference of easy and hard methods for students to learn via digital devices, what the prior knowledge is for students in digital devices, and lastly, building new epistemologies for digital devices using prior knowledge. When teachers use TPACK in their classrooms, all three areas of content (content, pedagogy, and technology), curriculum, and digital devices are intertwined for learners. "Ignoring the complexity inherent in each knowledge component or the complexities of the relationships among the components can lead to oversimplified solutions or failure" (p. 66). Physical education teachers must have training on how to implement the devices. Training in digital device use, which has been discussed in this literature review, is necessary as physical education tends to not be incorporated in digital device training or other content areas. Three areas circumnavigate TPACK: PCK, TK, and TCK.

In TPACK are three areas of knowledge: pedagogical content knowledge (PCK), technological knowledge (TK), and technological content knowledge (TCK). Combining these three in a Venn diagram formation leads to TPACK in the middle (see figure three). Where this falls in physical education is described in a case study by Parker et al. (2017). They found that teachers in physical education tend to learn new technologies on their own without support from the administration. Teachers learned about new technologies (TK) through their own devices, then pilot studied them on their own. Next is the content technology knowledge (TCK) where variabilities of the student's and teacher's

knowledge with new digital devices tend to be broad. The teacher from Parker et al.

developed his own TK and TCK. But critically learned on his own about the small

portion that is TPACK. What drove him was that TPACK provided the focal point for

him was his students to learn and teach in unity. The devices were not the end as a

motivator but were "the use of technology as a means to provide holistic student

engagement, emphasizing an understanding of key concepts, and the ability to apply

these concepts to solve authentic real-world problems" (p. 43). Using digital devices

helps teachers incorporate all areas of TPACK in their classrooms.

Koehler and Mishra (2009) provided implications of using TPACK with the three

components: understanding content, teaching, and technology. The objective of their

research was the relationship with two critical domains: "teacher thought processes and

knowledge and teacher's actions and their observable effects" (p. 67). They discovered

that TPACK and its framework utilized research and scholarship to include digital

devices into their curriculum gave teachers the ability "to assist the development of better

techniques for discovering and describing how digital devices-related professional

knowledge is implemented and instantiated in practice" (p. 67). Lastly, TPACK can be

used in teacher education, professional development, and digital devices. One specific

area is how complex digital devices may be unpacked and used for synthesis into the

curriculum. When TPACK is implemented into development and design with teachers,

the connections made with student learners are impacted "upon the connections among

technology, content, and pedagogy as they play out in classroom contexts" (p. 67).

Integration of TPACK Into Physical Education

Surrounding TPACK is the context. The premise of the contexts is students using all three main circles designed by the teachers. Students must be considered throughout the process of implementation of new digital devices in the curriculum. Baert et al. (2017) looked into how TPACK is integrated into physical education against the pedagogy in physical education. Integrating digital devices "used in a simplistic way to explain the process of how to infuse technology within pedagogy" (p. 205). The areas where digital devices are implemented were how the devices need to be used with the intendedness of how students are using digital devices. The challenge for physical education teachers is the content through technology and pedagogy, working cohesively to meet the learning needs of every student using digital devices in the classroom.

Fullan and Langworth (2014) reported when a new form of pedagogy is introduced, the attention needs can be on how the learning is taking place rather than teaching. As teachers become increasingly familiar with learning digital devices within pedagogy, deeper learning occurs for both teachers and students. At the end of their report, Fullan and Langworth suggested starting points for teachers to begin a transition into new digital devices pedagogies. The first is to partner with students for learning; with and from them. Physical education teachers would do well linking with students as many are knowledgeable with devices, particularly outside of school. Another suggestion is to learn about a student's dreams and interests. From their study, lead to digital devices supporting students to investigate those dreams and interests. The devices may help identify deeper learning activities that provide broader inclusion between the school and

the community. A third suggestion is redefining learning activities that focus on problem-solving and implementation associated with real-world applications. These are tied to those student's dreams and interests when there is a collaboration with additional teachers and stakeholders to better engage students and push student learning. The last suggestion is to nudge collaborative times with other teachers with new pedagogies that tie into deeper learning. Utilizing all of those items, particularly in physical education, students and teachers can find physical activities, some new or embedded in the curriculum, for all to participate in. TPACK and physical education can work together for students and teachers to improve their deeper learning.

Summary

Having TPACK as a template, physical education teachers visually comprehend how to use digital devices in their classrooms can help their teaching. When using TPACK, there are three core areas teachers need to have: the content with digital devices, how the devices align with pedagogy, and if those devices work for individual students. Through trial and error and training, there are areas of growth in learning how those devices work. TPACK was formed by Koheler and Mishra (2009) through those trials and errors with use in the classroom. In TPACK are three areas of knowledge: PCK, TK, and TCK. Each area of knowledge, fused in a Venn diagram, provides a unity of knowledge. When TPACK is unpacked and synthesized into the physical education classroom, pedagogy and digital devices provided new means of a curriculum for teachers and students to use.

Conclusion

This literature review focused on digital device history in physical education, how motivation with devices are used together for curriculum development, exergames and their involvement in physical education, digital devices in the physical education curriculum— specifically the challenges physical education teachers face, self-determination theory, and its impact with motivation and devices, and technological pedagogical and content knowledge structure for physical education teachers. Each area provided insight on how digital devices have influenced teachers to stay current with modern times and evolve their curriculum. Having a foundation of goals with the literature review and why digital devices are used in the physical education curriculum is vital for this study. The primary and guiding questions include do digital devices motivate students to be active, were the focal points of the literature review. Having unpacked these questions through topics related to them, provide a baseline for the case study and the methodology which provided the means to what other physical education teachers believe with digital device use in their classrooms.

The next chapter describes the research methods, how the data is collected, and the steps taken for the researcher to obtain results from participants. Also included is the creation of a survey and interview questions, with the approval of the internal review board application and consent forms. After approval, surveys were sent out for possible participants, setting up interviews, then analysis of content, narrative, and developing themes provided results from urban elementary physical education teachers and their impression, use, and knowledge of digital devices in their profession.

CHAPTER THREE

Methods

Introduction

Digital devices in elementary physical education have evolved from teachers recording student activities with large video cameras to capturing student's skills and documenting student work; keeping score with bulky scoreboards during team sports to personalized pedometers and personal activity tracking devices for each student. As demonstrated in the literature review, the growth of digital devices in physical education classrooms continues. Knowing the evolution of digital devices in the physical education curriculum, the focus of the methods chapter begins with a selection of a paradigm for research.

At the beginning of this case study, the selection of which paradigm was based on teachers being from one school district. A constructivist case study was chosen to allow the teachers to establish their voice through an ontological lens. As the case study evolved, the themes became present from the teachers through the interviews which are unpacked in the last two chapters.

Recruiting teachers, determining the setting, examining the proper tools, and choosing the precise methods took time and diligence to move into the analysis portion; data went through a narrative analysis that looked for themes within the transcribed interviews. Then, content analysis led to coding those themes that provided information to develop those themes in chapter four on how elementary physical education teachers are using digital devices in their classrooms.

Chapter Overview

This chapter describes the research paradigm, survey and interview questions, rationale for the case study, the setting and participants, data collecting tools, methods used, and types of data analysis. Starting with how to obtain the data, a qualitative case study was selected to answer the following primary and guiding questions:

- **Primary research question**: How are urban elementary physical education teachers using digital devices in the classrooms?

- **Guiding question one:** What are elementary teacher's primary purposes for using digital devices in their physical education classes to support the attainment of learner outcomes?

- **Guiding question two:** How do elementary physical education teachers describe the current usage of digital devices in their classrooms?

- **Guiding question three:** What are possible descriptors and factors that either support or form barriers for the use of digital devices in the urban elementary physical education classroom?

- **Guiding question four**: How do urban elementary physical education teachers describe their perception of their role in physical education class during the coronavirus of 2020?

- **Guiding question five:** With digital devices, what role do urban elementary physical education teachers serve regarding motivating their students to participate in physical education? And is the self-determination theory part of providing motivation for students with digital devices?

From the research questions, the data taken from the interviews moved into content analysis that determined how digital devices are being used by elementary physical education teachers in the school district. Themes were created from content analysis and then into answering the research questions. Before the interviews, a survey was conducted and sent via email to gauge interest from the 41 elementary school physical education teachers in the school district. The number of teachers desired for the interview was between five to ten to account for differences in the school district from each of the schools those teachers represent. Categories of diversity from teachers included which neighborhood school they taught, length of employment of the teacher in the district, and as an elementary physical education teacher.

Chapter three begins with establishing a research paradigm. Next is framing the case study, determining the teachers interviewed from the survey and providing a setting for an interview. As the survey and interview questions were written, my selected methods of analysis were narrative and content analysis. Finally, a description of what my positionality and biases are before the data collection tools were implemented. Concluding the chapter were possible limitations and the Internal Review Board's permission to formally conduct the case study.

Research Paradigm and Rationale

A constructivist paradigm was selected as it allows a participant to establish, through pre-established questions and semi-structured interviewing, to tell their story within those parameters (Dagar & Yadav, 2016). The constructivist paradigm in this case study provided teachers those opportunities to share their experience with the use of

digital devices. Having the teachers all from one school district, a case study fits the research paradigm definition.

Constructivism

Constructivism was selected from the teacher's ability to create their story based on the research questions asked of them. One critical piece was how the interview questions would be written based upon the constructivist definition. That was explained by Spigner-Littles and Anderson (1999) as "constructivism maintains that knowledge is acquired through an active process in which the individual continually structures and restructures experience through self-regulated mental activity" (p. 205).

The practical issues that encapsulate the constructivism paradigm are from Lincoln and Guba (1994). Their meaning of constructivism included inquiry aimed at the nature of knowledge, knowledge accumulation, goodness or quality criteria, values, voice, training, accommodation, and hegemony. First, the inquiry aimed to understand and reconstruct the nature of knowledge from the participant. Initially, I looked for a consensus between all the teachers yet would be open to "new interpretations as information and sophistication improve" (p. 113). In time, individuals may be open-minded to new content and meaning of different constructions they encounter. My thinking was introducing this case study topic to teachers to acknowledge either their use of devices or not using devices.

Secondly, the knowledge in constructivism focused on "creative consensus among the competent to interpret the substance of the construction" (p. 113). As a key component, knowledge in constructivism can be constant even through revisions and

individuals be open to new knowledge as it appears. Third, the accumulation of knowledge occurs when more informed constructions are made available from one setting to another. This may alter the experiences of the subject and researcher. The knowledge accumulated takes on a different mentality when the individual is more informed. Then the criteria for judging the quality of an inquiry in constructivism moves to trustworthiness and authenticity.

My paradigm selection aimed to use the practical issues by Lincoln and Guba to unpack the data teachers provided. As suggested by the authors, the research would see similarities with the teachers yet be available to different interpretations. Next is to revise one's thinking about what each teacher brings to their classroom with devices and listen for new ideas from each interviewee. As new information came from the interviews, I gained knowledge and was more informed about the thinking from each teacher.

Case Study

The method of using a case study is based on one specific group being studied as Yin (2017) provided this evidence for using a case study. The case study is an empirical method with rationales consisting of an investigation of a phenomenon that has depth and applies to the real world. He stated that when performing a case study, there is an assumption there is a contextual condition that focuses on the study one is researching.

Kvale (2015) wrote on case studies and how they are used when a researcher selects interviewing as their method of choice. Creswell (2018) and Yin (2009) agreed with Kvale that interviews are one of the most important sources of data in a qualitative

case study. Using methods of a constructivist paradigm: case study format, survey, and interviews provided the framework for research.

Yin described how the case study has three major points and the examples are mine. The first included a relevant situation where variables abound. The relevant situation for this case study included the teachers being in the same school district. Additional situations are teaching and experience with digital devices. Gender, time of day, age of the teacher, and the setting of the interview are variables with the case study. Then, the benefits of previous research from theoretical perspectives help navigate data collection and analysis. Prior research is in chapter two with different perspectives from a variety of sources. Lastly, there are multiple sources of data through evidence which the case study encompassed forms of inquiry and data formulated through data collection and means of data analysis.

The case study, from Yin, has a "focus on a specific person, situation, or institution" (p. 143). Case study findings are evaluated to ascertain if the conclusion has reliability and validity, from there, does the outcome reveal "local interest or whether they may be transferable to other participants, contexts, and situations" (p. 295). Are the results generalized? If so, this question leads into forms of generalization and how or when one can take one case and generalize the case to additional cases. There are three different types of case studies that Stake (2005) wrote about and how one was selected for this case study.

Stake (2005) provided three types of case studies: intrinsic, instrumental, and multiple case studies. Reading all three types of case studies, the selection of an

intrinsic case study was chosen because of the ability of the teachers participating to have personal experience and knowledge of the topic. Using an intrinsic case study, this type of case study rests with "personal experience" (p. 296) and "develops for the person as a function of experience; it derives from tacit knowledge of how things are and lead to expectations rather than formal predictions" (p. 296).

The reason for a case study is due to the nature of the research question as its being posed and teachers in the same district. Yin (2009) attested that a case study is "an empirical inquiry that investigates a contemporary phenomenon in depth and within its real-life context, especially when the boundaries between phenomenon and context are not evident" (p. 14) meaning the case study provides a detailed analysis of a specific phenomenon.

Why a Case Study

Dul and Huk (2008) discussed what a case study is—it represents "an empirical inquiry that investigates a contemporary phenomenon within its real-life context" (p. 4). With the "real-life context" from others, the case study was ideal for the study based on their situations in other schools within the school district. Knowing the teachers with whom I work with our peers, the feeling was of greater openness to an interview format. Previous conversations with them revolved around planning curriculum with digital devices. The peer group is diverse in age, career length, and each adjusted their curriculum through their time as physical education teachers, specifically with digital devices. The topic of digital devices in urban elementary schools aligns with what these participants' peers are doing in their careers.

Trust between all teachers within the district has evolved to share detailed intricacies about our teaching styles. Two teachers who were interviewed, I have known for seven years as a cohort through a personal learning community (PLC). The desired case study participants are in this PLC. One issue though in this case study is I was to have zero ties with the district in written form; the goal of the research was to maintain the anonymity of the school district. The rationale was the district did not want research to occur under their name and the protocol of not including the name was followed.

Limitations and Misunderstandings

Limitations happen in every area of life as and in this case study research, is no different. Hodkinson and Hodkinson (2001) presented their findings on the limitations of case study research. Their research indicated that there tends to be too much data for ease of analysis. Another is case studies are expensive if performed on a large scale. Then the ability to examine the results can be difficult to simplify with a lack of "numerical representation" (p. 10) as case studies are not generalized in a normal construct. "They are strongest when researcher expertise and intuition are maximized, but this raises doubts about their 'objectivity'" (p. 10). Lastly, case studies are unable to answer a fair number of "relevant and appropriate research questions" (p. 10). These limitations were thought through to address to decrease additional issues before the research being conducted.

Flyvbjerg (2006) rejected misunderstandings of case studies with five items arguing for the use of case studies. The first is "context-independent knowledge is more important than concrete, context-dependent knowledge" (Kvale, 2015, p. 298).

Interviewing peers and their experiences have greater importance than any other source

from a universal perspective. Second, an individual cannot be generalized based on one

individual instance. Having the opportunity for a case study with those in the same

district has a profound effect on the overall climate of digital devices used by elementary

physical educators. Third, case studies are only helpful for creating a conclusion. There

will be extreme instances between teachers, yet the ability to glean analysis from their

words provided a construct of understanding of digital devices use or not using digital

devices. Fourth, case studies have a bias towards a preconceived notion. The use of a case

study can reject biases and move towards a verifiable conclusion through analysis. Lastly,

"it is difficult to develop general theories based on specific case studies" (Kvale, 2015, p.

299). Case studies are the truth of participants and their experiences. Theories are meant

to be used as a guide towards truth and a case study with a small number of participants

still provides solid evidence from the lived experiences of participants. By using case

studies and finding common themes through narrative analysis from peers who gave

responses, I hope to analyze and give to those in the school district on ways to improve

curriculum through digital devices use.

Setting and Participants

At the beginning of the case study, all elementary physical education teachers

within the school district were available to be participants. Consent (see Appendix E)

was asked from the district. I followed specific guidelines to ensure their anonymity,

explained later in this chapter. Having the availability of all elementary physical

education teachers to be interviewed, voluntary participation was made available. A

formal invitation to participate was sent via email after Hamline University Internal

Review Board (IRB) approval to all 41 elementary physical education teachers in the

district with a return response time frame of two weeks after the invitation was sent out

on December 14th, 2020. In the invitation, survey questions were enclosed to preview

for the teacher in anticipation of what they were asked before accepting or rejecting the

opportunity to be interviewed. The survey gave a rationale to gauge interest in possible

participants. From the survey, the aim was to determine who was interested. Those who

showed interest were sent emails back to confirm their desire to be in the case study.

For the setting, Google Meet was used due to the pandemic of 2020 and 2021.

The ability to record the meeting through video and audio was available on the

computer which an additional consent form was used. Through the interview process,

the teachers provided the means from their personal narrative experiences to collect

information on their use of digital devices in their classrooms. Looking specifically at

what platforms they used, how, and elaborate on how digital devices either help or do

not help in skill acquisition of their students were topics in the interview. Also, if

teachers are not using digital devices as often as they would like, what known barriers

are preventing them from implementing digital devices.

Data Collection Tools

The tools used in the case study were a survey (see Appendix D), sent to all

elementary physical education teachers in the district, and a semi-structured interview

(see Appendix C). The survey had twenty-two items and once the survey data was

analyzed, an interview time was established online. The interviews were 30-55 minutes

with questions that aligned with chapter two literature review topics. Each is unpacked further in this section and chapters four and five. Next are the benefits and limitations of both surveys and interviews as case study tools.

Survey

As stated by Fink (2017), surveys are usually taken by individuals to gather data for research. Fink alluded that "surveyors must decide on the survey's overall purposes and specific questions. They also need to know who and how many people will be contacted" and how to "process, analyze, and interpret data" (p. 1). Another particular concern with sending out the survey, which I was concerned about with the privacy of my possible participants. Fink added that "surveyors must be concerned with protecting respondents' privacy and assuring confidentiality of responses" (p. 1). The survey sent out had 41 possible teacher participants. If a teacher finished the survey and wanted to be included in the interview, they were contacted by email. For confidentiality, the teachers were given a number to correspond with their name and email, which only I was aware of. For those willing to proceed with the interview, individual interview sessions were set up with Google Sheets. The aim of the number of interviewees was between five and ten.

Benefits. Using an online survey has ample benefits including the "speed and reach, ease the cost, flexibility, and automation" (Ball, 2019, p. 414). Ball continued with how the data is downloaded in multiple ways "into analytical software packages" (p. 414). Nayak and Narayan (2019) studied the advantages and disadvantages of online surveys. Their findings with benefits included a lower level of social desirability to responses, the ability to quickly produce the survey and distribute it, the ability to create

complex branching, and to give better prompts to questions. Additional benefits were fewer mistakes in data collection, more answers completed, and less overall cost to process data.

Limitations. With benefits to online surveys, there are limitations. Ball (2019) studied the disadvantages with advantages and her findings demonstrated a "lack of an interview can be a disadvantage" (p. 414), particularly when open-ended questions in the survey do not allow the researcher to address the respondent to add to their thoughts or clarification. She added online surveys that allow for confidentiality for the respondent which is positive and negative. Authors Nayak and Narayan (2019) found limitations included less social interaction with researchers and respondents. When provided with an open-ended survey, the answers were shorter than in-person surveys taken. Answers from the computer were less accurate, "less friendly" (p. 32), and took longer to complete. Acknowledging the possible benefits and limitations of an online survey, this method was selected to provide to potential teacher interviewees.

Interviews

Interviews were selected as the method to obtain data for the case study once the surveys were processed. From the surveys, teachers who wanted to be interviewed were provided a semi-structured format (see Appendix C). Interviews were estimated to take between 40-50 minutes. The selection of interviews gave me an opportunity, as defined by Kvale and Brinkman (2015) as "an interpersonal situation, a conversation between two partners about a theme of mutual interest" (p. 149). By establishing the interview with predetermined questions, the conversation provided the teacher to "describe their

points of view on their lives and worlds" (p. 154). Kvale and Brinkman attested that the

first few minutes in the interview is imperative as the participant needs to have a grasp of

how the researcher is giving the interview. By having a structure to the interview, the

researcher can direct the interview. Through interviews, the teachers would provide

extensive examples of their rationale for how they use digital devices in their classrooms.

Kvale (2015) said that "certain themes and may include suggested questions" (p. 32)

regarding the semi-structured interview and its focus.

The interview questions (see Appendix C) were semi-structured and the same

questions were asked for each teacher. This was to keep continuity for all with their

answers. There may be differences in each teacher response being interviewed with

examples of where they teach in the district, student socioeconomic status, and teacher

digital devices knowledge.

Multiple viewpoints of the study included how teachers use devices, the purposes

of the devices, and how they service students. While curriculum from the district is

similar, each teacher has different equipment at their disposal, size of gym or fields, and

support or not from administration. This interview format will produce results from the

primary and guiding questions of how urban elementary physical education teachers.

These results were transcribed through Otter (the transcription application, see Appendix

B) using digital devices. Once each interview was completed, it was transcribed with the

Otter application and the text allowed the researcher to find meaning through further

analysis with data collection methods.

Benefits. The benefit of a semi-structured interview (Ryan, Coughlan, and Cronin, 2009) is the flexibility with which the interviewer has to dig deeper into issues. "The focus is on permitting the interview to tell his/her own story rather than answer a series of the structured questions" (p. 310). Having the story being told by the participant allows for rich and in-depth answers.

Limitations. Limitations of having an interview from Alshenqeeti (2014) included the number of time interviews take, the interview needs to be a small scale study, the interview is never anonymous, has potential for subconscious bias, and the possibility of potential inconsistencies. He concluded that "that using more than one data collection instrument would help obtain richer data and validating the research findings" (p. 43).

Data Collecting Methods

Data collecting methods for this case study included taking the results from the interviews then unpacking the data through analysis. The two forms of data analysis used in this case study were narrative and content. The narrative analysis focused on the interview questions broadly looking for key phrases and quotes. Content analysis was for narrowing the findings and used to find specific themes. Those findings will be described more in chapters four and five.

The interview was recorded on two devices. The first was through Google Meet and the second with my iPhone. Having two devices is due to in case one device falters such as a low battery or does not catch all the audio. Each device had the Otter application designed to take the teacher's every word and format their words to text. For

analyzing, the interview questions presented to each teacher were the same (see

Appendix C).

Narrative Analysis

The first tool I used for the interviews was narrative analysis. The definition of

narrative analysis is "exploring a person's narrative story and allows us to better

understand the 'why' and 'how' of that person" (Cowger & Tritz, 2019, p. 1). As

individuals tell their story, qualitative research analyzes their story with narrative analysis

to better comprehend their story, making sense of their experiences with others.

Holm-Hansen (2007) saw interviews as a challenging method of data collection. A means

of acquiring more data in the interview is through clarifying questions during the

interview or after. Vanassche and Kelchtermans (2016) wrote that "narrative analysis

shapes data in a narrative form, using a plot to tie together discrete experiences and create

the context for understanding" (p. 358). They along with Nie (2017) found that narrative

analysis is based on a set of ideas to different types of texts, each that have similarities in

a storied form. It also gives a "holistic approach to discourse that preserves context and

particularity" (p. 56). Lastly, narrative analysis can produce a better understanding of a

story that combines key information regarding a case study.

Within the narrative analysis, the participant can develop their own story as Kvale

(2015) wrote: "narrative analysis is a story" (p. 253) that focused "on the meaning and

linguistic form of texts; they address the temporal and social structures and the plots of

interview stories" (p. 253). When using narrative analysis, I looked at stories told during

the interview then established a formulaic construct based on the teacher's narrative. For

the narrative analysis portion, the responses each teacher gave provided depth, structure, and subplots to why each decided to use digital devices. During the transcription process into narrative analysis, each teacher built a framework to construct themes. I took each teacher's story and unpacked it in greater detail in chapters four and five. Once themes were produced, content analysis was used, narrowing the themes to specific coding mechanics which provided additional knowledge from the interviews.

Benefits. The benefits of narrative analysis are the stories people share. Riessman (2008) found that narrative analysis gives the researcher opportunities to unpack an individual's context. Items like their ethics, biases, or beliefs give the researcher a frame of the person. From Clandinin and Connelly (2000), some interpersonal learnings and the shared experiences of one or more interviewees occur through interviewing. Those interviewees provide their experiences, the researcher analyzes all the information given and expands their knowledge about the topic they are researching. Lastly, knowledge of subjects and people increases through the telling of stories. Narrating to tell our story "motivates and explains our actions, the stories we tell change the way we act in the world" (Geiger & Sorber, 2013, p. 349).

Limitations. There are limitations to narrative analysis. One is the relationship between the researcher and the interviewees (Goodson & Gill, 2011). There is a connection between each and an admiration of respect can facilitate from the telling of one's story to another. This may hinder fleshing out more pertinent information. Hatch and Wisniewski (1995) described the issue of "authorship, ownership, and the voice of both the participant and the researcher" (from Cowger & Tritz, 2019, p. 3). When the

researcher has the information, it behooves them to understand their "power, control, and privacy that need to be kept in the forefront" (p. 3). The researcher may misinterpret the information provided by the interviewee. It is up to the interviewer to have questions to keep the conversation flowing and keep the interviewee comfortable.

Content Analysis

The narrative analysis was broken down into different areas for the researcher who can then code the narrative themes into smaller topics, then into the content analysis. Graneheim, Lindren, and Luncman (2017) documented how content analysis "focuses on subject and context and emphasizes variation or differences between parts of text" (p. 29). After the analysis was completed, the data is discussed at length in chapter four. There, the data was constructed into themes and new learnings are established from the interviews This provided a clearer idea of how digital devices are utilized in each of the elementary physical education teacher's classrooms.

Vaismoradki, Jones, Turunen, and Snelgrove (2016) determined that content analysis allowed for coding to occur from processing the meaning and interpretation of a view, from the individual, through the lens of social reality into a theme I established the researcher from their participants. Themes are the result of data analysis; they produce practical results from a variety of areas of study. What content analysis does is select between either "latent content" and "manifest content as a category in data analysis" before moving onto "higher levels of data analysis" (p. 101). By using content analysis, coding the interview from transcription leads to themes that produce results on how the teachers interviewed use or do not use digital devices. Content analysis, from Berelson

(1952) is "a research technique for the objective, systematic, and quantitative description of the manifest content of communication" (p. 18). Content analysis, as described by Krippendorff (2014) is a container where those who are interpreting the text can place those words into a metaphorical container—waiting for it to be placed with the other words of a text.

Benefits. Elo and Kyngas (2008) wrote on how content analysis provides a multitude of data through text to determine specific results. The ability of the researcher to take a large amount of data and begin to place the text into categories allows the researcher to properly organize the text. Two benefits include a content-sensitive method and flexibility in research as Downe-Wamboldt (1992) contended that content analysis is focused on meanings, intentions, consequences, and context. Another benefit is how content analysis gives markers of reference on topics. Brylla (2018) found content analysis could "dilute the methodology to a level that allows the pragmatism to come forth" (p. 155). While challenging, the outcomes are themes from a researcher's work to best tell the story of others.

Limitations. A limitation of content analysis is the lack of a linear method of data collection. The qualitative interview data tends to be more complex than quantitative data which is straightforward (Polit & Beck, 2004). Hoskins and Mariano (2004) discussed the lack of specific guidelines for data analysis meaning each inquiry has its place in how the researcher interprets the data. Another limitation is the issue that there is no right or wrong way to interpret the data. Weber (1990) concluded that researchers need to find the best analysis for their work and not others. Finally, the content analysis may parallel with

the research questions however, the analysis may become too "ambiguous or too extensive" (Elo & Kyngas, 2008, p. 114), and "excessive interpretation on the part of the researcher poses a threat to successful content analysis" (p. 114). The authors declared that "this applies to all qualitative methods of analysis" (p. 114).

Researcher Positionality

The positionality I focused on was on the findings of others to determine how digital devices were being used in an urban school district by elementary physical education teachers. Using my situation with having digital devices with my elementary students and access to digital devices is easy based on my career in the school district. Yet the thoughts from chapter one and the biases I have to include the time for using the devices in a class created a position of not wanting to use digital devices in any capacity. However, the case study pushes back against that positionality through other teachers in similar situations in the same school district on their positionality towards digital devices in their classroom. Vilsmaier (2012) stated that positionality demonstrates the situatedness of a researcher. This allows their research to have to be taken into account. Through interviews, the work of Kvale (2015) presented validation with seven stages (pp. 283-284).

Positionality through Validation

Kvale (2015) stressed that "validation does not belong to a separate stage of an investigation but permeates the entire research process" (p. 283). Thematizing is the first stage where research theory must have a framework for a study. Logic is the second stage based on the theory that logic validates the research questions. Research designing is the

third stage and referred to as having "the validity of the knowledge produced involves the

adequacy of the design and the methods used for the subject matter and purpose of the

study" (p. 284). The fourth stage is interviewing where the trustworthiness of the

participant and the quality of the interview questions must be meticulous. Next,

transcribing the oral interview and is put to text then analyzed. Analyzing "involves the

questions of whether the questions put to text are valid and whether the logic of the

interpretations made is sound" (p. 284). Validating is the sixth stage and takes

reflectiveness on the analyzer. This determines which form of validation is meant for

their study, the use of the specific protocol to ensure validation, and determining "the

appropriate community for a dialogue on validity" (p. 284). Lastly, reporting takes the

findings and if valid, uses them in the study to validate the results for an outcome. Each

of the seven steps listed by Kvale was aligned with the validation of this study. These

steps will be revisited in chapter five.

Validating the text from the teachers represents the sources of information as all

interviewees are elementary physical education teachers in an urban setting. The design

of the study is directly related to my work and how other teachers in similar positions

may use digital devices in the same way. The potential interviewees I believe will have

trust and high quality as all of the teachers are my peers. Finally, reporting the aim of the

data was having a valid account of the specific findings from the participants. Taking the

data and determining how each teacher uses or does not use digital devices provided

congruence for the study.

Assumptions

Beginning with the survey, I was optimistic having a multitude of teachers participating in the study. This would provide a range of knowledge within the research. That range included teaching experience, teaching duration in the district, prior knowledge of digital devices, age of the teacher, and genuine interest in use or not using digital devices. It was based on knowing that all of the teachers would fill out the survey honestly. That assumption was based on my knowing many of the teachers in this study. Simon and Goes (2013) described one basic assumption is the participants in a study are honest. The time to fully validate their answers would take too much time for this case study. Another assumption from the authors is the research needs to occur based on a phenomenon, here in the case study, in the teaching profession. Lastly, the scope of the study and what the aims are in the research questions. Simon and Goes ask if you are attempting to answer, ensure that what you are researching is in those parameters of the research questions, as this researcher is studying.

Institutional Review Board

Initial approval to research November 24th, 2020. Before this submission, the school district where my research was conducted did not approve direct contact or use of the school district's name (see appendix E). This meant all teachers from the district will be anonymous as will the district in the research.

Submitted on December 11th to Hamline University were the Internal Review Board (IRB) application, consent form, interview questions, and interest survey. The decision to proceed with permission from the IRB was on December 14th, 2020. On the

day of approval, the survey was sent to all members of the elementary physical education

staff in the school district for potential participants. Twelve teachers sent back the survey.

On the 31st of December, all submissions for surveys from possible teacher interviewees

were closed off. From the twelve submitted surveys, six interviews were established on

January 3rd, 2021. All interviews were through google meet, recorded on the platform,

and analyzed by Otter (see Appendix B) for content then narrative analysis.

Research Limitations

With every research study, limitations occur. The main limitation I found was the

time to conduct interviews. Many of the teachers had different time schedules for

participating in the interview. There are three different elementary school start times in

the district which were problematic to have a time to meet. Then with teachers having

families and others with ample time, there was a multitude of dynamics involved with

scheduling interviews. Working to arrange times while distancing learning was difficult

for each teacher.

An unforseen limitation was the pandemic of 2020. This study initially planned to

have in-person interviews. Once the school district went to distance learning in April

2020, there was a possibility the case study would not occur. Yet interviews took place on

Google Meet. It was discouraging to not have teachers use more physical mannerisms to

describe their thoughts was a limitation to the interviews. Then in February 2021, the

teachers and I found out we were going back to live to teach created another time

constraint issue. All teachers were going through their two weeks of in-service learning

and classroom setup while interviews took place. As this case study took place in late

2020 and early 2021 during the covid-19 virus pandemic, interviews were completed online with google meet. This format did not allow for good interpersonal exchange as would occur between two people.

Conclusion

This chapter gave the framework for obtaining data from six teachers in one school district on their use of the digital device in semi-structured interviews. Beginning with selecting the qualitative paradigm, the constructivist approach was chosen with a case study as the focus to answer the primary research questions. The interview questions were based around the use of technology in my elementary physical education classroom, curriculum, and methods of why or why not technology is implemented. The case study used a survey of 12 teachers and narrowed it to six based on the number of responses for interviews from those teachers who consented. From the interview, the teacher's words were transcribed and then to narrative and then content analysis. This analysis provided themes from the teacher responses. The survey and interview questions were based on the primary and guiding questions. No use of the school district's name nor mentioned the teachers who are from the school district were stated in the study. The interview and semi-structured questions gave vital information about the use of digital devices in elementary physical education classrooms. The analysis provided an in-depth rationale from the teachers who volunteered for the study. Narrative analysis and content analysis were conducted looking for themes in the transcribed interviews. When a theme was present, the theme provided results using the research questions as guides and written in chapter four. Each step was gone over frequently to ensure the protection of the data and

individuals in the study. By finding themes common amongst the teachers, chapter four demonstrates how the data was collected, analyzed, coded for themes, and brought into results of how technology is or not used in urban elementary physical education. From the results, chapter four will unpack their information and provide clarity for the reader.

In chapter four, the results determined how each of the participants and answers from the group use digital devices in their classrooms. The interview questions will investigate constructing the experiences of the teachers, their insights, strengths, fears, and thinking as they all move forward in their elementary physical education classrooms. Their experiences will be used to enhance the development of elementary physical education teachers in the district. By constructing the areas of growth and where teachers may have prior knowledge of using technology experience in their classroom to provide other teachers in the district to better implement the technology.

CHAPTER FOUR

Results

Introduction

Chapter four unpacks the results from the two methods of data collection: surveys and semi-structured interviews. With both methods, I followed the primary and secondary research questions listed below to create survey and interview questions to answer those research questions. This chapter provides answers for both the primary and guiding questions through the data collection and data analysis processes.

- **Primary research question**: How are urban elementary physical education teachers using digital devices in the classrooms?

- **Guiding question one:** What are elementary teacher's primary purposes for using digital devices in their physical education classes to support the attainment of learner outcomes?

- **Guiding question two:** How do elementary physical education teachers describe the current usage of digital devices in their classrooms?

- **Guiding question three:** What are possible descriptors and factors that either support or form barriers for the use of digital devices in the urban elementary physical education classroom?

- **Guiding question four**: How do urban elementary physical education teachers describe their perception of their role in physical education class during the coronavirus of 2020?

- **Guiding question five:** With digital devices, what role do urban elementary physical education teachers serve regarding motivating their students to participate in physical education? And is the self-determination theory part of providing motivation for students with digital devices?

Unpacking the Results

The survey was the starting point to answer the primary and guiding questions through optional pre-set answers. Then the interview questions provided depth to dive deeper into answering the research questions. Both the survey and interview questions moved into narrative and content analysis after all the data was collected to finalize answering each question. The two types of data collection tools were surveys and interviews from the teachers in this case study. Starting with the survey, the first section was on digital devices and their use in the classroom (guiding questions one, two, and five). The survey's second section is device use during covid-19 (guiding question four), through distance learning, and the applications in class use regarding how and which applications they chose to use (the primary question, guiding questions one, two, three, and five).

The interview questions were similar to the survey. The difference between the two was the interview allowed for greater openness with each response. For the pre-distance learning portion, the research questions one through four and the primary question paralleled with interview questions five to fourteen (see Appendix D) and interview questions fifteen through seventeen aligned with guiding question four. The

next section presents details into the answers from the twelve teachers who answered the survey.

Surveys

Surveys were sent out to all forty-one teachers on December 14th, 2020 with a deadline of two weeks for teachers to submit their responses. A total of twelve of the forty-three returned a completed survey granting full consent, a return rate of 27%. With twelve responses, the names of participants were recorded and given pseudonyms (Teacher 1, 2, 3, etc…). The survey contained twenty-two questions with five different sections: getting to know you, pre-distance learning use of digital devices, during covid-19 digital device usage, applications in class, and how do you use the application.

Getting to Know You

In this section, I aimed to establish a sense of rapport with the teachers. The first question was the number of years the teacher has been licensed to teach physical education. The average was 21.3 years, a range of 1-35 years. Question two was the number of years the teacher has been teaching elementary physical education. The average was 17.4 years and a range of 2-35 years. Next, the number of years the teacher has been with the school district. The average number of years was 16.3 and a range of 1-35 years.

The fourth question asked about the location of the school where each teacher works within the district. Due to the restriction of not including the district by name, the location will only be named with letters. There were seven options to choose from. Three teachers from areas A, B, and F1, two from E, and one from D. The fifth question was the

age of the teacher as the average age taken at the time of the survey was 46.9 years old. A range of 31-56 with 51 being the mode with three teachers at that age. The sixth and final question was gender with six males and six females identified.

Pre-Distance Learning

In this section, six different statements were presented to the teachers. Each statement had options of strongly agree, agree, disagree, strongly disagree, or does not apply. Teachers had one option for each statement. The format for each is the result, overview of the results, and the interpretation of the researcher. In response to the statement, "I have digital devices in my classroom to enhance my student learning" respondents marked: 1 strongly agree, 9 agree, 1 disagree, 1 strongly agree and 1 does not apply (see Figure 4). These results show that a majority of teachers used digital devices to enhance student learning. The interpretation is that teachers want to use digital devices and want student learning to improve yet are unsure of how to use which device.

Figure 4

Digital Device use to Enhance Student Learning

7. I have digital devices in my classroom to enhance my student learning. (Choose one)
12 responses
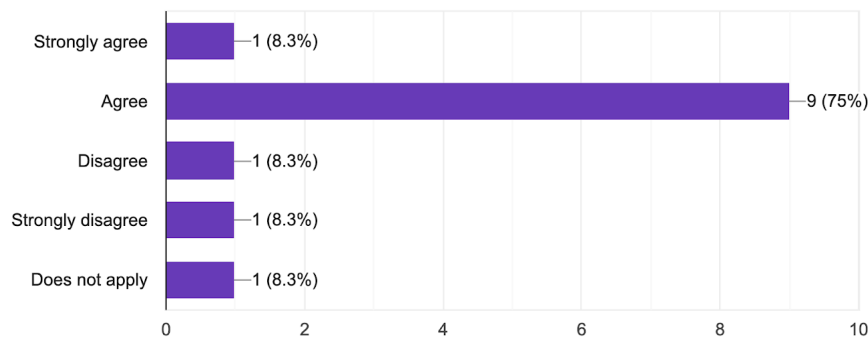
For statement eight, "I used digital devices in my classroom to improve my teaching", 2 stated strongly agree, 8 agree, and 2 disagree (see Figure 5). The results show teachers tend to use digital devices for improving their teaching. This is strong evidence that many teachers in the district do use devices in their classrooms. Again, how teachers use the devices is up to the individual teacher as there is not a mandatory concern for physical education teachers to use devices.

Figure 5

Digital Device in a Classroom to Improve Teaching

8. I used digital devices in my classroom to improve my teaching. (Choose one)
12 responses

Strongly agree	2 (16.7%)
Agree	8 (66.7%)
Disagree	2 (16.7%)
Strongly disagree	0 (0%)
Does not apply	0 (0%)
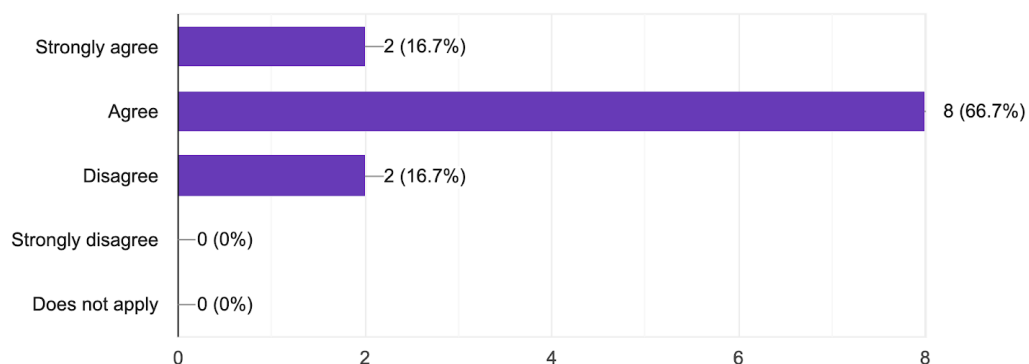
In statement nine, "I used digital devices in my classroom because I was mandated by the administration," 1 agreed, 6 disagreed, 4 strongly disagreed, and 1 did not apply. The results are that most teachers used devices on their terms (see Figure 6). This was a bit surprising given how administrators tend to want technology in classrooms per the school district's insistence, which is funneled to teachers. So what are devices used for in their classes? The additional survey questions provided some answers.

Figure 6

Digital Device use in a Classroom due to Administration

9. I used digital devices in my classroom because I was mandated by the administration. (Choose one)

12 responses

Strongly agree	0 (0%)
Agree	1 (8.3%)
Disagree	6 (50%)
Strongly disagree	4 (33.3%)
Does not apply	1 (8.3%)
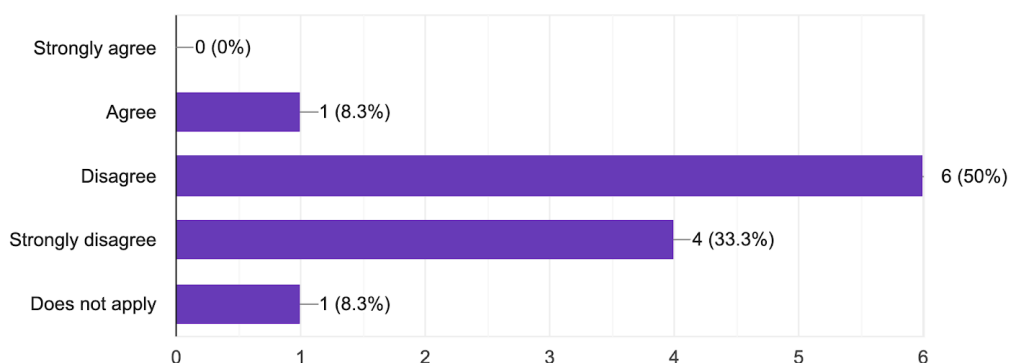
"I used digital devices in my classroom to improve the motor skills of my students" was statement ten. 1 strongly agreed, 8 agreed, 2 disagreed, and 1 strongly disagreed (see Figure 7). The results show a large portion of the teachers use devices for motor development for their students and a small portion do not. The results are confusing, meaning if the device can help, why or why not use the device to help students in a large area of their development: motor skills? The lack of concreteness with all teachers is explored in chapter five.

Figure 7

Digital Devices Used to Improve the Motor Skills for Students

10. I used digital devices in my classroom to improve the motor skills of my students. (Choose one)
12 responses
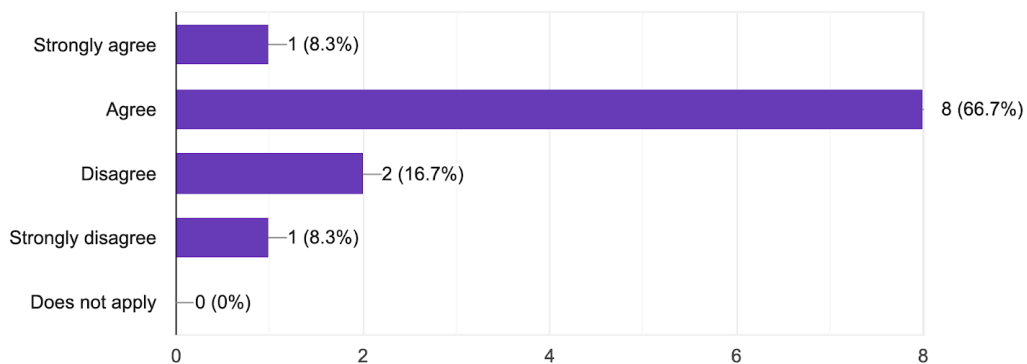
Statement eleven was, "I used digital devices in my classroom to supplement my curriculum." The respondents were 2 for strongly agree, 5 agreed, and 5 disagreed. While most of the teachers used devices for motor skills, enhance learning, and improve their teaching, there is a distinct difference with the use of devices to add to their curriculum (see Figure 8). When there is a split as there is here, supplementing a curriculum with devices does need additional discussion with those surveyed. More about the differences in reasons for usage in chapter five.

Figure 8

Digital Devices Used to Supplement Curriculum

11. I used digital devices in my classroom to supplement my curriculum. (Choose one)
12 responses
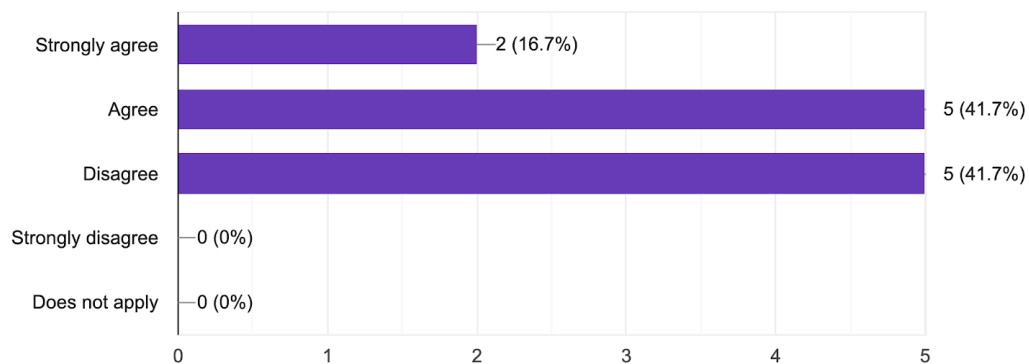
In statement twelve, "I used digital devices to enhance my curriculum," responses were 2 strongly agreed, 8 agreed, and 2 disagreed (see Figure 9). The difference between enhancing and supplement provides greater detail. Most teachers want to enhance their curriculum but do not want to supplement their curriculum with devices. The interpretation from the results is that teachers do want autonomy with their curriculum and tend to stay away from devices overtaking traditional methods such as a stand and deliver method. Additional thoughts are in chapter five, the conclusion.

Figure 9

Digital Devices in a Classroom to Enhance Curriculum

12. I used digital devices in my classroom to enhance my curriculum. (Choose one)
12 responses

Strongly agree	2 (16.7%)
Agree	8 (66.7%)
Disagree	2 (16.7%)
Strongly disagree	0 (0%)
Does not apply	0 (0%)

0   2   4   6   8
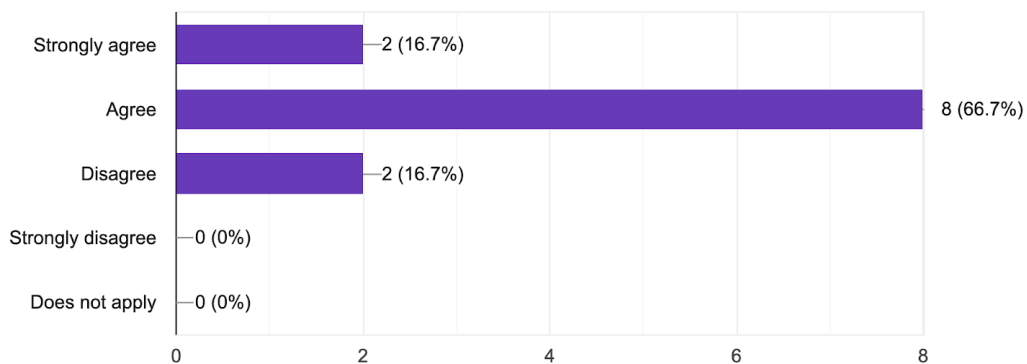
During Covid-19: Digital Device Usage

This section had four statements on using digital devices during the covid-19 virus pandemic and distance learning. The format again asked teachers the five options from the previous section (Strongly Agree, Agree, Disagree, Strongly Disagree, or Does Not Apply). For statement thirteen, "I use digital devices in my distance learning classroom," responses were 8 for strongly agreed and 4 agreed (see figure 10). All teachers used devices that were expected to be distance teaching with online platforms. This aligns with my thinking to others who also had to use a device with my distance learning classroom.

Figure 10

Digital Devices During Distance Learning

13. I use digital devices in my distance learning classroom. (Choose one)
12 responses
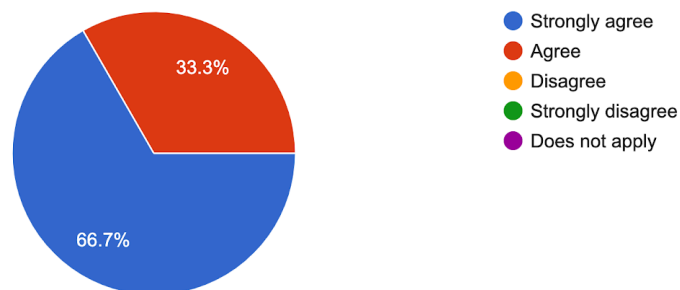
Statement fourteen was, "I had support from administration to use digital device platforms for distance learning." 5 responded with strongly agreed, 6 agreed, and 1 disagreed (see Figure 11). The results indicated the vast majority felt they had support from their administration. Having administrators and teachers working together, through using platforms, demonstrates a collaborative effort to support each other and students as the result of their working together.

Figure 11

Support from Administrators to use Digital Devices While Distance Learning

14. I had support from the administration to use digital device platforms for distance learning.
(Choose one)

12 responses
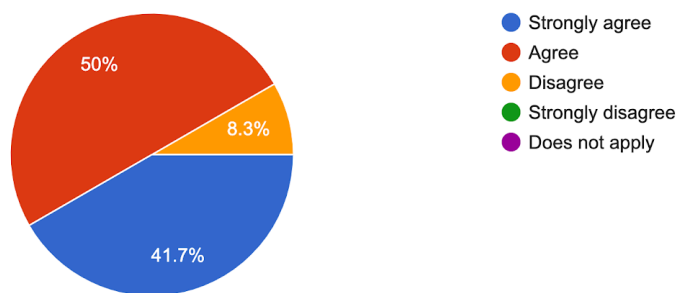
For fifteen, the statement was, "I found the platforms for distance learning easy to use." 6 said they agreed and 6 disagreed (see Figure 12). A split in the results meant those who found the platforms easier may have had less stress and more engaging lessons. Those who struggled could have had higher stress levels and had to work harder for lessons to be productive. Interpreting the results is quite subjective. The question looked at those struggling to learn the devices. Perhaps pairing a teacher who found the platforms easier with one who needs additional support. Having structured how teachers learn the platforms differently may have yielded stronger results. By preparing both teachers and administrators better in the future with platform use particularly after the year of teaching online has lead to.

Figure 12

Interpretation of Digital Device use During Distance Learning

15. I found the platforms for distance learning easy to use. (Choose one)
12 responses
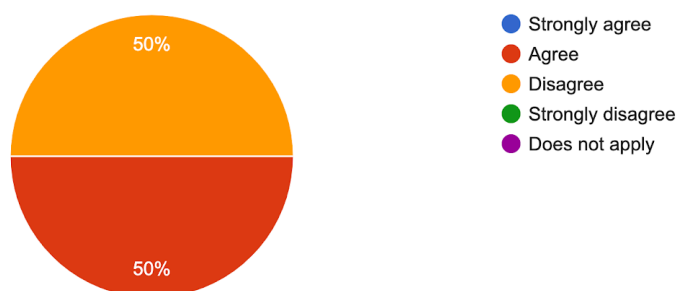
The last statement in this section was, "I believe that the digital device platform(s) I use allows for learning for all students." 1 teacher strongly agreed, 5 agreed, 5 disagreed, and 1 strongly disagreed (see Figure 13). Having the results split equally provided insight that teachers have vastly different thoughts on online learning for physical education. My interpretation is to work on collaborative topics regarding the platforms as a group rather than as independently as they have been. A whole group with the professional learning community to share and collaborate is a suggestion strictly on this topic that could benefit teachers.

Figure 13

Belief That Digital Devices Allows for Learning of all Students

16. I believe that the digital device platform(s) I use allows for learning for all students. (Choose one)

12 responses

Legend:
- Strongly agree
- Agree
- Disagree
- Strongly disagree
- Does not apply

(Pie chart values: 41.7%, 8.3%, 8.3%, 41.7%)
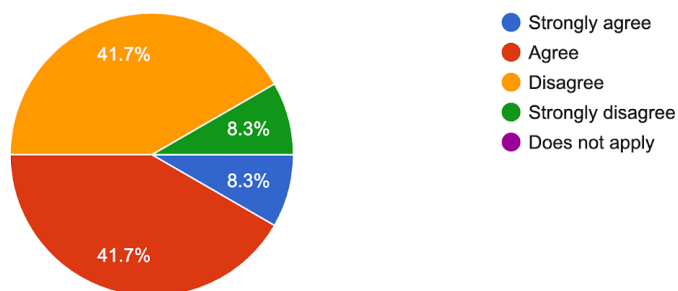
Applications in Class

Two statements were asked of teachers surveyed on using applications with digital devices before distance and during distance learning. Those statements had numerous options for platforms and teachers could have more than one response per application used. Each application may have been used by the teacher for any reason based on their prior knowledge.

Statement seventeen was, "I was using the following application(s) before distance learning (may select more than one). 4 responses for Schoology, 3 for FitBit, 2 each for Kahoot, See-Saw, and Dance Dance Revolution, while 1 response for YouTube, Nintendo Wii, and not applicable (see Figure 14). The scatteredness of the responses was insightful as all teachers have access to Schoology and See-Saw yet most did not use them. From the results, there does not appear to be a consensus on which application was

used before distance learning. Again, time to collaborate is missing for the teachers. This will be an item to be addressed after this study.

Figure 14

Applications Used Prior to Distance Learning

17. I was using the following application(s) prior to distance learning. (may select more than one)
10 responses

Application	Value
Flipgrid	1 (10%)
Kahoot	2 (20%)
Schoology	4 (40%)
See-saw	2 (20%)
Fitbit	3 (30%)
Dance Dance Revolution	2 (20%)
Goosechase	0 (0%)
Wii. IDoceo, Google docs, remote contro…	1 (10%)
	1 (10%)
	1 (10%)
NA	1 (10%)
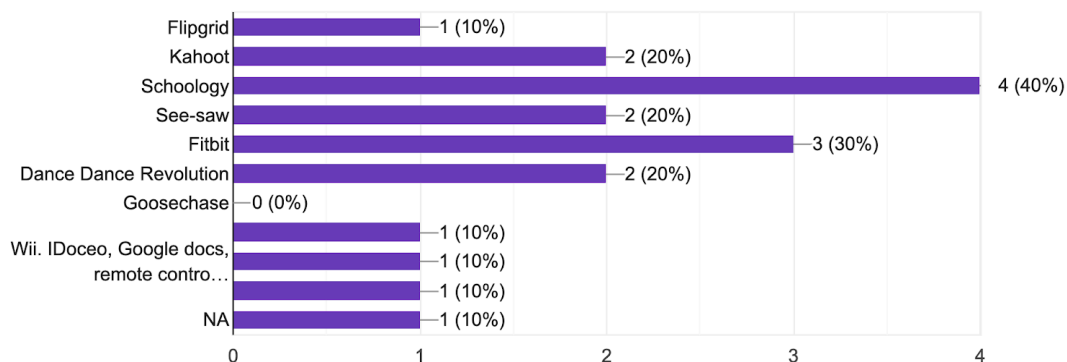
Statement eighteen was, "During distance learning, I use the following platform(s) (may select more than one)." Teachers stated Schoology 12 times, See-Saw 11, 4 for Flipgrid, Kahoot 2, 1 for Fitbit, Dance Dance Revolution, The Online Physical Education Network (OPEN), YouTube, Just Dance, and iMovie (see Figure 15). Both Schoology and See-Saw are used by teachers in the district to post work online for students. The other applications are used by choice. Seeing both the main applications (Schoology and See-Saw) shows teachers are using the applications required. The researcher was not surprised to see a lower amount of other platforms as in their experience, a lack of training is a theory.

Figure 15

Platforms Used During Distance Learning

18. During distance learning, I use the following platform(s): (may select more than one)
12 responses

Platform	Count
Flipgrid	4 (33.3%)
Kahoot	2 (16.7%)
Schoology	12 (100%)
See-saw	11 (91.7%)
Fitbit	1 (8.3%)
Dance Dance Revolution	1 (8.3%)
Goosechase	0 (0%)
OPEN - Online PE Network.	1 (8.3%)
YouTube	1 (8.3%)
	1 (8.3%)
YouTube/Just Dance	1 (8.3%)
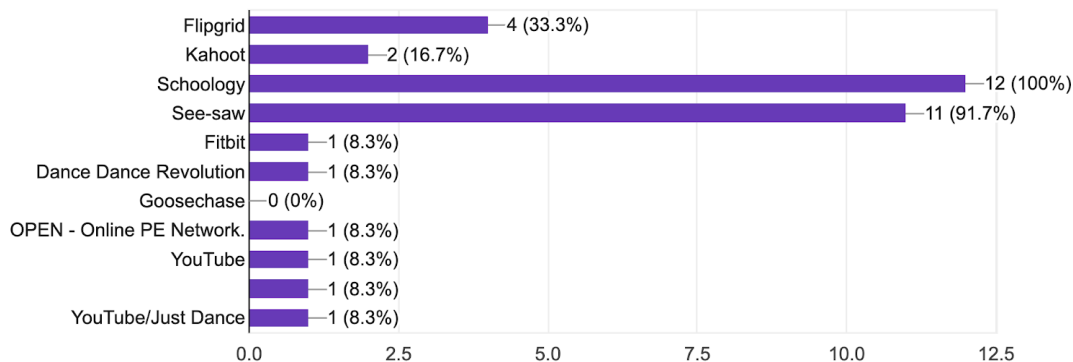
How do you use the Application?

The last section of the survey was about how the applications were used. Each statement had the same response options and teachers could check more than one box. One item of note is teachers needed to go back to statement seventeen: "I was using the following application(s) before distance learning (may select more than one)."

Statement nineteen was, "What are your intended objective(s) of using the application (from question #17) before distance learning?" This was a complex question with many options. The top responses were 8 for motivation and engagement in a physical education class, 6 for confidence and engagement outside of physical education class, 5 for skill development, reducing obesity, and evaluation, 4 for best practices and setting or achieving personal fitness, 3 for self-worth, 2 for athletic ability and interpersonal v. interpersonal, and 1s for record-keeping and iPad for photographs (see

Figure 16). The variety of use for applications was intriguing as there was no set format

for teachers to conduct their thinking, meaning with the array of topics, there is not a

format to follow. This creates a thought for me on why there is no framework in place for

teachers to use the application altogether. A suggestion would be to have uniformity for

one or two items then expand the objective for a device when most teachers have a

baseline knowledge for them.

Question twenty asked, "what are/is the intended objective(s) of using the

application during distance learning from question #17 (may check more than one box)?

The responses were 12 each for engagement outside of physical education class and

motivation, 11 for engagement in a physical education class, 8 for reducing obesity, 7 for

skill development, confidence, and setting or achieving fitness goals, 5 for self-worth and

evaluation, 3 for best practices, 2 for interpersonal v. intrapersonal, 1 for record-keeping

and 0 for athletic ability (see Figure 17). The results indicated all teachers intended to use

motivation and engagement outside the classroom followed by engagement inside the

classroom. These intended objectives varied less than before distance learning. My

interpretation is most teachers had ideas of keeping students engaged in and out of the

classroom, trying to motivate them to be active while keeping students confident,

attempting to reduce obesity with fitness goals alone, with some skill development.

Further interpretations from the interviews regarding this question are forthcoming in this

chapter and chapter five.

Figure 16

Teacher Intended Objectives With Applications Prior to Distance Learning

19. What are your intended objective(s) of using the application (from question #17) prior to distance learning? (may check more than one box)
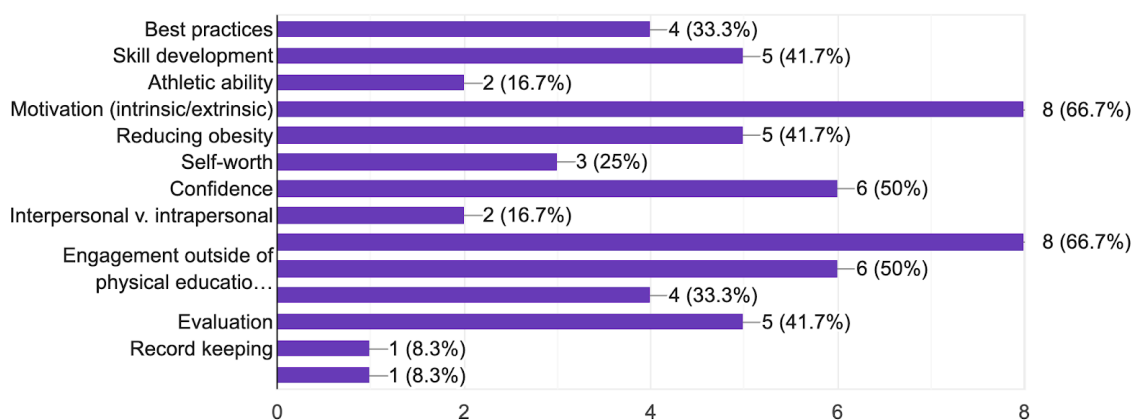
12 responses

Figure 17

Teacher Intended Objectives With Applications During Distance Learning

20. What are/is the intended objective(s) of using the application during distance learning from question #17? (may check more than one box)
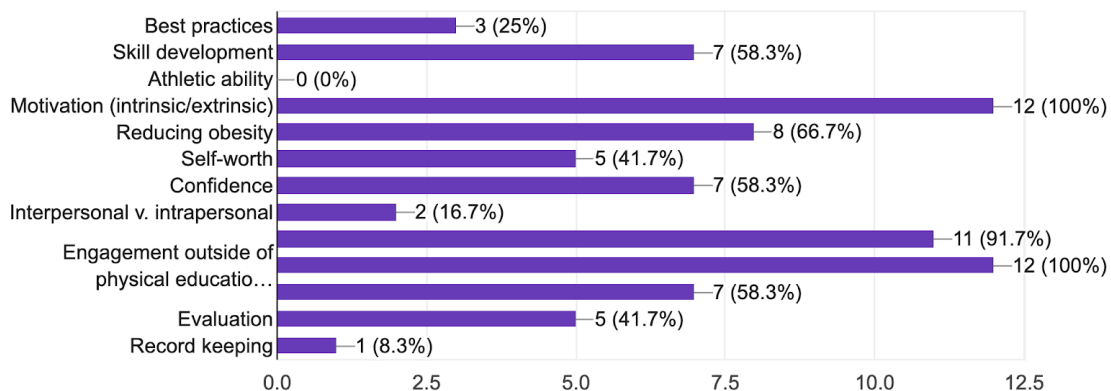
12 responses

For question twenty-one, teachers were asked "what are the major objective(s) for student learning regarding the application from question #17 (may check more than one box)? Responses were 9 for engagement in physical education class and motivation. 8 teachers said engagement outside of physical education. Seven were for reducing obesity, 6 for skill development, 5 for fitness goals, 4 for best practices and confidence, 3 for self-worth and evaluation, then 1 each for athletic ability, interpersonal v. intrapersonal, and record keeping (see Figure 18). The results show teachers want students to be motivated in and outside the classroom while attempting to lessen obesity. Interpreting these results demonstrated teachers wanting students to learn about being active through motivation on their own. Whether these worked would require additional research and the interviews potentially provide insight into the teacher's perspective. Having teachers express their experiences together would allow for in-depth inner workings on what works for their classes. From the survey results, it appears teachers need to discuss these objectives to find common ground on applications and the objective for each in their class.

Figure 18

Objectives for Student Learning With Applications

21. What are the major objective(s) for student learning regarding the application from question #17? (may check more than one box)

12 responses
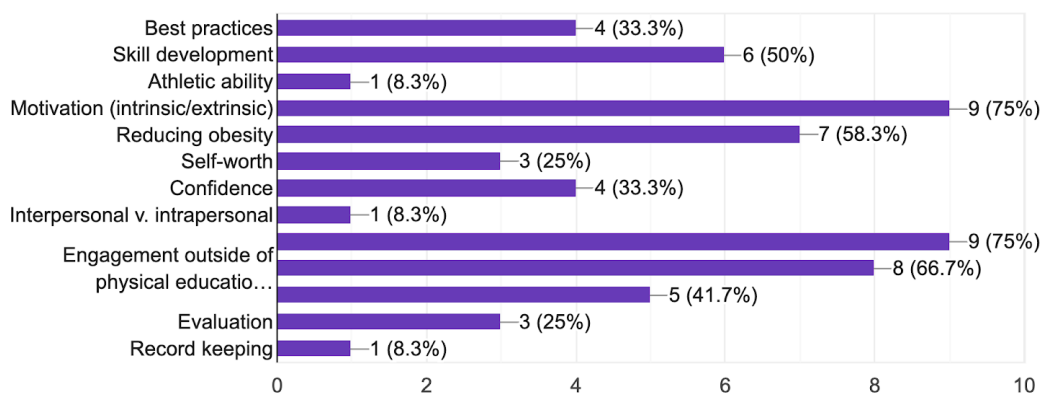
Lastly, teachers were asked, "in both distance learning and the classroom, what are/is the major objective(s) for teaching methods regarding the application from question #17 (may check more than one box)? The methods teachers selected were 10 for engagement in physical education, 9 for motivation, 8 for engagement outside of physical education, 6 for skill development, confidence, and setting fitness goals. 5 teachers said best practices, 4 stated self-worth and evaluation, and 2 for athletic ability and interpersonal v. intrapersonal (see Figure 19). The majority of teachers continue to want engagement and motivation as the major objective; a common theme throughout the survey. While this is indicative of most teachers, how well these objectives were

implemented remains to be seen as a student survey would give feedback for the teachers

and their intended objectives.

Figure 19

Major Objectives in Both Distance Learning and in the Classroom Teaching Methods

with Applications

22. In both distance learning and in the classroom, what are/is the major objective(s) for teaching methods regarding the application from question #17? (may check more than one box)
11 responses

Category	Value
Best practices	5 (45.5%)
Skill development	6 (54.5%)
Athletic ability	2 (18.2%)
Motivation (intrinsic/extrinsic)	9 (81.8%)
Reducing obesity	7 (63.6%)
Self-worth	4 (36.4%)
Confidence	6 (54.5%)
Interpersonal v. intrapersonal	2 (18.2%)
Engagement outside of physical educatio…	10 (90.9%)
	8 (72.7%)
	6 (54.5%)
Evaluation	4 (36.4%)
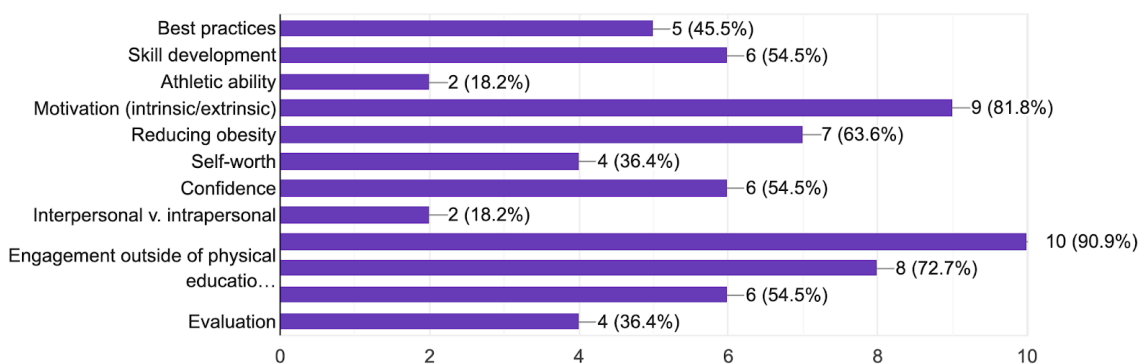
Survey Results

From the twelve teachers surveyed, each provided answers for twenty-two

statements or questions (the location of their school was removed for privacy reasons).

This section provides a synopsis for individual responses (full table results are found in

Appendix F). Each teacher's response below looks at questions seven to sixteen,

investigating their responses for similarities or differences.

Teacher 1 is a 51-year old male with twenty-three years of experience teaching

physical education. He was consistent with agreeing or strongly agreeing on all except

question 16 where he disagreed that devices do not allow for learning for all students. This disagreement would warrant learning more about his decision.

Teacher 2, a 51-year old male who has twenty-eight years of elementary teaching experience, disagreed with questions 7-12 and 16, then agreed with questions 13-15. This is intriguing because of not using any for in-person teaching and now forced to use devices, found them agreeable.

Teacher 3, a 51-year old female has twenty-four years of teaching experience. Her responses for 6-12 and 14-16 were either strongly disagree or disagree. Yet she felt devices were strongly agreed for 13: devices in digital learning. I am curious as to why the responses for those questions were adamantly against devices then acknowledges that devices work when distance learning.

Teacher 4, a 31-year old male with nine years of elementary physical education teaching experience. He agreed with most responses (questions 7-8, 10-15) but disagreed with questions 9 (administration pushing devices) and 16 (the devices allowed for all student learning).

Teacher 5, a 56-year old female teacher with thirty-five years of experience teaching elementary physical education, responded with a variety of answers. She agreed or strongly agreed with questions 7-8, 10, 12-14 and disagreed or strongly disagreed with questions 9, 11, and 15-16. That included being pressured by administrators to use devices, she felt devices did not supplement the curriculum, were easy to use, or allowed for learning for all students. I am rather curious about the disagreement with

supplementing the curriculum. Additional discussion on what barriers are in her way would provide clarification.

Teacher 6 is 42 years old male and has taught for 21 years in the district in elementary physical education. He agreed or strongly agreed for statements 7, 8, and 10-14 while disagreeing with statements 9, 15, and 16. Similar to other teachers, the disagreement with 16, "Digital devices allows for learning" then the agreement with earlier statements on how devices help students and improve his teaching is a mystery. The continued alignment with others on the agreement/disagreement is intriguing as the unpacking continues with teachers 7-12.

Teacher 7 is 46 and a male with 13 years as a physical education teacher but only one in the district. His responses were similar to the other respondents except being strongly encouraged by administrators to use devices. This is different then all other teachers surveyed. This piece would be one to ask about with him, particularly being a first year in the district.

Teacher 8 is a 52-year old female who has been a physical education teacher for twenty-three years. Similar to teacher 7, she has been in the district for a short time: only two years. She agreed with all statements except 9 (administration mandated) and 15 (platforms easy to use). This differs from most responses on statement 16 in particular. Her answers would be interesting to understand, especially being new to the district yet a veteran teacher of twenty-three years.

Teacher 9 is a 55-year old female and has taught physical education for 32 years with twenty-six in the district as an elementary physical education teacher. She agreed

with all except for statements 9 and 15 (easy to use). Her responses appear that she finds devices work for her classroom with support from administrators. Given her age and experience, this differs from other responses from teachers similar to her.

Teacher 10 is a 52-year old female with thirty years of experience and twenty-nine of them in the district. Her responses varied. She agreed with statements 7-8 and 12-16 while disagreeing with 9-11. Statements 10 and 11 asked about devices for motor skills and supplementing curriculum yet agreed that it enhances her curriculum.

Teacher 11 is 34 years old and in her first year as a physical education teacher but stated she has taught elementary physical education for three and a half years in the district. This may or not be an error in her open-ended response. She agreed on all statements except for statement 9 (administration influence). Her newness to the district would be pertinent to investigate with her perspective and devices which would be used in her classroom.

Lastly, Teacher 12 is a 42-year-old male with seventeen years of teaching experience as a physical education teacher and eight in the district as an elementary physical education teacher. His answers align with many: agreeing with all statements except 9 and 11. Again, the supplement to curriculum and enhancing are ones to ask him and how he came to his responses.

Conclusion on Survey Data

From the survey data, the case study research began with the years of teaching experience that each survey responded with. Overall, this was an experienced group of teachers and was a limitation. A balance of males and females (six and six) participated

in the survey with an average time in the district as an elementary physical education teacher in the district at 16.3 years. The range of experience in the school district as an elementary physical education teacher was 1 to 35 years.

In the pre-distance learning use of digital devices, most acknowledged they use digital devices in their classroom to improve their teaching, motor skills of their students, and enhance their curriculum. During distance learning (covid-19), all teachers used digital devices, and most had administration support. Conversely, half of the teachers responding felt the platforms during distance learning were difficult to use and the other half found them easy. The same outcome was for allowing for students to learn: the twelve were split.

Regarding the applications used before distance learning, there was a myriad of options teachers used in their classrooms. During distance learning, almost all stated Schoology and see-saw were platforms used that were communicated across the district. Lastly, for use of the application before distance learning, motivation and engagement in the class were the top two responses that paralleled the student learning objectives for the applications before distance learning. In distance learning, the main objectives were again motivation and engagement in physical education and engagement outside the classroom one response fewer.

When teachers use platforms in their classrooms, they are using them primarily for engagement in and outside the classroom for motivation. There are few applications beyond the two (Schoology and See-saw) consistently used by teachers with a smattering of others before distance learning respectively. The group is split for the devices allowing

for student learning and ease of use. Support is strong for these and the use of digital devices in all classrooms, as demonstrated by the rationale. The rationale is supported with an enhancement for curriculum and student learning with a general improvement to their teaching. The next phase in this case study is interviewing six teachers from the twelve from the survey. There are two sections to the interview: pre-distance learning and distance learning.

Survey Data and Research Question Connections

The survey data connects to the primary and guiding questions. With five guiding questions, each addressed an area of the study determining how teachers are using digital devices before distance learning and during. This section investigated the research questions to better understand how devices are impacting urban physical education teachers through their curriculum.

The survey investigated the ways teachers use devices which is the focus of the primary question in this case study. The variety of ways include enhancing, supplementing, and improving teaching, and improve the motor skills of students. Applications were used before distance learning and narrowed during distance learning. Teachers intended to use devices in some form. Not all teachers used devices which would be an area of increased research to get all to use a specific form for continuity throughout the district in elementary physical education.

Guiding question one was on the purposes of using digital devices for learner outcomes. From the survey, teachers responded with motivation and engagement outside of physical education being their main objectives. During distance learning, teachers

stated that motivation, engagement outside and in physical education were the purposes. These are ways to keep students engaged but to what extent is unknown and would require additional survey questions to unpack.

Guiding question two was on the current use of digital devices. This question centered on distance learning based on when the survey was available to the teachers, early January 2021. The two main platforms were Schoology and See-Saw with Flipgrid being the third. These responses differed from before distance learning with Schoology, Fitbit, Kahoot, See-Saw, and Dance Dance Revolution as the focused digital platforms used. Here, an example of more time for collaboration with physical education teachers would be warranted. As teachers moved back into schools in late January and early February to teach again, time to interview was limited. Which applications and devices work better and how are two areas for the district to provide professional development on from this researcher's analysis.

The third guiding question looked at support or barriers for use of devices in the classrooms. An issue from the literature review (Pyle & Esslinger, 2013) in chapter two was on administration support as a barrier. In this instance, teachers mainly agreed that administrators provided support for using devices before distance learning and during. The other barrier from the authors was the difficulty of knowing how to use the devices and platforms. Here, the teachers were split on ease and difficulty of learning the devices. Understanding that administrators are supportive is encouraging yet half are struggling to learn the devices is a topic to address with leaders in physical education.

Guiding question four prodded teachers their role during the pandemic of 2020. While no specific questions were asked on the pandemic, the section on digital device use during distance learning did investigate teachers' thoughts. All teachers used devices in their classrooms and most had support from administrators. Then half of the teachers had difficulty with the platforms and half-believed devices allowed for learning for students. The last statement on devices allowing for learning for all students needs additional research on how to help teachers and students learn through devices, particularly if a situation like a pandemic occurs again.

The fifth and final guiding question asked about motivating students using devices as and on the self-determination theory. Their responses indicated teachers want to motivate and engage their students with devices. These two areas from teachers are stated clearly from the results. Knowing these two areas demonstrate how teachers use the devices to motivate and engage students.

Conclusion and Introduction to Interview Questions

Knowing the benefits and aware of the limitations, content analysis was the choice for my unpacking the data from the interviewees. Content analysis from Krippendorff (1990) had an aim with the data to find a replication and sound inferences collected from interviews to give new understanding to the researcher and readers. The condensed version of data from its broad beginnings, as in this case study, is "to build up a model, conceptual system, conceptual map or categories" (Elo & Kyngas, 2008, p. 108). As stated by Neundorf (2002), content analysis can be as simple or challenging as

what the researcher wants it to be. I aim to have simplistic results even with the amount of data I needed to analyze.

The next section is on the research questions and their alignment with the interview questions. Content analysis was applied to each of the responses from the six interviews with themes I found from the transcriptions, narrowing the lengthy interviews into shorter items to unpack in the content analysis.

From Surveys to Interviews

Once the surveys were collected on Google Forms, invitations were sent for an interview to all twelve teachers. Six turned in the consent form to be interviewed. Interviews with six teachers occurred from January 5th to the 8th and lasted from 30-58 minutes for almost five and a half hours of interview time. Pseudonyms were given for each teacher: A, B, C, D, E, and F. This section goes through the questions and responses from each teacher.

Table 3

Teachers A-F

Teacher	A	B	C	D	E	F
Years teaching	21	30	35	23	21	28
Years teaching elementary PE	8	29	35	16	19	28
Gender	M	F	F	M	M	M
Favorite activity to teach	Health and nutrition	Games for 3-5th; music and movement, k-2	Locomotor skills; bikes and xc skis.	Choice day activities	Adventure, fleeing, and chasing games.	Motor skills; team sports

Getting to Know You

From the six teachers, they shared a theme of experience with a combined number of years teaching of 157 years and an average of 26.2 years per teacher (see Table 3, p. 168). Interview question two asked about teaching elementary physical education with 135 of the 157 years being in an elementary classroom and an average of 22.5 years per teacher. Regarding areas of the district, the research will hold on to where to protect themselves from using any information about the school district. Below is a short description of each teacher in the interview process.

Teacher A. Teacher A is new to the school district. He recently finished his EdD and was head of the physical education department in a suburban school district. One item since his hire was he has only seen his students on camera through distance learning.

He has vigor and excitement about being back in teaching. Lastly, he came to teaching a bit later in his career yet has enjoyed his journey.

Teacher B. Teacher B has been a teacher in the district throughout her career. At the beginning of my teaching career, she was my mentor during student teaching. She enjoyed playing different games with students and doing more team-building activities. The different activities and non-traditional curriculum is the focus of her students.

Teacher C. She has been an elementary physical education teacher her entire career and has been in the district throughout that period. She also prefers non-traditional activities like cross-country skiing to team sports for her students. Not knowing her well, she presented herself as confident in her knowledge and abilities.

Teacher D. He has been in the district in numerous roles from teacher to assistant principal. His thinking before the interviews is using devices would be promising yet needs better professional development. He has spoken for the use of devices in the classroom more than most. Teacher D, based on the interview, tends to wane on decisions yet enjoys working with his students and learning from them.

Teacher E. He has a motor that keeps working. His excitement for teaching is infectious which gets others wanting to teach with him. The curriculum he prefers is also more game-based rather than team sports with many tag games and creativity with activities. His ability to make others excited to teach is palpable.

Teacher F. He has lived and worked in the district his entire career. Not knowing him prior, he was focused on team sports with students. His preferences revolved around not using devices and more about movement and traditional activities.

Question Four: Favorite activities to teach? Question four asked teachers about their favorite activities to teach in general. Teacher A had a focus on nutrition and health curriculum and stated that "physical education is a piece, you know, nutrition" and "I like that the nutrition, the, you know, healthy living, that that sort of facet is probably my favorite to teach." Teacher B had much to offer but her main activities are music and movement for kindergarten through third grade. Another is reading stories to those students "and then we play a game that is connected to the story." For the fourth and fifth grade, teacher B said that games with higher-order thinking and strategies are involved "because it is fun to watch them progress like from the basic game and then every time we add more complicated strategy or a rule." Teacher C's favorite activities included a bike unit and cross country skis for her upper-level grades. The younger grades focus on "doing all the locomotor, personal space stuff and introducing them to, to just any kind of games that just you tell them we're going to run across the line and they all go, 'Yay'!"

Open gym activities are what Teacher D prefers. From scooters to a climbing wall, Teacher D gives his students a multitude of options. Another is "tag games like where we are fleeing" as students continue to move and get their energy out. Teacher E has a different take on activities as he enjoys "the ones that are just creative that sometimes may appear silly, but honestly, they're the ones that I feel like most of the class enjoys the most for most of the time." Teacher E also enjoys the fleeing and chasing games as the and lastly, Teacher F prefers locomotor skills for the kindergarten to third graders then competitive games for the older students. He was the first to favor more

traditional games in a physical education class of "soccer, volleyball, basketball thing for a majority of the week."

Pre-distance learning

This section is on the teachers and their use of devices in their classrooms before distance learning due to the pandemic of 2020. These ten questions are the majority of the interview and ask each teacher to recall their use of devices before distance learning. When these questions were asked, it had been ten months since they had been in the classroom (March 2020).

This section reviews each research and interview question(s) as a parallel: how each interview question, through themes, informs the research question or questions. Then through a discussion after each section, how the results apply to the research questions.

Primary Research Question. How are urban elementary physical education teachers using digital devices in the classrooms?

Interview Question Five. Before distance learning, describe how you used digital devices in the classroom.

Devices used by Teacher A included new devices like 3D accelerometers. He stated, "I really wanted to do something neat, sort of with them (students) and get really excited." Teacher B had her iPod for music when it first came out in the early 2000s. Now she uses a district-provided iPad for her classes. Teacher C did not use much beyond her iPad as "if they're too complicated, and I'm going to fiddle with it, in front of kids, I'm probably not going to use it." The iPad and the Wii were used by Teacher D and his

comment about the iPad was it "basically allows me to, you know, have everything in one spot, like control the music, check my lesson plans, grade kids, make notes, it's like an all in one kind of thing." Teacher E preferred his laptop, iPad, and a Bose speaker. The iPad has different chimes to alert the students for different activities. And Teacher F only used the iPad for "photographs or videos, but a lot of music is played, especially during dancing with the different cultures at my school."

The primary question is answered with urban elementary physical education teachers do use digital devices in their classrooms. To what extent varies between teachers. Four teachers use iPads mainly for student engagement, learning skills, and motivation. The interview question gave insight that teachers used the devices but needed ample training. A common theme was not knowing how to best use the devices and time was lost in the daily set-up, distribution, and collection of any devices, either on a cart or personal use as a heart rate monitor. I feel devices are not being used to their full potential based on the interview data. Further analysis will be in chapter five.

Guiding Question One. What are elementary teacher's primary purposes for using digital devices in their physical education classes to support the attainment of learner outcomes?

Interview Question Six. If you were using digital devices, what types of devices were you using? In what manner with students? How were you using those devices? (best practices, skill development, athletic ability, motivation (I/E), reducing obesity, self-worth, confidence, interpersonal vs intrapersonal, engagement in PE class,

engagement in PE in life outside of school, setting/achievement of personal fitness goals, evaluation) If not, what were some barriers not allowing you to use digital devices?

Teacher A, who is new to the school district, reflected on his time in his previous district. He indicated having a smartboard to show videos of his students doing skills before their class tried the skill. Additional devices were pedometers, 3D accelerometers, and heart rate monitors. Teacher B used only her iPad and mainly for music with occasional use for visual aids for games. Teacher C used her compact disc player for music and Dance, Dance, Revolution. She had used heart rate monitors yet did not work well due to time constraints like changing chest straps and cleaning them for the next class along with battery life being short. A key phrase from her was, "I'm a big advocate of wanting the kids moving." Teacher D also used only the iPad as it was "my remote control for my music and also, it's my grade book" and echoed the same idea for his students needing to move. An iPad for a timer or alarm is what Teacher E used with a projector on the wall to show skills. Again, he also wanted his students to move. Teacher F flatly stated, "Hardly any" as he and others said, they do not feel comfortable with devices. These sentiments are in part, a constant in the interview.

Interview Question Eight. What is/are the main digital device(s) used in your classroom before distance learning? Why did you select those devices?

As the interview progressed, the questions had overlapping themes and were connected in the next section. Teacher A used his devices for motivation, confidence, and engagement with heart rate monitors. Teacher B spoke of engagement, understanding comprehension, and motivation with Teacher C also mentioned motivation with skill

development and engagement. Again, engagement for Teacher D, assessment, and behavior are his main reasons for device usage. Teacher E focused more on motivation and self-worth citing a class not working well together and used the device to show video clips of athletes and kindness. Motivation was the main reason for Teacher F and setting personal/fitness goals for students. While motivation was a key factor for many of the teachers, how they use the device to motivate students and beyond was not fully known.

Interview Question Nine. Why, if you have not used digital devices, chose not to use them in your classroom?

This question had fewer responses. Teacher A had not been in his building at the date of the interview and is new to the school district. Teacher B though said the main reason to not use devices is batteries and their shelf life. An example was "I opened up a pack of pedometers and they are all dead." The other reason she mentioned was cheating for pedometers as students would shake them to get ahead. For Teacher C, the difficulty factor was the setup with students coming in and out at the same time; the beginning of a new class collided with those leaving hers. "Either they (devices) were too hard...I did not think it was worth the number of time students lost. Being inactive." For Teacher D, his thinking was keeping students busy enough with an iPad yet mentioned "I could foresee having kids do iPad work." Teacher E used digital devices and that question was omitted for him. Teacher F responded but the audio was unable to pick up a response.

The primary purposes for using digital devices in their classrooms were engagement, motivation, and assessment. Music being played was from all six teachers to provide both engagement and motivation and used during activity time with games, skill

work, or group challenges. iPads, heart rate monitors, and projection units on carts are used in most classrooms. None of the teachers have their students bring their iPads which each student has in their homerooms.

Guiding Question Two. How do elementary physical education teachers describe the current usage of digital devices in their classrooms?

Interview Question Ten. When you were in elementary, middle, and high school, what were some digital devices used? Would you use any of the current devices you use if you were and a student, and how?

A videocassette recorder and stopwatch are what Teacher A remembered growing up and thinks the heart rate monitor and 3D accelerometers would be great to have. Teacher B had a record player and that was it. She attested that having music "would be motivating for me" yet had mixed feelings about other devices saying "You have to listen to your body, your body knows what it needs, not, not your devices" referring to monitoring the steps and heart rate of a device in physical education. There was not a direct response to the question for Teacher C about her device use as a student but commented on liking an iPad with gamification. Yet, "I probably would not have liked, like the heart rate monitors or the dance revolution kinds of stuff where everybody was seeing you do it and it was focused on you." Teacher D directly responded with "We used no digital devices." Devices for him growing up, perhaps an iPad but he did not believe he wanted a device. A record player for square dancing was for Teacher E and a computer for health class but did not explain if they wanted devices while growing up.

Lastly, Teacher F remembered a slideshow for modeling gymnastics as an example but did not comment if he wanted devices growing up.

The elementary physical education teachers described their current usage as some but not what they are capable of. Setting up the devices was a factor and their distribution and collection. Another barrier is the lack of training provided for new equipment, which is purchased via grants as all the teachers mentioned they apply for yearly. And limited funds from the district budgeting for physical education classes do not help in obtaining new technology. When it came to what the teachers would like to have if they were elementary students, five said iPads, and one said music only.

Guiding Question Three. What are possible descriptors and factors that either support or form barriers for the use of digital devices in the urban elementary physical education classroom?

Interview Question Eleven. Has there been professional development on digital devices? If not, why? If so, describe what device use you were trained on.

Professional development on devices for Teacher A consisted of national and regional conferences. His insight was "Any company worth its salt is going to have some sort of right, PD, whether it's a, you know, a handful of experts that can come in, or just some, some Q and A." They explained that being a prior administrator, they relied on professional development upon purchasing new devices. Teacher B had no opinion on professional development as she felt the development of her students was sufficient. Teacher C explained the school district had minimal training on devices for staff where Teacher D felt there is administrative pressure to have devices in the curriculum and he

affirmed "the goal was not to use the iPad, the goal is to have the iPad help the kids not use them" meaning "if it (the iPad) makes the kids better, then let us use them." Teacher E's statement was, "I would love for someone to come in who just has...great ideas for apps that are specific to phy ed and health" and concluded with "I just, I do not know how to use them." Then Teacher F discussed how it was the specialists who did professional development and had none from the school district. From this question, there was no similarity between the responses.

Interview Question Twelve. Regarding digital devices, what are the challenges you face in the classroom?

Challenges for Teacher A included the device not working and the cost was his main item. "I have been so jazzed with something or their presentation...and you are so excited, you finally get it, and they come back an hour later, and like, it is just not working." Teacher B discussed the device not working and the time issue, meaning how infrequent classes meet and "I do not want to spend the time giving everybody a heart rate monitor, pedometer...setting it up, teaching them, I want to get them (students) moving." Knowing how the device works is what Teacher C commented upon. Teacher D also had time as his main challenge with device usage. "it (device) took too much time away from the minutes they can be moving." Internet connection in the gym was the issue for Teacher E. He described how the connection would "get cut out and then you have that awkward, like, alright, teacher's got to fix this, and yet you are trying to keep the kids occupied without fooling around." Besides, the acoustics were terrible in his gym with the infrastructure to currently have technology in the building. Teacher F mentioned

issues with coming up with a device curriculum but nothing in addition to his answering the question.

Looking at the concerns teachers had with the devices, themes were the lack of time for any professional development as all six teachers acknowledged this as a barrier along with the amount of time to teach, use devices, and movement in the classroom. With so few days in the school year to see students, distributing any type of technology would take away student movement, a theme consistent amongst all six teachers throughout the interview.

During Distance Learning

Guiding question four provided the framework for the interview questions in this section while teaching during distance learning. Interview questions fifteen through seventeen, the concluding portion of the interview, gave insight into how teachers managed to teach physical education online.

Guiding Question Four. How do urban elementary physical education teachers describe their perception of their role in physical education class during the coronavirus of 2020?

Interview Question Fifteen. During DL, how has the transition been to online teaching? Successes? Struggles?

Due to being new to the district, Teacher A found the transition difficult, particularly the move from an administrative role to a teacher again. "It was quite a struggle." Yet he found success with engagement using emailing or texting with parents. The struggles for him were learning the platforms for the district and a lack of

engagement with parents. Teacher B had success with improved engagement for some students. An example is a student who is quiet in school but "he sends me videos of himself, audio, he is like this new person." Another was the creativity some students are showing in their responses which has "expanded my curriculum" from doing "90% of lessons I would not be doing in the gym." Facebook group connections was a success for Teacher C and knowing that "phy ed is interactive" meaning "kids are just pleading to be able to play a game with each other versus 'I do not care if I can hit the ball,' I want to be able to hit the ball at somebody." Teacher D found himself not as effective as a teacher and an issue was others "telling us what to do" where before, he could do what he wanted to. He described setting all the items up for distance learning then abandoning everything to keep his sanity. Both good and bad have been the outcomes for Teacher E, namely learning about the platforms for getting activities ready and knowing the families better. A struggle for him was "the personal relationships and seeing the expressions on their face when that light bulb comes on and they click." His biggest concern was "not the same as in-person" and "there is always these little hurdles that are making it hard to teach." Teacher F found himself learning from colleagues was a success for him but thought this distance learning "was just a matter of time." Now he is ready for anything which could occur.

Interview Question Sixteen. When distance learning is over, what takeaways will you have from your experience teaching students online?

"The onus is still on me, right, to build an engaging lesson" is one takeaway from the online teaching experience for Teacher A. He mentioned the control of what he does and how it is "very tough to learn at home." His reflective quote was:

I take away that when they are on our turf at school, a lot of those things are controllable, right, we can feed them, we can make them warm, and we can help them, maybe, with even some other services, and we can create a positive classroom environment. But at home, you know, you cannot do any of that stuff. And if I take away that, it is just, it is not only is it difficult for me, and I will sit and talk about the difficulties, right, and the struggles, but it, more importantly, it is difficult for kids, I think to learn remotely.

Teacher B found "providing things that we do not do in the classroom as a takeaway." She commented on having substitute plans ready now due to online learning in case they were absent as the technical knowledge was a large learning piece for her. The Facebook group connections for Teacher C were a success. Her ability to seek out groups that she could respond to online gave her a pathway to learning new ways to teach her students on the computer. Teacher D found himself not planning to "use any more technology in my room...I think about how much time I have invested in learning Google meet...I am not planning on using any more technology now." Optimism that teachers can do anything was from Teacher E. "Who would have ever thought that we would be put in this position and all of a sudden, you are learning and in school through a computer, from your house?" Additionally, he mentioned the learnings about maintaining a schedule

independently for meetings as an example. Teacher F felt learning of his colleagues' ability to use technology was a success for him. Before distance learning, he had limited thoughts on using the platforms. Now he had a better understanding of how to access the technology to have some success.

Interview Question Seventeen. What advice would you give yourself knowing what you know now for yourself back in March of 2020?

Teacher A stated that "everyone fell flat on their faces in March through June." His analysis was telling himself "I give myself permission to like, know that it is not going to be perfect." Also, to be more creative with his lesson plans. Teacher B said to stay updated with the technology as she learned something each new day. "To go with anything because you can turn it into a positive or a negative based on your thoughts." "Relax" was Teacher C's advice for herself. "You will get it done; you will learn how to do it. And do not put extra pressure on yourself." Teacher D felt distance learning was bad for students as he observed, "Watching them get fatter in front of my face every day. It is heartbreaking." Not being afraid to ask for help was Teacher E's feelings and "borrow from others that maybe it comes easier to feel like what has helped me a ton." He indicated to be open to new ideas especially with the number of teachers in the district who have experience with technology. Lastly, Teacher F found his new learnings immensely impactful yet described how it has not been easy to see students be less active. He added "kids really miss gym" as something he did not realize before distance learning.

Guiding question four and the interview questions 14-16 focused around the transition into distance learning from the classroom setting, specific takeaways with the transition. Themes from question fifteen included difficulty, not successful, no accountability; then improved curriculum, iPad awareness, and engagement increased with students. Takeaways from their distance learning experience ranged from controlling the lesson plans still, improved planning, and a sense of achievement to learn how to teach physical education online. Finally, advice for themselves and others was to relax, stay updated with the technology, ask for help, viewing a student's home life, and be fine with struggling.

Motivation With Devices and the SDT

The final guiding question was about the role urban elementary physical education teachers play with digital devices. Interview questions were focused on the SDT, devices and their function to motivate students, and successes, if any, with devices in their classrooms.

Guiding Question Five. With digital devices, what role do urban elementary physical education teachers serve in motivating their students to participate in physical education? And is the self-determination theory part of providing motivation for students with digital devices?

Interview Question Seven. Do digital devices provide intrinsic motivation for students to participate in physical education activities? Do digital devices alter student's motivation when using the devices to becoming dependent on the devices? Why or why not?

Teacher A concluded that devices have extrinsic motivation but not intrinsic directly. While implementing digital devices into the curriculum with the intent of intrinsically motivating students, "it stayed very extrinsic." Similarly, Teacher B said "I think the device is an external motivator. I don't know that it's helpful at an elementary level for motivation." She stated, "I believe everybody is internally motivated. So it just how as a teacher can we engage that." Next, Teacher C felt that some students are motivated but not to a degree of intrinsic motivation from the devices. Gamification motivated Teacher D with activities that engaged students to be motivated thinking, "so there must be something intrinsically motivating about that," referring to gamification. Yet expressed that "I don't even know" on the intrinsic motivation from devices. Teacher E had similar words with gamification and its intrinsic motivation. An example was his students and his children playing Among Us (see Appendix B) where there is an imposter in the game and "pick which one you think is the imposter and then copy that exercise for 60 seconds, and then it just reveals." Teacher E concluded with "if you can somehow find ways to incorporate, you know, health and phy ed, things like that, I think it would be a big motivator to maybe get some more kids active." Teacher F talked about his thesis and alluded to how it was determined that students in the past decade "will spend on average 41 years of their life looking at screens." Whether devices were a motivator was not explained by Teacher F.

Interview Question Thirteen. With digital devices, what are your successes in your classroom?

Teacher A felt success with using devices. The idea of students having ownership of the device when they wore them created intrinsic motivation to perform. Additionally, engagement "and just the sheer joy where kids have good memories and they, of course, have fun." Teacher B described her success as a device "can motivate like if kids can see their progress...if they have a specific goal, but it can be a source of positive or negative competition." Teacher C found the devices to use for taking tests which sped up waiting time. And again, motivation due to "it is something new to try out." The Nintendo Wii was Teacher D's success for using Dance, Dance, Revolution (see Appendix B) for students to dance to. Teacher E focused on the distance learning successes with the students using their iPads to submit their homework. "A lot of kids that are not always the most successful in the gym, but they are really, really good with technology." Teacher F was clear about his not having any successes and does not advocate for using technology or devices at his home after school.

Interview Question Fourteen: With the self-determination theory according to Goodyear, Blain, Qarmby, and Wainwright (2017), "individuals are highly motivated when they fully endorse their actions and take part in activities for intrinsic interest and enjoyment" (p. 17), how do you believe that digital devices can move a student's motivation through digital devices? If not, why do you believe this?

Teacher A believed in getting his students hooked to increase motivation. "These devices can be a tremendous entry, they can just build motivation, they can get kids moving, and then...move (s) intrinsically." Echoing her earlier sentiments, Teacher B talked about "just want them to get out and play and enjoy moving." She discussed how

as a kindergartener with a device now will have to learn a new device years later and finished with "just to motivate kids to encourage them to want to let them have fun being active when they are little." Teacher C explained directly "I do not know that I see it as working as a motivator. Like taking it away and showing them exercising with it, I do not think (it) motivates them to exercise without it." For Teacher D, he felt some students do improve their motivation with specific activities noting "with the Just Dance and a kid hold a controller, some kids, I have noticed, like, they actually care who wins the dance." Teacher E expressed how "finding, really, getting to know the student, finding what their interest are, and I think...when you get to know your kids and you can actually have a conversation that taps into things that they are interested in" and finished with devices are like dangling a carrot for students to be motivated when they initially are not. Getting family involved was Teacher F's approach with increased participation when using a device like the iPad to generate responses with students.

Guiding question five focused on the motivation of devices to play with students to participate in physical education. The connection with interview questions seven, thirteen, and fourteen digs into motivation at the intrinsic level, successes with devices, and the self-determination theory. Teachers stated that extrinsic motivation was the main factor, not intrinsic motivation. With successes, they believed engagement was the main success while the self-determination theory could build motivation for those who need a nudge yet access was a contributing factor in the theory,

Chapter Summary

Narrative analysis narrowed the main ideas from six teachers and the seventeen interview questions to content analysis then themes from those interviews. Large portions of teacher responses were selected and the analysis for the content in the next section to drill down even deeper from the interviews. This was an experienced group that had a variety of activities they enjoyed teaching. Their use of digital devices was minimal before distance learning as devices were mainly used for motivation and engagement. The iPad was the device used most frequently, primarily for music, and was discouraged for student use with other devices due to time and setup. Professional development was not present which led to little success using devices. All the teachers want their students to move and not sit making the transition to distance teaching difficult. Some nuances from the interviews included learning new technologies and keeping up with lessons with devices. Lastly, their advice to themselves back in March was to relax, you are not perfect, and now we know we all can meet challenges head-on.

Conclusion

Interview questions five through seventeen were aligned with the primary question and five guiding questions to present the thoughts of the teachers helped answer the primary and guiding questions. The primary question of how are urban elementary physical education teachers using digital devices in the classrooms was answered with narrative and content analysis. Results found that urban elementary physical education teachers are using digital devices in their classrooms yet are facing numerous hurdles. Those hurdles included the lack of training from the school district and how little time

was provided to use the devices. Teachers use their iPad during teaching time but typically for music purposes. They gained knowledge as they used the iPad for various reasons but felt they could use the iPad better with additional training.

The guiding questions gave insight into what each teacher has gone through using digital devices. They primarily use iPads for music to engage or motivate students to move. All teachers alluded to the fact that their main job is to have students move and not be dependent on digital devices to exercise. Teachers agreed that the use of a digital device is an extrinsic motivator with two teachers feeling students may use the device to have intrinsic motivation eventually. The global pandemic of 2020 rendered teachers to be distance teaching from March of 2020 through this dissertation with a hybrid model occurring on February 1, 2021. Their responses were on the number of challenges to keep students engaged and active. Yet knowing they were able to overcome such hurdles, three teachers were upbeat on being able to accomplish more when a sense of normalcy returns. Finally, advice to their past selves was to be relaxed, be okay with mistakes, and keep up on the technology provided.

Preview of Chapter Five

Chapter five is the culmination of this dissertation. In this chapter, a reflection on major learnings that occurred throughout the process. A succinct connection back to chapter two, the literature review which topics were the history of digital devices used in physical education, use of digital devices by teachers, how digital devices can promote motivation in students, the challenges of physical activity and digital devices, self-determination theory: feedback on motivation in elementary physical education, and

technological pedagogical and content knowledge. Each topic was addressed in the interview and survey portion in chapter four. Next are the implications for this study and who could take away results from this dissertation such as district heads, teachers, and parents. Limitations of the study are next as there were many with the pandemic. The last two items are recommendations for future research and the plan to communicate the results to participants and others who may find this study relevant to them.

CHAPTER FIVE

Conclusion

Introduction

This qualitative, constructivist case study used elementary physical education teachers from an urban school district to find how they used digital devices in their classrooms. The six teachers interviewed were all tenured, over 43 years of age, and had a minimum of 21 years of teaching experience. This veteran group gave a large amount of data from surveys and interviews throughout three weeks in December and January of 2020 and 2021 during the covid-19 pandemic. The primary and guiding questions that were answered are:

Primary research question: How are urban elementary physical education teachers using digital devices in the classrooms?

- **Guiding question one:** What are elementary teacher's primary purposes for using digital devices in their physical education classes to support the attainment of learner outcomes?

- **Guiding question two:** How do elementary physical education teachers describe the current usage of digital devices in their classrooms?

- **Guiding question three:** What are possible descriptors and factors that either support or form barriers for the use of digital devices in the urban elementary physical education classroom?

- **Guiding question four**: How do urban elementary physical education teachers describe their perception of their role in physical education class during the coronavirus of 2020?

- **Guiding question five:** With digital devices, what role do urban elementary physical education teachers serve regarding motivating their students to participate in physical education? And is the self-determination theory part of providing motivation for students with digital devices?

Conclusions and Responses

This section reviews my conclusions and answers from the case study with six urban elementary physical education teachers. As an overview (more in-depth conclusions are later in this chapter), I found that many teachers in the school district are not using digital devices and if they are, not to their full potential. An example is the iPad where all students and teachers have one from the school district. None of the teachers interviewed have their students use their iPad in their classes with the intent of using them to build skills, enhance teaching, or supplement their curriculum with the iPad. Second is the reluctance to use digital devices. An example would be a step counter. Many of those interviewed have in the past yet have found hurdles such as cost, breakdowns, or losing the devices. The third is the mindset of knowing the devices help motivate students yet the teachers do not implement the devices. Fourth, the lack of collaboration between teachers. This may be a district issue but as a teacher in the district for seven years, there is little outside collaboration beyond the PLC group which only meets once a month. Lastly, the lack of openness to using devices with students was a

concern. All of the teachers were veterans of 21 to 35 years of teaching—an issue was a lack of new teachers in the interviews. Looking at the results, this discrepancy may have altered the data out of the researcher's control. From the results is the connection to the literature from chapter two.

Connections to the Literature

Using the topics in chapter two, six different topics were unpacked from the surveys and the interviews. This was from the twelve teachers from the survey to then six teachers for the interviews. Having the topics listed in this chapter, key themes are pulled from the data collection under each of the topics. Beginning with the history of digital device use in physical education, five other topics were in the literature review. These include the use of digital devices by teachers, how digital devices can promote motivation in students, the challenges of physical activity and digital devices, the self-determination theory and its feedback on motivation in elementary physical education, and TPACK (Technological Pedagogical and Content Knowledge). The connection between the data and the literature review is presented in this section and an overview follows each topic.

History of Digital Device use in Physical Education

This section reviews the data collected from the teachers through the survey and interviews. The connection between this topic and interview question ten: When you were in elementary, middle, and high school, what were some digital devices used? Would you use any of the current devices you use if you were a student, and how? Results from the interview noted little devices were used. A record player was discussed by two teachers and they felt music helped their students become motivated.

Trout (2013) wrote about the video cassette recorder that was wheeled out in the 1970s and commented on by teacher A and teacher F. Teacher A talked about the teacher "popping in a VCR tape back then to watch something" and teacher F talked about seeing different videos on basketball for skill development. The other device was a record player, commented on by teacher E. "I remember a record player back when I was an elementary school for the square dancing unit." Beyond these instances, none of the teachers recall any devices being used in their physical education classes growing up. Regarding the music, that was encouraging from this researcher. There is ample evidence to support music providing motivation. The next steps are how to add to music with a device to keep students engaged.

How Digital Devices Influence Physical Education Curriculum

All six of the teachers use digital devices but to varying degrees. Five teachers used the iPad only for music and one, being new to the district, has not had in-person class since his hire in September. How they used the iPad or any device was through mainly motivation, engagement, and learning. This section looks at different topics from the literature review and how the interviews connected to these topics.

The society of health and physical educators (SHAPE) is the national organization of those who teach health and physical education. The five ways teachers are to use digital devices according to SHAPE (as cited in Baert, 2015) are:

1. Identify grade-level outcomes, skills, concepts, focus, and objectives of the lesson.

2. Select appropriate tasks, instructional supports (including technology), and assessments that align with the learner's needs, learning outcomes, focus, and objectives.

3. Plan the unit and decide how to manage the lessons, including the protocols for the use of technology.

4. Implement the plan, observe, and then collect and record evidence of student learning.

5. Finally, evaluate the implementation of the less and the usefulness of the instructional tool, and make appropriate modifications to the next plan.

These five items need to be used by teachers in using digital devices. Unpacking the interviews, there are instances where those interviewed identified areas where they use the devices according to the standards.

Standards-Based Teaching with Devices. The teachers did not provide much detail using the devices based on the teaching standards nor the five standards in physical education (see Appendix A). Most of the discussion was around getting the students to move and not worry about the devices. This theme of "getting students moving" was echoed throughout the interviews. That stated the use of digital devices via the standards was not considered by the teachers interviewed. All of the teachers are capable of using the standards with the digital devices yet what training has occurred for them to acknowledge the standards and devices? Having a development on standards-based curriculum through devices is needed. There is more learning to occur for teachers in the

district, based on this case study, to improve their ability to use the digital device standards in their curriculum.

Understanding Devices for Curriculum. Five of the teachers, A-E, found the device useful for the curriculum. From chapter two, Laughlin, Hodges, and Traggiet (2019) found a need for devices to be understood by all physical education teachers in grades kindergarten through twelfth grade. The three topics which the authors contend that physical education teachers should know are the applications on the device, which tools the device has, and the device's mobile capabilities. From those topics, those interviewed took issue with devices whether it was not knowing the device, what the device does, or none of the mobile capabilities of the device.

Examples from the interview are from teacher A who stated: "the glitches, the hiccups" of the device. Teacher B flatly stated, "I only use an iPad for music" but did include she used it for a visual aid "when I play a game of battleship. They do not know what a battleship is…so we pull it up from the iPad so we can see a picture and we can read a description." Teacher C discussed their use of movement "partly because the kids are already using so much technology in their classrooms. I did not want it to be one more space where we are doing this again." Teacher D found ways to use the Nintendo Wii in the curriculum by having students play Dance, Dance, Revolution. Teacher E used activities from other teachers as examples of skills in the curriculum where Teacher F has not used their devices. The understanding of devices for the teachers appears to be at a minimum level. Playing music or using the iPad as an extension of a book is useful but to attain a deeper understanding, additional development would be warranted.

Devices Used as Tools. Laughlin et al. (2019) wrote that "Technology cannot supplant a well-designed curriculum or the reliance on effective instructional and assessment strategies" (p. 28). From the teachers, they did use their devices as tools in a variety of ways. Collectively, the device used most often is the iPad and as a tool, was used for music. Occasionally, three teachers mentioned they use the iPad as a camera to video their students for evaluation. The lack of use of any devices, namely from attempting to use devices earlier in their careers then giving up based on time, functionality, or lack of professional development were themed as to why they refused to use digital devices as a tool.

Device Accessibility. Being in the same school district for this case study, all teachers had access to an iPad. Beyond that, there was a mixture of access for each teacher interviewed. With a limited budget of $100 a year from the district, teachers had to write grants, ask the parent-teacher association (PTA) for funds, or ask for donations from parents. Hill and Valdex-Garcia (2020) studied three areas of access for teachers: "(1) specific technologies available for teaching, (2) availability of technical help for teachers, and (3) specific obstacles to incorporating technology in classrooms" (p. 31). Available devices for the teachers interviewed ranged from having heart-rate monitors and pedometers to nothing. Availability was worded from Teacher D as "there is no development for us in the district to learn how to use these devices." While not directly stated by all, this sentiment was consistent throughout the interviews from all teachers. The obstacles the teachers discussed were time, cost, and device workability. All six talked about getting students to move. All felt that handing out devices, then collecting

data after getting the devices back from the students took time away from the overall movement. While all teachers have some access, the accessibility is not equal amongst all teachers. Particular attention needs to be given to areas of the district where disproportionality economically is prevalent. Learning how to use a device and utilizing the three areas from Hill and Valdez-Garcia would benefit the teachers.

   Devices into Methods within the Curriculum. Using devices as supplements into the curriculum but not fully injecting the devices as methods was consistent with the teachers. Examples from the interview include Teacher F does modeling themselves and avoids using devices as "they take away from movement." Methods were not part of Teacher E either even though they used their devices as supplemental forms like a timer, chimes, or music. Just Dance is what Teacher D uses their devices for but nothing else. "The kids like to dance, you know, and they are inspired to do that." While Teacher C knows the motivation for devices yet the cumbersome nature of heart rate monitors as an example, took time from the student movement. Teacher B was quoted stating:

   I do not want to spend the time giving everybody a heart rate monitor,

   pedometer setting it up, teaching them; I want to get them moving. When I

   get them moving and having fun because they have waited a certain

   portion of their day. That is the only chance they are going to get to move

   and have throughout their day, and I want them to be as active as they can,

   for the most minutes.

While Teacher A did use devices in their prior district, they have not had the opportunity to use anything due to covid-19 being in their building and teaching students in person.

Most teachers are not utilizing devices due to time, cost, or the device working. Accessibility may be an issue but more unpacking would need to occur. There are concerns that teachers are flatly resistant to the devices. A piece to bring the attention of the lead physical education teacher is to survey all elementary teachers on their feelings towards devices and how to shift this mindset for some into a positive mind frame.

Motor Skills. Devices in the literature have not had an impact on students. One study by Lucena et al. (2019) did look at digital device student use outside of the classroom. Teacher A discussed providing an extrinsic motivator for students to use a device outside of school. "These devices can be a tremendous entry, they can build motivation." A quote from Teacher B thought that "you can take a person's pulse on your own watch," meaning a device cannot be the end-all for motor skills or practical skills too. There was limited discussion about motor skills from the other teachers as their device use did not advocate for those skills. This would be tricker with elementary students who tend to not pay close attention to their skills. Yet in time, students may acknowledge their motor skills better after watching videos of themselves.

Devices Leading to Transformation

Using devices to move into a transformation mentality is challenging. Rick, in my chapter two literature review (Jones et al., 2017), described how he moved from using no devices to embracing them in his classroom. For the interviewed teachers, Teachers B, C, and F had limited thoughts of moving into a transformational role with devices where Teachers A, D, and E made small movements to be more able to use the devices. Teacher C intently stated, "I cannot afford, or stay up to speed with what some of the kids can

play with at home, or the different games." Teacher F was adamant with "The transition to distance learning...I have learned that when the school session ends, this computer and iPad sit in a drawer. I almost refuse to be a part of it." The experienced teachers showed resistance from the interviews to be transformational in learning devices. While transformation takes time, small nudges would provide a change over time to better understand and use devices.

Instructional Use. With Juniu (2011) and her finding that when digital devices are being used, "the context in which it is used and should be thought of in those terms" (p. 42), a few teachers did use devices within the context. Teachers C and D use the Nintendo Wii for dancing. They know their students enjoy dancing and the Wii provides a choice for them to use devices for an activity that aligns with the national standards (1, 4, and 5; see Appendix A). Teacher A was still having to meet their students, Teacher B and E uses music yet not directly uses devices to promote learning. Teacher F had no opinion and chose not to use any devices for students. Again, there is a lack of consistent use and light application for instructional usage for devices. Direct methods and applications for using devices would improve throughout the district.

Assessment. A case study by Parker et al. (2017) wrote on how digital devices could be used for assessment yet is aimed more at performance and not theories of learning. The goal of using a digital device for assessment for learning (AFL). Assessing students was only performed by Teacher D. They would keep grades on the iPad and be able to show students their grades for the day. "But when kids can come up to the iPad and go, 'what was my score?', and I scroll, scroll, and in 10 seconds I have their score."

Five characteristics with AFL include assessment and instruction, how is assessment learner-centered, assessment as an ongoing part of teaching, assessment has meaningful tasks, and how the criteria for assessment are presented before the activity. If devices are going to be used to assess students, a change needs to be made in the district.

iPads. In the school district, all teachers and students are provided an iPad. Teachers are allowed to use the iPad as they deem appropriate with no oversight based on this researcher's knowledge. Amour et al. (2017) stated that the iPad "is portable and can be used to access a range of apps and that includes a camera and video function" (p. 216). All six teachers use their iPads and for similar reasons. Teachers B, C, D, E, and F used their iPads for music in their classrooms while Teacher A did not have a physical classroom at the time of the interview. Regarding student use of the iPad, not one of the teachers stated they have their students bring their iPads down for class. One comment from Teacher E resonates for the group based on the interviews:

> I would love just because we all have iPads just to keep it simple. I would
>
> love for someone to come in who just has. A plethora of great ideas for
>
> apps that are specific to physical education and health. Maybe. Maybe
>
> someone that is younger come in and just share things that they think
>
> could be useful or could be collected, and how they are used with kids.

Again, the use of the device can be improved and likely from better professional development, as expressed by the teachers. The district has had iPads in use for all teachers for seven years yet there is one application for the iPad (Sworkit, see Appendix B). Certainly, additional applications could be vetted for use.

Brain Plasticity. A study by Cotman and Berchtold (2002) looked at how brain plasticity supported the notion of using digital devices in physical education class as the brain can retain a capacity for changes to occur. For the teachers interviewed, the researcher did not discuss this notion with them yet with the dancing activities from the Wii with Teachers C, D, and F, there would be an increase in brain plasticity when students are engaged with dancing. While a little-known part of the physical education curriculum, discussing how using devices can improve brain plasticity when implemented properly with good research.

Summary. From the interviews, the teachers are utilizing digital devices little into their curriculum. Themes included resistance to change, music only, the Nintendo Wii, and the need for professional development. The conclusion is there needs to be an induction to what the devices can do, providing schools to have a similar curriculum, mandatory digital devices like the iPad, and assistance for ideas. Next is answering how the devices have benefits and challenges for physical activity.

Digital Devices Through Exergames

This section looks at the responses from the interviewed teachers in exergames used in physical education. Growing in popularity, exergames are activities that typically use sensors to monitor a student's heart rate and movement. Within the interviews, exergames were not discussed at length yet warrants discussion.

Benefits and Concerns of Exergames. Beginning with the benefits of exergames, Lindberg et al. (2016) found that students had increased enjoyment and socialization with the competition with virtual teammates or competitors. Regarding the

teacher interviews, Teacher D and E commented on activities incorporating exergames and the positives. Teacher D believed that the Wii was a benefit for many of his students. "I gotta say, you know, the whole gamification thing. They love the Wii like certain kids will play that Just Dance to literally be sweaty messes, like, as if they have just been running laps for twenty minutes." In the opinion of Teacher E, games similar to Minecraft that involve activity are becoming more popular. They explained how video games can come to life in the physical education classroom. "During the real game, you go around and do these different missions...You pick which one you think is the imposter and then copy that exercise for sixty seconds." His thinking was with the exergames, and an increased nudge of motivation could provide students to be more active.

The challenges with exergames from Lindberg et al. (2016) is they will not replace traditional physical education skill activities. Activities like kicking, throwing, and volleying need to be taught and demonstrated without the guidance of a digital device. Teachers did not directly comment on the challenges of exergames yet gave statements on the issues of exergames as Teacher C did. "The gamification of different skills, I probably would not have liked." Their reason was the lack of controllers for example the Nintendo Wii that has four and the number of students in their class ranges from 18-28. Exergames have made their appearance in the district and have gone by the wayside in most cases. While there are benefits with exergames, it seems likely that the challenges outweigh the benefits. What needs to occur is for the district to approve exergame applications. There are none approved as of this dissertation. Yet the next

section may provide a rationale for attaining exergames for some students needing the motivation to be active.

How Exergames Improve Motivation with Student Motivation. At first instance, exergames do improve motivation with students as Ennis (2013) brought this in his study. Overall, exergames had more issues than their purpose of engagement that included cost, maintenance, storage, research training, material preparation, finding a place for the game to occur, and setting up the game before class. Similar findings were from the teachers. Teacher B had little to like with games that revolved around the devices, meaning any device at all. Her thoughts are considered a dependency upon a device to be motivated. "I do not know that any other kind is appropriate for elementary or motivating them." However, they did recognize that using the devices to get those students who are not quite motivated to move the needle. "I think everybody is intrinsically motivated, we just have to ignite that or sport that within them." Similar sentiments were from Teachers C and F that devices cause more issues than help. Teachers D and E expressed interest in wanting to learn more about exergames. Teacher D commented on "QR codes that pull up really awesome videos" meaning a game pops up with the code for students to follow. Teacher A felt that any motivational tool for students is well worth exploring, particularly if that tool has them active. If exergames are used, they should be used by students who need additional motivation to be active in class. Then to wean students off exergames to more traditional activities or the regular curriculum of skills and games.

Summary. Exergames are being used by teachers namely the Nintendo Wii and modified games of Minecraft. Yet four of the teachers prefer not to use any exergames in their curriculum. I aim to look into exergame activities to flush out potential usage throughout the district. Table 1 in chapter two provided examples of exergames that can be investigated further to look at cost and feasibility for teachers and students.

Challenges of Digital Devices in the Curriculum

Going through the surveys and then interviews, a majority of the discussion was on the issues that digital devices create rather than their successes. This section will go over those obstacles, what physical education teachers can do with digital device usage, how new and older teachers feel about devices, the basic problems with devices as one integrates them into the curriculum.

Obstacles. The literature review from a study conducted by Pyle and Esslinger (2013) found two main obstacles were for consideration with physical education teachers: school administrators and self-imposed obstacles by the teachers. The interviews with the teachers suggest the latter was the larger obstacle. Teachers B, C, E, and F admitted they chose not to integrate devices into their curriculum. Teacher A looked "for newest and coolest devices" to use in the classroom while Teacher D used applications for assessment but not to integrate the application for activity based upon an in-service where they were turned off because "kids would only move for ten minutes for a fifty-minute class!" These obstacles are genuine being a peer of the teachers. This researcher agrees that movement is imperative and supersedes anything else. Yet to have a tool that may help movement would be something to explore.

Basic Options for Devices. Pyle and Esslinger (2013) also discussed basic options for physical education teachers to have maintenance with devices starting with web pages then "pedometers, heart rate monitors, iPads, active apps, interactive whiteboards, digital video recorders, and so forth" (p. 37). The six teachers discussed a few of the items mentioned by the authors namely heart rate monitors, iPads, and pedometers. Teacher A focused their device use with 3D accelerometers which they found the students enjoying. Teacher C described using heart-rate monitors and their struggles putting them on students:

> The girls would wear the heart monitors one day and I would send all the girls in my storage closet, and they would help each other get the heart rate monitors on. And then on Tuesdays, it was the boys. So that made it tricky because they actually had to sit against your skin underneath your shirt. I am a big advocate of I want the kids moving. So if the technology piece helps them move either longer or motivates them to do it, then it is a good thing. If it is just one more way of looking at it, if it is a way for teachers to record and so it helps them, I am not always so sure that it is worth it because I want the kids to move.

Teachers D and E have basic knowledge of devices yet chose not to use them while Teacher F has no desire to use devices in their classroom.

The challenges from the literature and interviews are clear from the numerous items physical education teachers need to do. From the literature, administration and teachers themselves are obstacles. The interviews agreed that teachers do impose

obstacles upon themselves from not wanting to use devices or the time the device takes to learn, hand out, and collect data. Starting with a small item such as taking a picture or video to show the class to increase their skills can move the needle of integration and intrinsic motivation to use devices slightly.

Concerns for Physical Education Teachers and Devices. The challenges for new health and physical education (HPE) teachers, particularly with new devices, adds to the level of difficulties new teachers face entering the teaching profession. Krause et al. (2017) felt that new HPE teachers need to have confidence in their abilities to implement new technology into their curriculum. This also plays into older teachers and the challenges of learning about new devices. For Teachers B, C, and F, their concern was not keeping up with the devices and once they would learn how to use them, the device would be obsolete. Teacher E was torn between learning new technology or staying constant. "I feel like it is my own fault but I feel like I could use training and professional development on how to best use technology in a physical education setting." This encompasses how a teacher with twenty-one years of experience is at the crossroads of staying the course or learning a new system. What would be advantageous is to have veteran teachers learn the new skills to nudge other veterans to come abroad, slowly but eventually.

Fundamental Problems with Integration of Devices. As the title indicates, there are problems with integrating digital devices in the physical education classroom. Silverman (1997) proposed four problems: funding, performing skills with devices, best practices, and learning application before full implementation. These four items align

with much of what the teachers stated. With the lack of funding for Teacher A, they were needing to ask for funding from the PTA or apply for a grant as had Teachers B, C, D, E, and F for any new equipment. Having skills to watch and attempting to video students was talked about with Teacher F who spent a fair amount of time videoing sports. Yet felt better by "modeling of activities that I can do myself." Next are best practices as Teacher B, C, D, E, and F believed that not using devices created the best environment for learning physical skills. Then learning the application where Teachers B, C, D, E, and F all contented that learning the devices was not to be had for various reasons. These four items can be adjusted with additional funding, learning how to use devices like the iPad, incorporating devices that do not overtake the curriculum, and being comfortable with applications slowly.

Summary. The number of challenges outlined in this section from lack of funding to motivation is a challenge that can be altered. Yet the integration of devices into the curriculum is the biggest obstacle for the teachers interviewed. Having someone work with small groups of teachers to integrate devices, could improve the mentality. Beginning with a web page to provide communication with stakeholders, Pyle and Esslinger (2013) provide a starting point for these veteran teachers. Teachers being motivated parallels students being motivated in physical education as the next section discusses.

Digital Devices to Promote Motivation

The literature in chapter two gives credence to the use of digital devices in physical education classes. However, students who lack the motivation to be active in

physical education have the most to gain from the devices. This section looks at the responses from teachers regarding biofeedback from devices, the use of technology in the curriculum, motivation with the devices, and what is the mindset of the teachers regarding device use in their classrooms.

Biofeedback With Devices. Biofeedback devices were discussed with the teachers interviewed are considered ones that track movement with students. This connects from Nation-Grainger (2017) and his study focused on using a watch device to measure movement and heart rate with students in a physical education class. He concluded that watches did improve student's exercise amount but no direct correlation with the watch and exercise intensity. Teachers A and C have used heart rate monitors in the past. Teacher A felt "a lot of those things really enhance their experience, you know, mostly motivation." Teacher B discussed earlier on not being able to take another's heart rate without a device does not lead to learning when a device is doing it for you. The study concluded that the use of devices "appeared to have a huge influence on the behavior of the students with some demonstrating characteristics such as competitiveness that they would not normally experience in physical education" (p. 475). The researcher contends that using devices with biofeedback is important yet when to implement is the key such as older students in third to fifth grade.

Information and Communication Technology. What the information and communication technology (ICT) refers to is the impact of ICT in physical education. Leigrain et al. (2015) studied how students used ICT against traditional teaching and found the ICT had lead students "to display motivated behavior according to the

pedagogical environment, teachers considered camcorders, pocket computers, and computer software to be useful for their work in physical education" (p. 395). Referring to the teachers and their use of ICT, there is little to be had. While Teacher B had used the iPad for recording some skills, the other five did not. This case study demonstrates that having new technology introduced to veteran teachers is difficult for them to either accept or promote. Additional new learnings will need to occur to find specifics on exact barriers for those teachers. Having little nudges to research by peers may induce those veteran teachers to adapt to the devices.

Do Devices Decrease Motivation? In the discussion of their study, Attig and Franke (2017) found "participants stated that their physical activity would diminish when the tracker is not available with a considerable variance" (p. 22). The dependency effect influenced participants but not all. If participants used the tracker to attain a goal, active and goal-orientated and had a high score from the device based on the need for cognitive closure, were found to be less active without the tracker. However, those participants who are active because the activity is fun were found to have a loss of motivation smaller than those who needed the tracker. If a participant had a higher hope for success, the intrinsic motivation participant was more likely to be active and lowered their dependency effect. A finding was there is a dependency effect with all participants in the study regarding the use of an activity tracker, yet it varies from each participant and may not adjust their behavior to having a tracker or not.

Implications in the study from the Attig and Franke (2017) study are physical activity trackers are essential to individuals to be physically active. When an activity

tracker is unavailable, the motivation to be active decreases. Aligning with self-determination theory, if a participant needs the activity tracker to be active, extrinsic motivation is greater. By having biofeedback from the tracker, the authors suggested that "tracker feedback should be designed to minimize its perception as externally controlling and rather to enhance user's interest in his/her data" (p. 23).

This topic had opinions from both sides. Teacher A discussed how devices are "mostly motivational" or when activity tracker watches "became the student's, and so they would just really wear them with pride." Teacher B also felt devices could be a motivator yet "having a device can become an addictive thing." "For some kids, the devices do motivate them more" was from Teacher C. There was not a definite statement from Teacher D as they felt unsure of digital device motivation and students. A motivator is likely with Teacher E regarding active activities for students and Teacher F did not have a comment. From the literature review, Attig and Frank (2017) researched if activity trackers did improve motivation. The result was yes but with issues as students became dependent upon them to be active. Rather than intrinsic motivation, students were extrinsically motivated to be active. Having students who need the motivation to be active and give them a device to track their progress is critical for them to be active. The result may improve overall activity levels for students who need to be active the most.

Mindset: Interpretation Into Physical Education. A mindset with teachers who have been working with students for decades can be difficult to shift. Dweck (2006) wrote on fixed or growth mindset and for this case study would mean a teacher would have grown to new ideas with digital devices or fixed on not being receptive to devices.

Using their interview, the researcher is using both subjective and objective thinking to categorize each noting that fluidity is possible between both mindsets. Teachers A, D, and E tended to lean to growth mindsets. Examples are each are willing or have used devices and expressed eagerness to learn. Teachers B, C, and F leaned to fixed mindsets. The teachers discussed being "old school" (Teacher F) or "stuck in my ways" (Teachers B and C).

Summary. This section looked at motivation for student use and teachers. From the teachers, they recognized that motivation does occur yet do not act in getting devices or due to lack of training. Having students moving is their common theme and devices do get students moving. Yet the mindset tends to be fixed on not providing devices in a variety of ways. The research indicates that devices provide motivation but a dependency occurs when the device is taken away. Knowing this, the next section goes into the self-determination theory which encourages students to move from extrinsic motivation to intrinsic.

Self-Determination Theory: Feedback on Motivation

The self-determination theory (SDT) focuses on physical education as knowing highly motivated students and "fully endorse their actions and take part in activities for intrinsic interest and enjoyment" (Goodyear et al., 2017, p. 17). Teachers were interviewed on this topic and their thoughts will be unpacked with the literature review topics by the researcher.

Motivation With the SDT. The key factor in motivation is the ability to motivate others. And knowing that devices can motivate students to a degree, the question to the

teachers being interviewed was if this factor in motivation gives their students the motivation to be active. Teacher A felt that devices can move the needle for students to be intrinsically motivated. Teacher B discussed how devices would change so fast that the device they would have in kindergarten would be too old by the time the student was in fifth grade. This leads to a more defeatist attitude towards one progressing through the theory. Teacher C talked about how the device and the theory "do not motivate them." Teachers D and F did not have anything on the theory and discussed other items where Teacher E said "it is finding really getting to know the student finding what their interests are." Physical education is, from Ryan and Deci (2000), "social values and extrinsic contingencies and progressively transform them into personal values and self-motivation" (p. 69). This researcher believes that social values can move personal values to the individual to become motivated from extrinsically to intrinsically.

Ball, Malijak, Bice, Valley, and Parry (2019) had 148 physical education teachers in elementary, middle, and high school. Those taking part in the research as participants used the Basic Psychological Needs at Work Scale (BPNWS), created by Brien et al. (2012), and took into account the basic psychological need satisfaction based on the SDT (Deci & Ryan, 1985, 2002). The BPNWS had 18 options, six each for competence, autonomy, and relatedness, discussed in the preceding paragraph regarding the objective of the author's study. Each question was modified to be congruent for physical education teachers. Examples included, "I feel like I determine how I teach physical education skills to the students", "I do not feel very competent with my implementation of physical education", and "People at work tell me I am good at what I do."

Ball et al. (2019) used descriptive analysis using gender, age, teaching experience, community type, and frequency of teachers meeting the recommended weekend physical education minutes. The five constructs of autonomy, competence, relatedness, support, and roused were analyzed to determine group differences among teachers meeting physical education recommendations. By using regression analysis, Bell et al. demonstrated that the combined effects of those five constructs on the results of the physical education teachers surveyed meeting the daily recommended physical activity minutes were found to be the most pivotal. The results indicated 72.8% of the teachers surveyed attained the recommended minutes for physical education. Ball et al. used an analysis of variance that determined the variability of the motivational constructs (autonomy, competence, and relatedness) and teaching constructs (support and resources) from the physical education teachers meeting and not meeting the recommended minutes. Those teachers meeting the recommended minutes had higher feelings of competence than those not meeting the minutes. The author's outcome was that meeting minutes and having available resources to teach, can overcome most hurdles with students. Although not meeting the minutes fewer resources meant higher and more barriers to overcome.

Extrinsic Motivation From the Self-Determination Theory. Extrinsic motivation from Ryan and Deci (2000) is "referring to the performance of an activity to attain some separable outcome" (p. 71). In physical education, there is a reward system for a student to attain when they accomplish a task. If not supported with a reward, the student may feel unmotivated to continue to perform activities from the teacher. The self-determination theory would work to touch on the potential intrinsic motivation so the

student can perform activities without a reward system in place. For the teachers, Teacher A discussed getting kids hooked to move the needle to intrinsic motivation. Teacher B does not believe in using devices to motivate students. Her thinking was "I just kind of want them to get and play and enjoy moving." For Teacher C, she stated, "I do not know that I see it (devices) as working as a motivator." Teacher D used a device to motivate students for fitness scores yet did not feel it moved the needle from extrinsic to intrinsic motivation. A carrot dangling for students that did not even know it would provide an eventual intrinsic motivator for Teacher E. And Teacher F felt some devices work to have students be intrinsically motivated. Overall, the group does use devices to help motivate yet is wary of putting full backing for use of digital devices. Further research into self-determination theory and professional development would provide a framework for teachers to implement the theory in their classrooms.

How the SDT Works. The SDT works, as Ryan and Deci (2000) stated, that when a student's well-being is a foundational piece for teachers, the student can then thrive in the classroom environment. Teachers A and E believed that devices with the theory could move students in a direction of intrinsically being motivated. Teachers B, C, D, and F though were intent on not using a device to have students become more independently motivated. This researcher contends that having trained teachers to understand the theory would be beneficial. The studies undertaken by researchers demonstrate how using tangible extrinsic motivators can move students towards intrinsic motivation.

Rationale for the use of the SDT. Ball et al. (2019) saw a correlation to use the self-determination theory between students moving through activity and lower obesity rates. Their study found when students were motivated through the theory from extrinsic to intrinsic, student's obesity rates were lowered. For the teachers being interviewed, Teacher A felt a device is merited to help a student be more active. "These devices can be a tremendous entry, they can build motivation." Teacher B had a different reason as she felt a student would be dependent on a device early in elementary school and by the end, the device would be too old or broken. "I do not think it motivates them to exercise without it", Teacher C felt which is similar to what Teacher D stated. For Teacher E, he was optimistic about having a device to hook the student and eventually move away from devices. Lastly, Teacher F was opposed to any use of a device after his experience with them breaking and student dependence on them. If the researcher and others provide evidence of the theory through development, then devices could be used and implemented throughout the district.

Summary. The self-determination theory can move extrinsically motivated students to be intrinsically motivated when implemented properly. I feel that the teachers interviewed have little background knowledge of the theory as a whole. Teachers A and E have been positive in using devices to motivate students while teachers B, C, D, and F have little interest or motivation to implement devices at all. Where this researcher can assist is to demonstrate through studies that the theory can improve student motivation through device use. Additional research is needed and a process to provide the evidence for each elementary physical education teacher in the district is a large undertaking yet

worth the effort. The last section from chapter two is how technology and pedagogy with content knowledge were asked through the interview questions.

Technological Pedagogical and Content Knowledge (TPACK)

The premise of this topic is how teachers can use technology with pedagogy into content knowledge for their curriculum. Technological pedagogical and content knowledge (TPACK) was created by Koehler and Mishra (2009), is "an emergent form of knowledge that goes beyond all three 'core' components (content, pedagogy, and technology)" (p. 66). As it relates to physical education, teachers would learn how to implement devices, teaching with the devices, and layering additional technology as teachers learn new devices. This section focuses on the teacher interviews and their responses to questions 11-13: professional development on devices, challenges with devices, and successes with devices.

Implications for Using TPACK. TPACK centers on the knowledge of technology, pedagogy, and content. The teachers from this case study were asked about their experiences with these pieces. Teacher A had a background in acquiring devices in his previous position as head of physical education in a school district in Virginia. "I was pretty pleasantly surprised at the professional development and ongoing support with the ongoing support of the devices" meaning his school district. He used devices often in his curriculum and the content. His struggles were the batteries going dead frequently. Yet had positives with how students were engaged with the curriculum which had devices incorporated into it. Teacher B discussed little professional development that leads to her not using devices. Her struggles to implement devices were based on losing the devices

with students taking them or they would fail. The successes revolved only around music being played for students. She was adamant about not implementing devices into her curriculum.

Teacher C was similar to Teacher B regarding not wanting to implement any devices in their classrooms. A quote from Teacher B was "I see devices as a negative and, I think when you are using the devices, it becomes a bad habit and how are we going to teach kids if they are always looking at their device?" Then Teacher C talked about the lack of professional development on devices with limited training "on physical education specifically." For Teacher D commented on any professional development as "I do not remember. And if there was, it was not memorable." He did comment on using the Nintendo Wii as a success for Dance Dance Revolution with his students

Teacher E noted on professional development that he "would love to have professional development as we all have iPads just to keep it simple." A challenge, which is something I had concerns with at his school was an internet connection that was strong enough to use throughout the gym. Then a success was how capable his students are with devices and had hoped upon their return to capitalize upon that fact. Then Teacher F discussed how he had no professional development with devices and keeps his iPad in a drawer once school is over. The lack of professional development makes a correlation between the numerous challenges teachers faced. While some successes are present, overwhelming responses from the teachers are challenges and barriers to their use of devices in their classrooms.

Summary. TPACK provided a framework for teachers to use to develop their knowledge of device use. Baert et al. (2017) saw the challenge of physical education teachers using devices is with the content component and implementation with technology into pedagogy with all learners. The lack of professional development for technology in the district to elementary physical education teachers would improve the TPACK for all involved. Using figure 2 in chapter two (see Figure 2, p. 109) with the Venn diagram of TPACK, there could be an increase in device use when all three phases of technological, pedagogical, and content knowledge come together.

Conclusion of the Connections to the Literature

Through the literature review and interviews, there were numerous connections with what the teachers answered to and what I wrote months before the interviews took place. A specific connection was the barriers in the literature review and brought out in the interviews. There were similarities between a lack of time to know the device and technology to implement than the motivation of students to participate using a device. The topics and subtopics that involve devices in physical education were more than this researcher imagined before the interviews. Each topic provided evidence for the following: additional professional development that is specific to urban physical education, allows for training with students with multiple teachers to observe how the devices can impact curriculum, and for teachers to work within their comfort level of the device used to layer improving their curriculum with devices. These conclusions will be echoed throughout the remainder of this study.

The history of digital devices in physical education was discussed briefly with the teachers. Many had no recollection of any technology or device in their childhood classrooms. In influencing curriculum through standards-based, a tool, or through methods, the literature indicated that devices can provide support with the curriculum. The teachers either have not pursued the device standards to base their curriculum on with devices or have little to no knowledge of the device standards.

Exergames are a new option for physical education teachers. Ennis (2013) demonstrated that exergames are a good option for students needing additional motivation. The teachers do realize their possibility yet lack of time to prep and cost are two issues hindering exergame use in their classrooms. Next are the challenges of devices in physical education. Being teachers that have years of experience, they talked about the lack of integration for devices and not enough of them. To decrease the barriers, teachers needed time and better resources to have devices fully vetted into their curriculum. These sentiments are echoed throughout the case study about the lack of time and resources. From this section, there is motivation with devices but how to immerse devices into the curriculum is for additional study.

Next is the self-determination theory in physical education that focuses on moving extrinsically motivated students to intrinsically motivated. Using digital devices has shown (Goodyear et al., 2017) there is merit to the theory. The teachers feel devices can help motivate students yet most teachers choose not to use them citing students relying on them to be active. Additional information to them and others in the district could move the needle to use devices to help transition student motivation. The last

section is TPACK where three concepts of technology, pedagogy, and content knowledge come together to provide curriculum assistance. All teachers from the interview know their content yet seemed to struggle with the technology devices provide. To improve their knowledge in those two areas of technology and pedagogy, additional resources need to be provided in segmented means and ways to nudge implementation in their curriculum.

The Implication for Further Study

This case study looked at how teachers in an urban school district use digital devices in their classrooms. Throughout the writing process and specifically unpacking the results, how does this study provide evidence for further research? Why was this case study critical to conduct and perhaps continuing research into this topic? Once the results from the survey and then interviews were completed, there are two areas of implications for further study into this topic: stakeholders and educational implications. Each is discussed through the lens of the researcher and their potential impact with the primary and guiding questions to frame the implications around.

Stakeholder Implications

Stakeholders for this study in the mind of the researcher are teachers, students, parents, and administrators. Each one has a vested interest in digital device use in physical education whether being a teacher who has to implement the device into their curriculum and learn how to teach the students to use it, the student who has to use the device and give their feedback to the teacher, the parent who pays taxes in this instance for public education and hears second hand how their child does in physical education,

and the administrators who approve the device purchases with hopes the teacher uses them and the student can understand the impact of the device in physical education.

Primary Question. The primary research question of how elementary physical education teachers use digital devices, the implication is that they are using them but not to their potential. From Table 5, page 226, four themes emerged from the case study interviews of the six participating teachers as results. The first is teachers do use digital devices with the primary use being music for students. iPads are used by all six teachers for various purposes with no specific alignment for all. Two concerns on the lack of use of digital devices are the lack of time in class for any device used as stated by all six teachers and a lack of training involved to use digital devices.

Thoughts on Results. This leads to students needing to learn how to use them as with any new device. Additionally, using them carefully and properly. Yet a piece that has huge importance is to have fun and learn with the device. Without having fun, it is unlikely the student will be motivated to be active with the device. Parents want to know what is going on with their child and physical education is no exception. When their child has fun while learning, they can engage better with their child. As a taxpayer, parents have a right to understand where their tax money goes. Provided if the devices are used well, a parent may feel their dollars are justifiably going to the worthy endeavor. Lastly, administrators are the ones to sign off on purchases. When a teacher decides to purchase a device, it is usually more a classroom setting, such as 30+ as this researcher has done with 45 FitBits at one time. When devices are used, students typically are excited to use them, parents want to know what is going on in their child's classroom, administrators

expect teachers to implement devices purchased, and teachers are the ones where the impedance is to appease all stakeholders in this section.

Purpose of Device Use. The primary purposes for using digital devices to support learner outcomes are engagement, motivation, and assessment for and of students. Music, skill improvement, and providing demonstrations for students are how those teachers interviewed use their devices for improving learner outcomes to support their teaching.

Thoughts on Results. When teachers are following these and other reasons, device use can help in all those areas from the literature review and interviews. Students have additional motivation when using devices in physical education. While the motivation may be extrinsic with the device, the literature demonstrated that it can be intrinsically valued by the student. The other two areas the researcher found were devices are fun and students are competitive with them. While based on the literature, this is grounded from experience as an elementary physical education teacher. Parents want to understand the purposes of devices as well. Many parents have discussed with me how to improve the device usage with their child. The experience with parents is they want to grasp how devices in physical education are needed. Using the literature in chapter two demonstrates that devices do play a role in having their child be active through motivation via the device. Administrators, particularly ones in the district the researcher and teachers are employed in, know all students and teachers have access to devices. Specifically, iPads and beyond that are unknown. The undertaking of using devices has been demonstrated by teachers in the interviews to not be used more than playing music and some small areas like motor skills or enhancing curriculum but not supplementing.

Teacher use of Devices. How teachers describe their current use of the devices in their classrooms consists of minimal use based on the amount of time they had with their students, primarily due to not having the same students daily. Another theme was a lack of training (as described in the result of the primary question) to integrate the devices. Two teachers wanted to incorporate devices and talked about their need for grant money to acquire devices. Lastly, music was used by all six teachers as their means to use a digital device through their iPad to a speaker.

Thoughts on Results. The results were mixed, particularly from the interviews. On paper, many stated they use them in many areas (primary question). Yet being interviewed, there was limited actual use by the teachers with devices. The literature states devices are more useful but lack of training and time are barriers as discussed in the next question. Students use their devices when the teacher has made them available. Based on the interviews from teachers, it is apparent, at least from the six teachers interviewed, students do not use devices frequently or at all. For parents, this question is dependent on the teacher's use of devices for their child. Many parents had little technology in their classes based on the interviews of teachers so it is likely their expectation of device use would be lowered. With administrators, the expectation could be higher based on the changing curriculum. From the digital device standards in chapter two, the expectation of teachers using devices based on those standards would suggest teachers use them frequently.

Barrier or Support Factors. Possible descriptors which play a factor or as a barrier for using digital devices for these six teachers, mentioned a lack of time to learn

how to use the device. Three listed a limited amount of time for professional development that revolved around training for devices, and five stated a reduction of time for student movement if they would use digital devices in their classes. Finally, two teachers indicated a lack of structural support from the school district.

Thoughts on Results. For teachers not using the devices, their responses ranged from the dependency of students for the devices to feeling they were time taken away from a movement that their students could have. Supportive factors were the ease of use and if they allowed students to move without dependence. Students in this researcher's experience are excited with devices when they and the teacher know how to use them. When students have an interest in using devices for movement, they tend to gravitate towards being motivated. Parents are similar to their child meaning if their child is motivated by a device, this may have the parent be motivated to be active. From iWatches to FitBits, devices do nudge people to move. Administrators, as mentioned in chapter two, have been a part of the barriers to physical education mentioned. From the interviews, this is the opposite, and have been supportive. The administrator can support teachers with devices through training and budgeting or be a barrier with expectations to implement devices without training and time.

Pandemic and Role During. During the pandemic of 2020 and into 2021, teachers were asked to describe their perceptions of their role as a teacher in elementary physical education, specifically as a distance learning teacher. Their thoughts were the difficulty of transitioning to online as opposed to in-person, how challenging it was to develop curriculum, how to use the iPad, in particular, better with it being a means to

teach away from students, and different engagements with students through a screen as opposed to in the gym. Also, what advice would they give themselves, reflecting upon their new learnings? These were to relax, roll with the punches, and when they were able to put their minds to a task, these teachers could accomplish anything.

Thoughts on Results. Teachers had the task to go from teaching students in person and through the physical to through a computer. Half of the teachers surveyed stated they felt online learning was not productive. The pandemic was challenging for teachers along with all other stakeholders. Yet learning new platforms and coordinating how to teach physical education online took creativity with the teachers surveyed and interviewed. Students also adjusted being from in-person to online. In physical education, students had to perform videos or activities given to them by their teachers who were learning the platforms better and how to keep their students moving. Parents had to stay home in most instances watching their children on top of working. Many parents discussed this with the researcher on the challenges of working, parenting, and keeping their sanity during the pandemic. Administrators had to pivot when in March of 2020, schools closed and online learning began. Navigating online meetings, observing classrooms, maintaining budgets were a small part of what the researcher found from the pandemic and his principal.

A Mindset of Using Devices. The final research questions focused on the role of urban elementary physical education teachers serve to motivate students to participate in their class with the self-determination theory as a guiding piece to this motivation. The results from the interviews indicated the devices are more extrinsically motivating for

students. Then if there are exergames on the devices, they may motivate movement. Four teachers did explain how the devices do help with engagement but the movement to intrinsic may not be likely due to a dependency upon the device.

Thoughts on Results. From the interviews and surveys, teachers are not advocating for using devices unless they are beneficial to students to move. This thinking was established with the lack of battery life, the time it takes to equip students, and learning how to use the devices. Students seemed to enjoy devices from the perspective of the researcher. The literature indicated students with lower motivation would gravitate towards devices to be motivated to be active. Conversely, teachers from the case study felt there would be a dependency upon the devices. Parents appeared to want devices from conversations the researcher had yet more wanted activity for their child. Administrators, the one the researcher works for, wants technology implemented more into classrooms but understands curriculum choices teachers make to better students.

Table 4

Questions and Themes from the Interviews

Primary/Guiding questions	Themes
Primary Question: How are urban elementary physical education teachers using digital devices in the classrooms?	Teachers use digital devices; iPads; lack of training; lack of time in the class for using the device.
Guiding question one: What are elementary teacher's primary purposes for using digital devices in their physical education classes to support the attainment of learner outcomes?	Engagement, motivation, and assessment. Music, skill improvement, and demonstrations for students.
Guiding Question Two: How do elementary physical education teachers describe the current usage of digital devices in their classrooms?	Minimal usage due to time, lack of training, having to apply for grants, and use for music as the main use for most.
Guiding Question Three: What are possible descriptors and factors that either support or form barriers for the use of digital devices in the urban elementary physical education classroom?	Lack of time to learn how to use the devices, limited professional development, and time from student moment. No supportive structures were in place. Teachers are on their own for curriculum.

Guiding Question Four: How do urban elementary physical education teachers describe their perception of their role in physical education class during the coronavirus of 2020?	Difficult, challenging, transitional; new curriculum, iPad learnings, new engagement with students, For themselves to relax, roll with the punches and can accomplish anything after this experience.
Guiding Question Five: With digital devices, what role do urban elementary physical education teachers serve regarding motivating their students to participate in physical education? And is the self-determination theory part of providing motivation for students with digital devices?	Devices are extrinsic motivators, games provide motivation on devices; helps engagement, can move to intrinsic but not likely.

Educational Implications

From the surveys and interviews, the educational implications from the case study are to implement devices into the classroom of each teacher in the school district (see Table 5, p. 229). The rationale behind this thinking is students have iPads; every student has an iPad. Students are knowledgeable on technology and I feel are capable of learning how to use a pedometer to count their steps, a heart rate monitor to show their heart rate zones, and their iPads which many are aware of how to use a camera to upload to their

designed platform (See-Saw or Schoology). By not allowing students to continually use devices in physical education is doing them a disservice. However, teachers have said admittedly they want their students to move which is challenging with an iPad in their hands. Parents are caught in the middle as their child has limited time in physical education each month (more on that in the preceding paragraphs). Will a device help them be more active? If so, then use a device. If not, do not use the devices. Finally, administrators have pressure from district officials to use iPads and other devices. The principals may have incentives for their teachers to use technology through surveys that go to the district. These are issues I am not fully aware of yet know administrators have to follow protocols from their higher-ups.

In my classroom, I am reimplementing pedometers. The excitement a student demonstrated when they received the pedometer was palpable. Observing students work with greater fervor was exciting. How these pedometers are purchased will be through my pocket. The district allocates $100 for physical education teachers in their budget each year. I used all $100 on 10 store brand pedometers/fitness trackers. Out of the 10, three did not work out of the packaging, two did not measure correctly, with five working trackers. Those five did not function, I went back to the store and purchased new ones until I had 10 functional trackers. Although, I do have 45 FitBits which are of high quality but need to program them—by myself. I may ask for help but that would take days to have someone come to the school. This example is problematic with the district with teachers providing supplies through their pocketbooks.

One option is to ask the Parent Teacher Association (PTA) for funds. An instance was asking for a volleyball standard worth $300. The PTA donated $200 for the cause and I covered the rest for the standard. A question I ask myself for an educational implication is what do students need regarding a device? After reading through survey and interview data, I am still unsure of what device a teacher would be able to use and distribute, retrieve data, and collect quickly? In a perfect world, heart rate monitors with a Global Positioning System built are ideal. Yet that would be an expense of $3000-4000. What I am suggesting is for devices for a class that can Bluetooth data to the teacher's iPad to be purchased with plentiful professional development to frontload. Typically, teachers have three days out of five for workshop time before school begins. The implementation of a device that is cost-effective, easy to use, and provides clear data is what I am researching for the school district to pursue.

How this will occur is to notify the physical education department chair of the results of this case study and bring recommendations to her. Knowing the moratorium on studies with the district which this case study followed, the privacy of those in the study is imperative. Teachers from the study indicated in question seven of the survey, most use devices to enhance their student's learning. Then the impetus is to implement devices to do just that.

Table 5

Teacher, Student, Parent, and Administrator with the Research Questions

Question	Teacher	Student	Parent	Administrators
How teachers are using devices?	More time and training to use devices.	Using devices properly and having fun using them.	Engagement with their child. Taxpayer.	Signs off on devices. Expects them to be used.
What is the purpose of device use?	Enhance learning, improve teaching, motor skills, and supplement curriculum.	Fun, motivation, and competitiveness.	Understand why use devices in physical education.	See use of devices by teachers.
How do teachers use devices?	Minimal use beyond music, iPads in particular.	Dependent upon use from the teacher.	Unknown unless asking teachers or their child.	Could have higher expectations based on digital device standards in physical education.
What are barriers or support factors for use of devices?	Knowledge of the device, if students are motivated.	Teacher understanding of the device. Motivated to use in most cases.	Learning from their child if used in class. Nudges with devices	Can be supported with training or a barrier without this training and time.
What are perceptions of use devices in the 2020 pandemic?	Switching to online from in-person, learning new platforms.	Not seeing friends, now doing physical education online.	Staying at home to work and being a parent. Difficult transition.	Establishing meetings online, checking in with staff, maintaining stability as a school.
What is the mindset of using the	Not in favor of using the devices.	Enjoy using devices when the teacher	Unsure but want their tax dollars	Typically they are urged to use it in their school.

devices?		knows how to use them.	working to benefit their child. Ultimately, wants their child to move as do their teachers.	Then falls on teachers to implement devices.

Summary

All four individuals—teachers, students, parents, and administrators indicate the use of devices either through this case study, observable data, or listening to their thoughts. What is known from the study is to use digital devices in the classroom. Barriers for teachers are time devices taken to implement, collect, and unpack data; time to learn about the devices and how to use them the best; the cost of devices along with the lack of budget provided for any equipment let alone a new digital device.

The pandemic of 2020 has altered teaching and learning in the short-term and likely the long-term. Teachers in physical education doing workout videos for students, students learning skills using equipment from around the house, parents navigating how to work and help their child get online, while principals and administrators flummoxed with how to lead online. This case study went from in-person to online too and had to adjust how I acquired data. The next section of limitations of the study describes the online portions with others from the pandemic to "regular" limitations of dissertation work.

Limitations of the Study

With this case study, there were limitations beyond the researcher's control. Others were biased, using narrative analysis which could miss themes, and or missing individuals through email. I will discuss a few limitations I feel merit discussion to improve through reflection.

These obstacles are ubiquitous for individuals working in physical education wanting digital devices. As the world becomes more technologically advanced, physical education has attempted to turn to digital devices to aid in the curriculum. Digital devices provided additional ways to present material and were described further in this study.

A Lack of Historical Literature

Going into the literature review, I believed there would be a fair amount of literature on how devices were used in physical education, particularly in the past 30 years. To my surprise, there was a fragment of what I perceived. Currently, literature in the past 10 years (2011-2021) is ample with the iPad, GPS watches, and FitBits to name a few. This limitation is one I aim to look more into for future recommendations of literature.

Teacher Experience and Participation

While out of my control, all of the teachers in the interview are considered veterans with each having twenty years of experience or greater. This was far more than anticipated. There are 41 elementary physical education teachers and while I was aware of the multitude of those who have twenty years of experience. The insight for those

bringing in a year or two would have been intriguing to unpack with their learnings with technology.

Also, six of the forty-one possible teachers for the case study chose to participate. While this was sufficient in the research, I would have preferred ten to twelve to differing thoughts and see if there was more or less agreement on the interview questions. A possibility was using an email that went into junk boxes or spam folders. One adaptation would include a read receipt on the email to identify if the email had been opened to at least ensure the email got to the teachers.

Covid-19

Covid-19 impacted this case study in a multitude of ways. First, not being able to meet teachers in person to have the interview, then the entire educational system going online created a new world of teaching and learning. Physical education teaching went to making videos and having students upload their work. By the time this dissertation had the results analyzed, teachers were back to teaching in-person and online simultaneously. Covid-19 distributed the world. Every teacher's classroom went online for eight months and their perception, as mine did, of how teaching students to be active via online learning was changed.

Summary

This section covered a few limitations in this case study. With the teacher's experience, a bias towards non-use of devices to the lack of interviewees thought of by the researcher, and possible missed themes, there are going to be limitations. The goal of the case study is to improve on lessening limitations for future research. Learning from

one's mistakes will ensure an improvement in any additional research into the topic of devices in elementary physical education.

Recommendations for Future Research

This case study wanted to know how are digital devices being used in urban elementary schools by physical education teachers in their classrooms. The answer is while teachers are using devices, the devices are mainly used for music, enhanced curriculum, and online learning via platforms. Knowing this, future research is to improve the type of device all teachers and students are capable of using with limited time learning, ease of data collection from the device, and smooth transitions from a student having the device to giving the device back after class.

Where my research is merited for additional support is finding out in suburban and rural elementary schools in the state to triangulate data on what devices work and which do not. A myriad of items like funding, staff development, and implementation of devices need further unpacking. It is, in my opinion, to continue investigating how devices work or not in different environments. Funding for devices, motivation for use of the device, and ease of use are three pieces to further research from this case study.

Plan for Communicating Results

The plan to communicate my results starts with those taking part in the interview. I believe they would be intrigued with my findings along with their narrative via the interview. The impact of seeing your spoken word written has merit to how we communicate verbally. Next, those in the survey along with the survey/interview group would get the results from chapter four. To see in a graph or chart could impact their

thinking regarding how they responded on top of seeing what peers said. Further, the district will be presented with my findings. The school district has individuals who work with teachers like myself and need to hear from us how devices have barriers to them. Those in professional development may want to take the results and use them to enhance how devices are implemented into the elementary physical education curriculum and what devices if elementary teachers can all comprehend. Sharing this case study could improve how professional development is done to increase knowledge of devices and their ability to help students move and track their physical skill improvements.

Publishing and Conferences

From the onset of this research, I have not intended to publish my results. Yet if warranted, I would publish to a few journals under the guidance of those on my committee. Those journals include *The Physical Educator*, *SHAPE*, and the *Journal of Physical Education, Recreation, and Dance.* Then when conferences in person begin again, I would be happy to present these findings and incorporate new learnings from this case study to help physical education teachers. The areas I would like to guide to are device competency, grant writing to allocate funding, and implementation with grade levels. The opportunities are endless yet are wary to present to those in the field until additional learnings for myself occur.

Dissertation Summary

The undertaking of this dissertation began in 2017 when I began my studies at Hamline University. To work with the notion of colleagues and what their thoughts were about using different devices in their classrooms was one I have wanted to investigate for

many years. To understand their thinking, I had to navigate through how to follow the

protocols set forth by Hamline and the school district. Once these were secured, I was

able to move forward. Then came the creation of the research questions, survey, and

interview format. Where all of this has left me is a deeper desire to keep working on

learning more about how physical education teachers can improve their teaching

practices. When teachers can implement better practices with technology or devices,

these motivators can provide additional means of student engagement which I am

advocating for the district.

    As this process moved from ideas to writing chapter one to this final portion, I

feel I am in a position to be a leader in physical education for teachers. The continuation

of interviewing and surveying teachers is one I plan on doing. Physical education, in my

opinion, has been on the back burner for technology compared to other areas of

education. Why cannot physical education have technology and ones that can fit the

needs of most if not all teachers and students?

    In the end, I read through pages of survey data, interview transcripts, and found

themes to write about. This study has changed me immensely in three ways. The first is

to implement more technology and digital devices into my curriculum. As of this writing

in the spring of 2021, I have used my iPad to show clips of students and their skills which

in turn, has them more engaged in improving. Second, the case study has me telling

others about how devices could be used in their curriculum and learning from them.

Particular Teacher E, who I have known for seven years, and I have been discussing new

ways to slowly implement new digital devices and how to allocate additional devices to

get students motivated to move. Lastly, I plan on taking this study to the school board. I have reservations about the reception but now I must do something to take my learnings and put them to use. After a presentation, I aim to go forth on a post-doctoral journey. I will need guidance from others on how to best use my knowledge for the betterment of students first and then teachers. There is much to learn after this dissertation defense yet I am confident I will pursue additional knowledge. My question is after all is done: what will I do with this information to improve the district with its 41 elementary physical education teachers and thousands of students?

How will I be an advocate with the knowledge gained from the case study? As mentioned above, the students come first. My goal is to listen to them with surveys, particularly in third through fifth grade. These students have used devices more than I have in their short time in school. I envision my classroom being movement-centered with an iPad going during student movement time. As they play catch, kick a ball, or any skill that requires their time to be practicing, I aim to record their work to catch glimpses of how they are performing. Another is to get my FitBits ready for next school year. I will need to ask for help, likely from students, to arrange for every student to have a FitBit assigned to them. The possibilities are percolating and are excited to have more established in the fall of 2021.

Step by step, as with this dissertation, I will advocate and implement new devices for physical education in the district and possibly beyond. Listening to the experienced teachers through the research, ultimately I aim for the devices to be easy to use, retrieve and download data quickly, and provide ample development time for them.

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Appendix A

National Physical Education Standards, 2020

https://www.shapeamerica.org/standards/pe/

Standard 1: The physically literate individual demonstrates competency in a variety of motor skills and movement patterns.

Standard 2: The physically literate individual applies knowledge of concepts, principles, strategies and tactics related to movement and performance.

Standard 3: The physically literate individual demonstrates the knowledge and skills to achieve and maintain a health-enhancing level of physical activity and fitness.

Standard 4: The physically literate individual exhibits responsible personal and social behavior that respects self and others.

Standard 5: The physically literate individual recognizes the value of physical activity for health, enjoyment, challenge, self-expression and/or social interaction.

https://www.shapeamerica.org/standards/pe/

Appendix B

Application	Use in elementary physical education	Website
Garage Band	Create music, signals.	https://www.apple.com/mac/garageband/
Swork-It	Exercises for students.	https://sworkit.com/
Just Dance	Video dancing.	https://justdancenow.com/
Flipgrid	Video discussion experience for students and teachers.	https://info.flipgrid.com/
CoachNow	Helps teachers improve student skills.	https://coachnow.io/
Coach's Eye	Video analysis to help students improve their skills.	https://www.coachseye.com/
Hudl Technique	Uses video to help students and skills.	https://www.hudl.com/
See-Saw	Classroom application; platform.	https://web.seesaw.me/
Among Us	Social deduction game.	https://apps.apple.com/us/app/among-us/id1351168404
Schoology	A virtual learning environment and social networking service for k-12 schools.	https://www.schoology.com/
Flipgrid	The website allows teachers to facilitate video discussions with a "grid" format.	https://info.flipgrid.com/
Kahoot	Game-based learning platform.	https://kahoot.com/
Fitbit	Devices that track activity,	https://www.fitbit.com/global/u

	exercise, food, and weight.	s/home
Dance Dance Revolution	Dance platform; used in schools for students to mimic movement.	https://www.ddrgame.com/
YouTube	Video platform for teachers to add and show videos for students.	https://www.youtube.com/
iMovie	Video editing software.	https://www.apple.com/imovie/
Nintendo Wii	Video game system used for videos for the student movement.	http://wii.com/
Pedometers	A portable device that counts a person's steps through their motions.	https://www.amazon.com/pedometer/s?k=pedometer
Heart rate monitors	A digital device that measures electrical signals from your heart.	https://www.health.harvard.edu/heart-health/how-to-choose-and-use-a-heart-rate-monitor-
Otter	Records and takes notes in real-time via transcription.	https://otter.ai/login
Padlet	A web application to let users post notes on a digital wall.	https://padlet.com/

Appendix C

Interview questions

Pre-distance learning:

1. How long have you been teaching?

2. How long have you been teaching elementary physical education?

3. In which area of the district do you teach?

4. What are some of your favorite activities to teach in your classroom?

5. Prior to distance learning, describe how you used digital devices in the classroom.

6. If you were using digital devices, what types of devices were you using? In what manner with students? How were you using those devices?

   (best practices, skill development, athletic ability, motivation (I/E), reducing obesity, self-worth, confidence, interpersonal vs intrapersonal, engagement in PE class, engagement in PE in life outside of school, setting/achievement of personal fitness goals, evaluation)

If not, what were some barriers not allowing you to use digital devices?

7. Do digital devices provide intrinsic motivation for students to participate in physical education activities? Do digital devices alter student's motivation when using the devices to becoming dependent on the devices? Why or why not?

8. What is/are the main digital device(s) used in your classroom prior to distance learning? Why did you select those devices?

9. Why, if you have not used digital devices, chose not to use them in your classroom?

10. When you were in elementary, middle, and high school, what were some digital devices used? Would you use any of the current devices you use if you were and a student, and how?

11. Has there been professional development on digital devices? If not, why? If so, describe what device use you were trained on.

12. Regarding digital devices, what are the challenges you face in the classroom?

13. With digital devices, what are your successes in your classroom?

14. With the self-determination theory according to Goodyear, Blain, Qarmby, and Wainwright (2017), "individuals are highly motivated when they fully endorse their actions and take part in activities for intrinsic interest and enjoyment" (p. 17), how do you believe that digital devices can move a student's motivation through digital devices? If not, why do you believe this?

Distance learning
15. During DL, how has the transition been to online teaching? Successes? Struggles?

16. When distance learning is over, what takeaways will you have from your experience teaching students online?

17. What advice would you give yourself knowing what you know now for yourself back in March of 2020?

Appendix D

Survey

This survey's focus is on how urban elementary school physical education teachers use digital devices in their classrooms, both during pre-distance learning, and distance learning. Take care as you read each of the statements/questions.

Definition of a digital device: A digital device is one where a student or teacher has a device, is capable of being on one's wrist or in one's hand, and gives feedback to the individual.

All individuals in this survey are anonymous and will be through the research if you desire to continue with the next stage. I appreciate your interest in my research!

1. Your name:
2. Your email address:

Some responses are short answer, check a box or selection of one item.

○ By selecting "I CONSENT" below, you are endorsing and acknowledge the following:

■ Through the information above, Eric Kaluza has explained the purpose, the procedures, the benefits, and the risks that are involved in this research study.

○ You have been informed about this study's purpose, procedures, possible benefits and risks, and you have received the opportunity to download or save a copy of this Form. (Link to the consent form will be here: placeholder)

○ You have been given the opportunity to ask questions before you sign, and you have been told that you can ask other questions at any time.

○ You voluntarily agree to participate in this study. By consenting to participate, you are not waiving any of your legal rights.

○ Please indicate whether you consent to participate in this study.

1. By selecting "I CONSENT" you affirm the above information and will be directed to the study.

2. By selecting "I DO NOT CONSENT" you will be exited from the study.

Getting to know you!

The questions below provide the researcher with an idea of your background.

1. How many years have you been a licensed physical education teacher?

2. How many years have you been an elementary physical education teacher?

3. How many years have you been in the school district as an elementary physical education teacher?

4. In which area of Saint Paul do you teach? A, B, C, D, E, F1, F2? (See map below.) (https://www.spps.org/cms/lib/MN01910242/Centricity/Domain/8719/2020-21_ElemMap.pdf, 2020)

5. What is your age?

6. What is your gender?

Pre-distance learning use of digital devices

The following statements are on digital devices use in your classrooms. The statements vary so take care reading each statement. Use your opinion with each statement and its applicability to you.

Please use the following to answer: Strongly agree, agree, disagree, strongly disagree, or does not apply.

7. I have digital devices in my classroom to enhance my student learning. (Choose one)

Strongly agree, Agree, Disagree, Strongly Disagree, Does not apply

8. I used digital devices in my classroom to improve my teaching. (Choose one)

Strongly agree, Agree, Disagree, Strongly Disagree, Does not apply

9. I used digital devices in my classroom because I was mandated by the administration. (Choose one)

Strongly agree, Agree, Disagree, Strongly Disagree, Does not apply

10. I used digital devices in my classroom to improve the motor skills of my students. (Choose one)

Strongly agree, Agree, Disagree, Strongly Disagree, Does not apply

11. I used digital devices in my classroom to supplement my curriculum. (Choose one)

Strongly agree, Agree, Disagree, Strongly Disagree, Does not apply

12. I used digital devices in my classroom to enhance my curriculum. (Choose one)

Strongly agree, Agree, Disagree, Strongly Disagree, Does not apply

During covid-19 digital device usage

Answer the following four statements regarding your use of digital devices during covid-19 distance learning.

Use the following to answer the statements: Strongly agree, agree, disagree, strongly disagree, or does not apply.

13. I use digital devices in my distance learning classroom. (Choose one)

Strongly agree, Agree, Disagree, Strongly Disagree, Does not apply

14. I had support from the administration to use digital device platforms for distance learning. (Choose one)

Strongly agree, Agree, Disagree, Strongly Disagree, Does not apply

15. I found the platforms for distance learning easy to use. (Choose one)

Strongly agree, Agree, Disagree, Strongly Disagree, Does not apply

16. I believe that the digital device platform(s) I use allows for learning for all students. (Choose one)

Strongly agree, Agree, Disagree, Strongly Disagree, Does not apply

Applications in class.

This section is about which digital application(s) you used in your classroom prior to distance learning on a weekly basis and during distance learning.

17. I was using the following application(s) prior to distance learning. (may select more than one)

Flipgrid, Kahoot, Schoology, See-Saw, Fitbit, Dance Dance, Revolution, Goosechase

18. During distance learning, I use the following platform(s): (may select more than one)

Flipgrid, Kahoot, Schoology, See-Saw, Fitbit, Dance Dance, Revolution, Goosechase

How do you use the application?

Think of how you use or did use the applications (from question #17) as objectives for your teaching; both in your classroom and during distance learning. Select as many boxes as you feel best represents your use of the application(s) listed.

19. What are your intended objective(s) of using the application (from question #17) prior to distance learning? (may check more than one box)

Best practices, Skill development, Athletic ability, Motivation (intrinsic/extrinsic), Reducing obesity, Self-worth, Confidence, Interpersonal v. intrapersonal, Engagement in physical education class, Engagement outside of physical education class, Setting or achieving personal fitness, Evaluation, Other

20. What are/is the intended objective(s) of using the application during distance learning from question #17? (may check more than one box)

Best practices, Skill development, Athletic ability, Motivation (intrinsic/extrinsic), Reducing obesity, Self-worth, Confidence, Interpersonal v. intrapersonal, Engagement in physical education class, Engagement outside of physical education class, Setting or achieving personal fitness, Evaluation, Other

21. What are the major objective(s) for student learning regarding the application from question #17? (may check more than one box)

Best practices, Skill development, Athletic ability, Motivation (intrinsic/extrinsic), Reducing obesity, Self-worth, Confidence, Interpersonal v. intrapersonal, Engagement in physical education class, Engagement outside of physical education class, Setting or achieving personal fitness, Evaluation, Other

22. In both distance learning and in the classroom, what are/is the major objective(s) for teaching methods regarding the application from question #17? (may check more than one box)

Best practices, Skill development, Athletic ability, Motivation (intrinsic/extrinsic), Reducing obesity, Self-worth, Confidence, Interpersonal v. intrapersonal, Engagement in physical education class, Engagement outside of physical education class, Setting or achieving personal fitness, Evaluation, Other

This concludes the survey. Thank you for participating! I look forward to discussing the next steps with you within two weeks for an interview!

I look forward to discussing the next steps with you within two weeks for an interview!

Appendix E

From: Eric Kaluza <eric.kaluza@spps.org>

Sent: Wednesday, May 6, 2020 3:58 PM

To: Stacey Gray Akyea <stacey.gray-akyea@spps.org>

Subject: Research for my EdD

Ms. Gray-Akyea,

Hopefully, you are well. My name is Eric Kaluza and the PE teacher at Jie Ming. I am enrolled at Hamline University for my EdD and am wanting to interview members of my PLC on technology use in the PE classrooms.

The study is a constructivist paradigm, meaning no data from students will be used nor the names of the district or subjects are used. Constructivism would allow the subjects to answer questions that I prepared in a semi-structured interview setting. The subjects would elaborate on their use of technology from their own experiences. Their interviews would be recorded then destroyed after transcription and themes found from the interview.

I and my chair, Dr. Trish Harvey, acknowledge that this would provide clarity for my work as a practitioner. And stressing that no student or district information would be used in the entirety of the study.

Please advise as I have completed my coursework this weekend and am ready to move onto my IRB phase. Thank you.

Eric Kaluza

Jie Ming Mandarin Immersion Academy

Physical Education Teacher

Saint Paul Public Schools

From: Stacey Gray Akyea <stacey.gray-akyea@spps.org>

Sent: Thursday, May 7, 2020, 6:57 PM

To: Eric Kaluza <eric.kaluza@spps.org>

Subject: RE: Research for my EdD

Hello Eric,

I am well thank you.

We are not approving research in the district at this time.

I would suggest that you contact your colleagues to ask if they would participate in your

research as teachers, not SPPS teachers. You can conduct your research without needing

the district's approval if you do it that way.

Take care,

Stacey

Stacey Gray Akyea, Ph.D. (she/her)

Director, Research, Evaluation & Assessment

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55102

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Eric Kaluza

Fri 5/8/2020 1:06 PM

To: Stacey Gray Akyea

Dr. Akyea,

Thank you for the quick response. I will advise my colleagues to be teachers and there will be no mention of SPPS anywhere in the dissertation, notes, or any other forms related to the district to adhere to the policy.

I will inform my chair, Dr. Trish Harvey, about the note you have written and we will begin to move forward this summer with interviews after the IRB approval from Hamline.

Thank you and have a great day!

Eric

Appendix F

Survey From the Twelve Urban Elementary Physical Education Teachers

Survey Statement	Teacher 1	Teacher 2	Teacher 3	Teacher 4
Years as a PE teacher.	23	28	24	9
Years as an elementary PE teacher.	15	28	20	9
Years in the district as an elementary PE teacher.	13	28	20	9
Age?	51	51	51	31
Gender?	Male	Male	Female	Male
Digital devices to enhance student learning.	Agree	Disagree	Strongly Disagree	Agree
Digital devices to improve my teaching.	Agree	Disagree	Disagree	Agree
Digital devices from the administration.	Strongly Disagree	Disagree	Strongly Disagree	Disagree
Digital devices for motor skills.	Agree	Disagree	Strongly Disagree	Agree
Digital devices to supplement the curriculum.	Agree	Disagree	Disagree	Agree

Digital devices to enhance the curriculum.	Agree	Disagree	Disagree	Agree
Digital devices in distance learning.	Strongly Agree	Agree	Strongly Agree	Strongly Agree
Support from the administratio n for digital devices.	Agree	Agree	Disagree	Agree
Platforms easy to use.	Agree	Agree	Disagree	Strongly Agree
Digital devices allow for learning.	Disagree	Disagree	Strongly Disagree	Disagree
Applications prior to distance learning.	Wii, IDoceo	NA	Fitbit	Kahoot, Schoology, YouTube
Platforms during distance learning.	Schoology, See-Saw, iMovie	Schoology, See-Saw	Flipgrid, Schoology, See-Saw	Kahoot, Schoology, YouTube
Objectives prior to distance learning.	Motivation (intrinsic/extrin sic), Reducing obesity, Engagement in a physical education class, Engagement outside of physical education class, Evaluation, Recordkeeping	Evaluation	Best practices, Skill development, Athletic ability, Motivation (intrinsic/extrin sic), Reducing obesity, Self-worth, Confidence, Interpersonal v. intrapersonal, Engagement in physical education	Best practices, Skill development, Motivation (intrinsic/extrin sic), Engagement in physical education class, Engagement outside of physical education class, Setting

			class, Engagement outside of physical education class, Setting or achieving personal fitness, Evaluation	or achieving personal fitness, Evaluation
Objectives during distance learning.	Motivation (intrinsic/extrinsic), Reducing obesity, Interpersonal v. intrapersonal, Engagement in physical education class, Engagement outside of physical education class, Evaluation, Recordkeeping	Skill development, Motivation (intrinsic/extrinsic), Reducing obesity, Engagement in physical education class, Engagement outside of physical education class, Setting or achieving personal fitness, Evaluation	Motivation (intrinsic/extrinsic), Reducing obesity, Self-worth, Confidence, Interpersonal v. intrapersonal, Engagement in physical education class, Engagement outside of physical education class, Setting or achieving personal fitness	Best practices, Skill development, Motivation (intrinsic/extrinsic), Engagement in physical education class, Engagement outside of physical education class, Setting or achieving personal fitness, Evaluation
Objectives for student learning prior to distance learning.	Motivation (intrinsic/extrinsic), Reducing obesity, Engagement in physical education class, Evaluation, Recordkeeping	Motivation (intrinsic/extrinsic), Reducing obesity, Engagement in physical education class, Engagement outside of physical education class, Setting or achieving	Motivation (intrinsic/extrinsic), Interpersonal v. intrapersonal, Engagement in physical education class, Engagement outside of physical education class	Best practices, Skill development, Motivation (intrinsic/extrinsic), Engagement in physical education class, Engagement outside of physical education

		personal fitness, Evaluation		class, Setting or achieving personal fitness, Evaluation
Objectives for methods, prior and during distance learning.	Motivation (intrinsic/extrinsic), Reducing obesity, Interpersonal v. intrapersonal, Engagement in physical education class, Engagement outside of physical education class, Setting or achieving personal fitness, Evaluation	Motivation (intrinsic/extrinsic), Reducing obesity, Engagement in physical education class, Engagement outside of physical education class, Setting or achieving personal fitness, Evaluation	Best practices, Skill development, Athletic ability, Motivation (intrinsic/extrinsic), Reducing obesity, Self-worth, Confidence, Interpersonal v. intrapersonal, Engagement in physical education class, Engagement outside of physical education class, Setting or achieving personal fitness, Evalua	Best practices, Skill development, Motivation (intrinsic/extrinsic), Engagement in physical education class, Engagement outside of physical education class, Setting or achieving personal fitness

Survey Statement	Teacher 5	Teacher 6	Teacher 7	Teacher 8
Years as a PE teacher.	35	21	13	23
Years as an elementary PE teacher.	35	21	8	2
Years in the district as an	35	21	1	2

elementary PE teacher.				
Age?	56	42	46	52
Gender?	Female	Male	Male	Female
Digital devices to enhance student learning.	Agree	Agree	Agree	Strongly Agree
Digital devices to improve my teaching.	Agree	Agree	Strongly Agree	Strongly Agree
Digital devices from the administration.	Strongly Disagree	Strongly Disagree	Agree	Does Not Apply
Digital devices for motor skills.	Agree	Agree	Agree	Strongly Agree
Digital devices to supplement the curriculum.	Disagree	Agree	Strongly Agree	Strongly Agree
Digital devices to enhance the curriculum.	Agree	Agree	Strongly Agree	Strongly Agree
Digital devices in distance learning.	Strongly Agree	Agree	Strongly Agree	Strongly Agree
Support from the administration for digital devices.	Strongly Agree	Agree	Strongly Agree	Strongly Agree
Platforms easy to use.	Disagree	Disagree	Disagree	Disagree

	Disagree	Disagree	Agree	Strongly Agree
Digital devices allow for learning.	Disagree	Disagree	Agree	Strongly Agree
Applications prior to distance learning.	Fitbit, Dance Dance Revolution	Dance Dance Revolution	Fitbit	Flipgrid, Kahoot, Schoology, See-Saw
Platforms during distance learning.	Kahoot, Schoology, See-Saw, Dance Dance Revolution	Schoology, See-Saw	Schoology, See-Saw	Flipgrid, Schoology, See-Saw
Objectives prior to distance learning.	Motivation (intrinsic/extrinsic), Engagement in physical education class, Engagement outside of physical education class, Setting or achieving personal fitness	Best practices, Skill development, Motivation (intrinsic/extrinsic), Reducing obesity, Self-worth, Confidence, Engagement in physical education class, Engagement outside of physical education class, Setting or achieving personal fitness	Motivation (intrinsic/extrinsic), Reducing obesity, Confidence, Engagement in physical education class	Best practices, Skill development, Athletic ability, Motivation (intrinsic/extrinsic), Reducing obesity, Self-worth, Confidence, Interpersonal v. intrapersonal, Engagement in a physical education class

Objectives during distance learning.	Skill development, Motivation (intrinsic/extrinsic), Self-worth, Confidence, Engagement in physical education class, Engagement outside of physical education class, Evaluation	Best practices, Skill development, Motivation (intrinsic/extrinsic), Reducing obesity, Self-worth, Confidence, Engagement in physical education class, Engagement outside of physical education class, Setting or achieving personal fitness, Evaluation	Motivation (intrinsic/extrinsic), Reducing obesity, Confidence, Engagement in physical education class, Engagement outside of physical education class, Setting or achieving personal fitness	Best practices, Motivation (intrinsic/extrinsic), Reducing obesity, Self-worth, Confidence, Engagement in physical education class, Engagement outside of physical education class
Objectives for student learning prior to distance learning.	Skill development, Engagement in a the physical education class	Best practices, Skill development, Motivation (intrinsic/extrinsic), Reducing obesity, Self-worth, Confidence, Engagement in physical education class, Engagement outside of physical education class, Setting or achieving personal fitness	Reducing obesity, Confidence, Setting or achieving personal fitness	Best practices, Skill development, Athletic ability, Motivation (intrinsic/extrinsic), Reducing obesity, Self-worth, Confidence, Engagement in physical education class, Engagement outside of physical education class
Objectives for	Motivation	Best practices,	Motivation	Best practices,

methods, prior and during distance learning.	(intrinsic/extrinsic), Engagement in physical education class	Skill development, Motivation (intrinsic/extrinsic), Reducing obesity, Self-worth, Confidence, Engagement in physical education class, Engagement outside of physical education class, Setting or achieving personal fitness, Evaluation	(intrinsic/extrinsic), Reducing obesity, Confidence, Engagement in physical education class	Skill development, Athletic ability, Motivation (intrinsic/extrinsic), Reducing obesity, Self-worth, Confidence, Engagement in physical education class, Engagement outside of physical education class

Survey Statement	**Teacher 9**	**Teacher 10**	**Teacher 11**	**Teacher 12**
Years as a PE teacher.	32	30	1	17
Years as an elementary PE teacher.	26	29	3.5	12
Years in the district as an elementary PE teacher.	26	29	3.5	8
Age?	55	52	34	42
Gender?	Female	Female	Female	Male
Digital devices to enhance student	Agree, Does not apply	Agree	Agree	Agree

learning.				
Digital devices to improve my teaching.	Agree	Agree	Agree	Agree
Digital devices from administratio n.	Disagree	Disagree	Disagree	Disagree
Digital devices for motor skills.	Agree	Disagree	Agree	Agree
Digital devices to supplement curriculum.	Agree	Disagree	Agree	Disagree
Digital devices to enhance curriculum.	Agree	Agree	Agree	Agree
Digital devices in distance learning.	Strongly Agree	Agree	Strongly Agree	Agree
Support from administratio n for digital devices.	Strongly Agree	Agree	Agree	Agree
Platforms easy to use.	Disagree	Agree	Agree	Agree
Digital devices allows for learning.	Agree	Agree	Agree	Agree
Applications prior to distance learning.	None	None	Schoology	Schoology, See-Saw, Just Dance
Platforms during	Flipgrid, Schoology,	Schoology, See-Saw	Flipgrid, Schoology,	Schoology, See-Saw,

distance learning.	See-Saw		See-Saw	YouTube/Just Dance
Objectives prior to distance learning.	Confidence	ipad for photos of PE related things to clarify for MLL kids	Evaluation	Skill development, Motivation (intrinsic/extrinsic), Confidence, Engagement in physical education class.
Objectives during distance learning.	Skill development, Motivation (intrinsic/extrinsic), Reducing obesity, Self-worth, Confidence, Engagement in physical education class, Engagement outside of physical education class, Setting or achieving personal fitness	Motivation (intrinsic/extrinsic), Confidence, Engagement in physical education class, Engagement outside of physical education class	Skill development, Motivation (intrinsic/extrinsic), Reducing obesity, Engagement outside of physical education class, Setting or achieving personal fitness	Skill development, Motivation (intrinsic/extrinsic), Engagement in physical education class, Engagement outside of physical education class

Objectives for student learning prior to distance learning.	Skill development, Motivation (intrinsic/extrinsic), Reducing obesity, Self-worth	Best practices, Motivation (intrinsic/extrinsic), Confidence, Engagement in physical education class, Engagement outside of physical education class	Reducing obesity, Engagement outside of physical education class, Setting or achieving personal fitness	Skill development, Motivation (intrinsic/extrinsic), Engagement in physical education class, Engagement outside of physical education class
Objectives for methods, prior and during distance learning.	Best practices, Skill development, Reducing obesity, Self-worth, Confidence, Engagement in physical	Confidence	None	Skill development, Motivation (intrinsic/extrinsic), Engagement in physical education class, Engagement outside of physical education class