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Wearable Technology and Schools: Where are We and Where Do We Go From Here?

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WEARABLE TECHNOLOGY AND SCHOOLS: WHERE ARE WE AND WHERE DO WE GO FROM HERE?

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Abstract: *The area of wearable technology is having a rapidly growing impact on society with more consumers purchasing wearable tech. At the same time, wearable technology seems to be poised to have an impact on educational settings. This paper explores the area of wearable technology related to schools. It considers how wearable technology can be used by teachers to improve instruction and by students to change how they interact with the school environment. Wearable technology applications currently being implemented as part of the curriculum in schools are identified and discussed. To conclude, traits and skills that school leaders need to exhibit for a wearable technology initiative to be successfully implemented are proposed. Wearable technology has the potential to impact schools in the same way as the computers and mobile devices of today. This paper does not set out to provide answers but is designed to create discussions about wearable technology and schools.*

Introduction

Wearable technology is a growing area of interest to researchers, consumers, and educators. During late 2014, wearable technology hit the mainstream market with consumers making major purchases of the Fitbit, smart watches, and other devices. The wearable technology movement began in the 1970's with the calculator watch and has progressed to where it is at today, seemingly poised to become part of mainstream culture.

Wearable technology is a group of devices that can be worn by individuals that includes the ability to track information related to the individual wearer. Often wearable technology has sensors that can detect motion, measure environmental conditions, take photos and communicate all this information in real time for the user to access (Tehrani & Michael, 2014). Wearable technology is related to the ubiquitous computing movement where it is interwoven into everyday life so that technology becomes invisible and the interaction is simple and natural (Mostéfaoui, Maamar, & Giaglis, 2008).

From conducting research, it appears that there are two major categories of wearable technology: devices that strap on to the human body and devices that are integrated into clothing. Strap on devices include wearable technology like smart watches, Google Glass, Fitbit, prosthetics, and medical monitoring devices. Wearable technology incorporated into clothing can monitor a stroke patient's progress and physical therapy or can be a fashion statement like Lady Gaga's "living" dress. Both categories serve the same purpose. That purpose is to allow a user to interact with the environment in some way to improve the user's life, whether that is through data collection or some other function.

Wearable Technology Implementations

There are numerous applications where wearable technology and e-textiles have found usage in the mainstream market. Fitness is one growing area of wearable technology with the recent sales growth of Fitbit and other fitness bands that track your activity and monitor your sleep wirelessly. This data is communicated to your smartphone or tablet with an app that shows progress, goals, and rewards. The goal of products like these is to make individuals more cognizant of life choices and to provide them feedback related to those choices ("Fitbit Find Your Fit," n.d.).

Another area that wearable technology has shown recent growth is smart prosthetics. Robotic exoskeletons have been part of science fiction for decades. Now Dr. Frank Sup from the University of Massachusetts Amherst College of Engineering has developed a next generation lower limb prosthesis that is an example of wearable

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robotics. The knee and ankle joints, which are battery powered which are guided by sensors that help the limb constantly adjust to terrains, slopes, and steps. Sensors on the heel and toe measure ground force on the knee and ankle allowing the proper movement of the limb as it moves and interacts with the surroundings ("'Wearable Robotics' Replace Amputated," n.d.). Other scientists have created smart prosthetic skin that can cover robotic limbs. The prosthetic skin is stretchy and warm like real skin and is embedded with a multitude of sensors that can gather information from the environment like heat, pressure and moisture (Alford, 2014).

Wearable technology is currently heavily involved in applications related to health monitoring. It has found utility related to stroke patients where one company has developed an unobtrusive garment called an upper-limb kinesthetic garment (ULKG) which is used in neurorehabilitation, specifically poststroke, to detect the posture and movement of the arm. The ULKG can be used as a virtual trainer to treat patients suffering from a stroke who need to continue exercises to regain control of the affected limb and thereby improve quality of life (Rutherford, 2010).

In the area of diabetes management, wearable technology is showing promise. There are several new glucose monitoring devices on the horizon that will soon be available. Abbott Diabetes is preparing to launch a new glucose monitor that is a wearable device with a sensor that pierces the skin on the arm to have contact with blood and take measurements. The sensor lasts 14 days. No calibrations are needed, meaning that users do not have to use test strips. Data is collected and read by a near field communication (NFC) reader and may become available using an app on a smart phone in the future (Das, 2014). Google has developed a "smart" contact lens to help diabetics monitor their glucose levels, which was announced as having been licensed to Novartis. The lens utilizes a wireless UHF radio frequency infrared device (RFID) chip and miniaturized glucose sensors embedded between two layers of soft contact lens material. Data can be transferred from the contact lens to a smart device via the RFID capabilities of the chip (Das, 2014; Rizzo, 2014).

An additional area where wearable technology is becoming more prevalent is Alzheimer's disease. A study related to finding ways to monitor Alzheimer's patients who wander found that textile-based monitoring with RFID chips embedded in garments can be used to identify and track patients using GPS and RF tag systems (Mahoney, 2010). Wearable technology systems have been designed for the detection and remote monitoring for epileptic seizures. Electroencephalographic (EEG) sensors are hidden in a hat worn by a patient which collect data related to seizure location and occurrence and remotely communicate it using mobile communication technology (Giansanti, Ricci, & Maccioni, 2008).

A wearable technology system is currently being used to monitor patients with Parkinson's disease who experience severe motor fluctuations. The monitoring is achieved by using wireless sensors that are incorporated into garments whose data is relayed to a clinical site remotely via a web-based application (Patel, Chen, Buckley, Rednic, McClure, Tarsy, Shih, Dy, Welsh, & Bonato, 2010). Wearable technology can monitor and keep track of people who suffer from autism by alerting caregivers or the wearer when predetermined boundaries have been crossed (Mahoney, 2010; Veazey, 2014). Another wearable tech product can help children before they reach a crisis point and try to leave. The Q Sensor, developed by Affectiva, monitors stress levels during the normal activities and provides doctors and family members with information about stressful triggers (Veazey, 2014).

In summary, it is believed that wearable technologies will allow health care providers to use voice commands to facilitate care to patients and clinicians will use wearable technologies to communicate easily and share data. Wearable technology will allow health care professionals to focus on the patient and not on the digital tool (Skiba, 2014).

Wearable Technology in Schools

Educational ramifications. In educational settings, wearable technology could affect schools in several ways including student usage of wearable technology for enhancement of some facet of their educational experience and the introduction of wearable technology into school curriculums. As wearable technology continues to evolve and become more prominent in our lives, our students will bring this technology into our schools thereby changing, enhancing, and modifying the school environment in profound ways. In special education, this technology can fundamentally change the way students manage their disability and interact with their environment. Using wearable technology, autistic children can be monitored, and if predetermined boundaries are crossed, alerts can be generated and sent. This will increase safety for the autistic child in school settings (Veazey, 2014).

Using wearable technology like Google Glass, physiological measures can be determined that over time can be utilized to predict meltdowns and provide that information to parents via mobile devices and to the child in real time. If you can predict behavioral episodes, caregivers and teachers then have an opportunity to attempt to deescalate the situation. Google Glass provides quantitative data relating to attention and focus. Using sensors, the direction of a speaker relative to a child can be determined and the child's attention focus can be determined. The technique plays like a game. When the child is not looking at a speaker, the Google Glass can alert the child via an arrow in the display. The child is then rewarded through the game when attention is redirected (Sahin, 2014).

Wearable technology has the potential to improve the learning environment for our children. Diabetic children can utilize wearable technology to better manage their medical condition so missed class time is reduced and the time spent in class can be more productive due to that management **(**Rizzo, 2014**)**. It is not a stretch to think that with Dr. Frank Sup's robotic prosthesis ("'Wearable Robotics' Replace Amputated," n.d.) students could come to wear smart prosthetics possibly allowing them to move without the aide of wheelchairs and other mobility devices allowing their performance in physical education classes to be enhanced. In the future, smart prosthetics could have the possibility of removing restrictions that are placed on handicapped children allowing for easier mainstreaming and less accommodations.

Curricular implications. Wearable technology will enter our classrooms for purposes other than medical or physical reasons. About 13 million wearable tech devices were shipped in 2013, and that number is expected to increase to 170 million by 2018 (Delgado, 2014). With this kind of growth, it is important that schools consider the educational impact that wearable technology can have on students. Wearable technology can increase a student's ability to interact with the environment more naturally, to be innovative and creative, and to access information easily without obstructions.

Several wearable technology devices exist in the market with others sure to follow. While this list is not exhaustive, these wearable technologies appear to have educational impacts: Muse, Virtual Reality, GoPro cameras, and Google Glass. Muse is a headband that measures brain activity with data transferred to a smartphone or tablet via a wireless connection. It can help learning by determining what keeps students focused ("Muse: The Brain Sensing," n.d.). Virtual reality, like Oculus Rift, allows students to experience learning differently (Lam, 2014). They can have a "live" lesson rather than just reading about it. Virtual reality devices allows for hands-on interaction of objects in an environment (Kuranda, 2014). GoPro is a camera that can capture a student's or teacher's point of view of events. For example, it could be used for recording a lesson or student behaviors, for a teacher's self evaluation, or observation of the learning environment (Lam, 2014). Google Glass enables students and teachers to: search; take pictures; record video; make short instructional or how-to films from the perspective of the wearer; record student presentations; conduct virtual field trips; present a remote class; record the teaching process; bring in outside experts; and answer/translate questions in a foreign language (Delgado, 2014; Kuranda, 2014; Lam, 2014; "Could Wearable Tech Like," n.d.). Smart jewelry/watches can send alerts to students and teachers if conditions in a laboratory become dangerous. A wearable technology bracelet can measure heart rate, hydration levels, how many steps students have taken, and even breathing rate. A teacher can monitor all this data from a tablet and ensure students get the physical activity they need while remaining safe (Delgado, 2014).

In the future, students will bring the latest gadgets and technology to school because it will be part of their lives. Much like the cell phones of today, wearable technology has the potential to change our educational systems, and it will create many questions for school personnel to consider. If students bring Google Glass or have computers integrated into their clothing, how will teachers and school leaders react? Many questions will need to be considered. Will there be restrictions placed on the applications of wearable technology? Will the new technology be embraced as a learning tool to enhance instruction? Is it fair for some students to have access to wearable technology and not others? Will schools have to invest in providing this type of technology to students? Will more and different professional development for teachers related to instructional uses of wearable technology be needed?

I see wearable technology in educational settings possibly having the same impact as both computers in the 1980's, and the one-to-one device initiatives in schools today. Technology is constantly evolving, and changing society and schools are one microcosm of society. Is it our responsibility as educators to engage in the growing wearable technology market and teach ethical usage of that technology; or will schools avoid the issue and not accept both the potential for educational growth as well as the potential for problems? Wearable technology is here whether we as educators like it or not. We must develop plans to think about how schools will or will not address the societal and student usage of wearable technology.

Existing wearable technology educational projects

In addition to the curricular changes related to wearable technology that will occur just because students bring wearable technology devices to schools, wearable technology might enter into schools as part of the proscribed curriculum. Buechley, Peppler, Eisenberg, & Kafai (2013) point out that wearable technology has been around for centuries with the best electrical conductors (metals) being incorporated into garments. For instance, large sheets of metal make up armor and smaller pieces of metal have been incorporated as decoration. Artisans have used metal wrapped threads as embroidery thread for centuries. In the 20th century, space suits and clothes that could light up and heat/cool themselves made their way into culture. Buechley et al. (2013) argue that a small group of scientists, engineers, and artisans have been exploring wearable textiles since the 1990's, but until the recent introduction of e-textile construction kits, these technologies were inaccessible to schools and the general public. They liken the impact of e-textile construction kits to the robotic kits that have recently made robotics accessible to educators and schools.

While the e-textile kit is only in extremely limited usage in today's schools, there are workshops and grants that have utilized e-textile construction kits to teach content like engineering design and simple circuits. One such workshop involved 17 youth ages seven to twelve at a Boys and Girls Club summer program. In this workshop, children explored the concepts of flow, plurality, connectivity, and series/parallel circuits (Peppler & Glosson, 2013). The authors felt that children had a better understanding of electrical circuit concepts using the e-textile construction kits than with other methods. Their rationale for the increase in understanding was attributed to the "unforgiving" nature of e-textile tools relative to the coated wires and rigid part of other circuit kits currently on the market (Peppler & Glosson, 2013).

Another curricular connection to e-textiles were workshops lasting four to six weeks serving 14 – 15 year old students from a public magnet school in a large urban school district. These workshops researched by Kafai, Fields, & Searle (2013), attempted to break down the process of creating an e-textile into three parts (domains): crafting, coding, and circuitry. The authors stated it was difficult to separate these domains and "students were the most challenged and learned the most when the domains intersected in ways that were not always in keeping with their prior knowledge of the individual domains" (Kafai, Fields, & Searle, 2013, p. 86). It was found that by inserting crafting into the technology of electronics and code, it made the workings of circuits and programming visible to students (Kafai, Fields, & Searle, 2013). The authors felt that "the multiple components that make up e-textiles render visible how technology is designed and built in ways that add to, rather than detract from, learning for the novice designer" (Kafai, Fields, & Searle, 2013, p. 86).

Another way to incorporate e-textiles into school curriculums does not require the design and construction of a project. E-Puppetry using already created e-textiles can allow students to explore complex system-related concepts from science while providing students with models of what is possible with e-textiles before they actually design and create their own (Peppler & Danish, 2013). The authors outlined a honeybee simulation where students acted the part of forager and worker bees gathering nectar. Students quickly learned the roles that different bees play and how information is communicated to other bees. The e-Puppets can be modified with a change in skins and programming to simulate other complex systems. From conducting simulations like these, Peppler & Danish (2013) found that a real strength of e-textiles lies in their ability to shape, guide and constrain student activities in a productive fashion.

A similar e-textile project at the University of Nebraska-Lincoln, University of Nebraska at Omaha, and the Nebraska Department of Education is the Wearable Technologies Project (WearTec). This project, in its first year of grant funding, is attempting to use emerging wearable technologies to design, develop, and test an effective model for teaching and learning engineering design concepts for youth in grades four through six. The target population is students who are attending a Nebraska public school and its accompanying 21st Century Community Learning Center. A majority of the students involved in this study will be members of groups traditionally underrepresented in science, technology, engineering, and mathematics (STEM), particularly females, and activities will cut across both formal and informal educational settings (Barker, Nugent, Clark, Melandar, & Grandgenett 2014). The WearTec grant investigators believe that the hands on learning that wearable technologies can provide for students is both exciting and personally relevant to them and especially for females who tend to be more interested in textiles and design than their male counterparts.

The referenced e-textile projects point out the growing interest in e-textile and wearable technology in K-12 educational settings. It appears at least anecdotally that e-textiles/wearable technologies have the capability to impact student learning in a new way or at the very least provide opportunities to engage and increase interest in STEM fields for a diverse group of students. The challenge for schools is the same as when any new idea or methodology emerges. How will schools react to these emerging technologies? How do e-textile/wearable technologies fit into today's standards? Finally, how will schools connect e-textile/wearable technology to curriculums and assessments? These questions are rhetorical and no single answer will fit all schools. It will be up to each individual school leader and school district to determine how the wearable technology movement will impact their students.

School Leadership Implications

Technology has historically been a change instigator in education. In its many forms, technology has pushed teachers and school leaders to modify, adapt, change, and otherwise develop new pedagogical methods for using technology in the classroom. The area of wearable technology could be the next great change agent in schools related to technology. We are seemingly poised on the cusp of seeing wearable technologies enter our schools. Some students already bring wearable technologies to school in the form of smart watches, and other similar technologies are sure to follow as they become cheaper and more prevalent in society. Wearable technology might be similar to the robotics platform used to teach science, technology, engineering, and mathematics (STEM) curriculum that began in after school clubs and summer programs and has gained mainstream acceptance from many schools as part of the curriculum. The challenge for schools and school leaders is to find appropriate ways of using technology in the school curriculum in order to make it a valuable tool rather than implementing technology for the sake of implementing technology.

Challenges. The area of wearable technology will face some resistance from education as it attempts to assert itself. There will be different groups of both teachers and school leaders that will emerge as the change is implemented including: the progressives, the status quos, and the resisters. Progressives will immediately grasp wearable technology as the next thing to engage, excite, and teach students. These teachers will actively pursue ways to adapt the current curriculum to fit wearable tech or make wearable tech adapt to the curriculum. Status quos will sit on the sidelines quietly waiting to see if and how the next new thing will affect their classrooms. Finally, the resisters will resist the changes being proposed by wearable tech and will do anything to discourage and stop possible implementation.

The challenge of school leaders will be to shift the paradigm of schools to accept the value of what wearable tech can bring to education and not be seen as just one more thing that teachers must do to “entertain” students. Leaders of schools attempting to bring about this change must engage in systems thinking described by Senge et al. (2012). Smith et al. (2000) defines system thinking to be “developing awareness of complexity, interdependencies, change and leverage” (p. 77). He cites three primary concepts that leaders must understand in order to engage in systems thinking. First, leaders must understand the nature of the system in which we work and live. For school leaders this means that they must have an understanding of how they themselves and their staff fit into the groups of progressive, status quo, and resister. Second, leaders need to develop personal skills like clarity, consistency, courage, and the ability to see interrelatedness. Leaders must have an understanding of the dynamics and relationships present in their school so that they can leverage those relationships in positive ways to affect the change and reduce the resistance. Leaders must be able to present their vision for the change clearly and concisely and remain true to that vision. Third, systems thinking must allow stakeholders to believe that they can shape their future. School leaders must allow all educational practitioners to participate in the change, help shape the change, and ultimately be partially responsible for the change.

Systems thinking provides leaders with the ability to see the big picture and how all the parts of the system affect one another. The last point, allowing stakeholders to shape their future, allows leaders to develop the relationships and supporting structures to get that critically necessary “buy in” of teachers if any change is to be sustainable.

Sustainable change. To achieve sustainable change in schools related to the implementation of wearable tech, a coalition of school leaders, both formal and informal, will need to be built. The coalition should consist of interested teachers, administrators (building and district), community members, school board members, and other interested parties including informal educators. The process should be transparent and open to discussion. Resistance will be met from teachers that see this change as unnecessary and another burden in their already busy teaching day. Recognizing the resistors and understanding their concerns is critical if the change is going to be sustainable.

Stein and Book (2000) outline five areas of emotional intelligence that a leader must exercise in order to meet and successfully overcome resistance. The leader must possess intrapersonal and interpersonal skills. They must be both self-aware and independent as well as having empathy for/with the resisters. The leader must be adaptable; meaning that they are flexible problem solvers. Leaders must manage stress and reduce the impulse to act out of frustration. Finally, leaders must remain positive and optimistic in the face of difficult change. In Fullan’s (2001) words, leading change is about “relationships, relationships, relationships”. Change can only be successful and sustainable if the stakeholders believe that they had a part in the implementation and that their concerns were heard. Leaders do not have to agree with every concern that stakeholders bring to the change process, but they do have to listen to those concerns and make individuals feel important and worthy. School leaders must build trust with teachers (Tschannen-Moran, 2007, p.99) because collaborative decision-making and site-based management can bring insights of more people to solving complex problems, however these processes depend upon trust. The implementation of wearable technology, or any other change implemented in schools, will be complex and messy. Collaborative groups of progressives, status quos, and resisters will need to be formed to solve the implementation problem. School leadership will need to develop trust: trust *from* its constituents that it will not willfully do anything to harm the group, and trust *of* the group to listen to concerns, ideas, and not merely discount them because the leadership does not agree.

School leadership. To implement a change as complex as integrating wearable technology into school curriculums will require a leadership framework similar to what Fullan (2001) proposes. Leaders must have moral purpose, understand the change and change process, build relationships, coherence making (focus on the outcomes), and knowledge creation and sharing. When the leader combines these five properties with enthusiasm, energy, hope, and the commitment of group members more good than bad results happen.

Leaders personal traits and skills define their ability to exercise moral purpose, relationship building and understanding of change. Focus on the outcomes (coherence making) comes from a shared group vision of those outcomes and maintaining that vision even in difficult times. The last trait outlined by Fullan (2001), knowledge creation and sharing, is critically important for the implementation of wearable tech into a school curriculum.

Professional development/teacher support is a key component of integrated STEM education that directly affects the creation and sharing of knowledge. According to the National Academy of Engineering, (2014) very few teacher education programs are preparing prospective teachers with appropriate knowledge in more than one STEM curricular area. Professional development of teachers allows them to become more comfortable with their own knowledge of STEM and as teachers learn more about math and science they become more comfortable teaching STEM (Nadelson, Seifert, Moll, & Coats, 2012).

The implementation of wearable technology into schools will not be that different than other STEM education initiatives which will require additional content and pedagogical knowledge beyond that which teachers currently are trained. Therefore, schools currently attempting to have an integrated STEM curriculum must provide professional development for its teachers and leaders (Rockland et al., 2010; National Research Council, 2011; Nadelson et al., 2012; Sterns et al., 2012; Scott, 2012; National Academy of Engineering, 2014). The implementation of wearable technology is going to be directly related to STEM content with tangents into other curricular areas and professional development will be a critical component both for the creation of knowledge and the sharing of that knowledge between colleagues.

Guidance from past implementations. The implementation of wearable technology into a school curriculum should not be that different than the implementation of 1:1 learning environments. Nash (2009), found that strong school leadership is a key to success and that the desired outcomes cannot be overemphasized. All school leadership, superintendents, principals, and curriculum directors, should be actively engaged in the process. Technology staff must have an extensive role in the project implementation with guidance from top leadership. Finally, Nash stresses the importance of collaboration, joint planning, and professional development.

Additional evidence from current 1:1 initiatives that can apply to implementing wearable tech into school curriculums shows that the most critical, yet overlooked, issue related to technology deployments is leadership (Salerno & Vonhof, 2011). Schools desiring to implement technology programs have to consider the people within the organization. Salerno & Vonhof (2011) believe that launching a 1:1 program requires a leader with sufficient power to command the attention of all constituents. In addition, the leader must be a champion for technology and have enough knowledge to coordinate an internal and external technological vision.

A recent study of 997 schools across the United States (Greaves, Hayes, Wilson, et al., 2010) identified factors that, when present, appear to contribute to higher student achievement in schools that have adopted one-to-one programs. These factors include: 1) ensuring uniform integration of technology in every class, 2) providing time for teacher learning and collaboration (at least monthly), and 3) using technology daily for student online collaboration and cooperative learning.

These lessons from the world of 1:1 school initiatives can provide a template for the implementation of wearable technology into school curriculums. First, a leader who is competent and passionate must be present in the system. An overall vision with tangible outcomes has to be created. Collaborative groups of stakeholders must be built to create and share knowledge. Professional development for and by practitioners has to occur in order to provide teachers with the necessary skills to be comfortable with the implementation. Technology and pedagogical support structures have to be present for struggling teachers. Finally, since the change process is often a cycle, constant evaluation with the overall vision in mind has to occur to allow both the people and implementation to adapt as needed to the learning environment.

Additional considerations. As with any new area of technology or concept that enters the educational arena to be an effective instructional tool, assessment of how it functions and improves student performance must be determined. If wearable technology is to be integrated into the curriculum, assessments must be developed to show its value. STEM curricular projects often have difficulty meeting the standard of being measureable. Robotics and other integrated STEM activities are often deployed in extra-curricular classes rather than in core subjects for this reason. It is not to say that STEM activities are not in core subjects because they are in limited fashions, but fully integrated STEM activities with open-ended products tend to be hard to define and assess. It may very well be that wearable technology is designated to strategic implementations in core areas and deeper implementations in elective classes. If wearable technology is going to become mainstream in schools, proponents are going to have to figure out how it fits into curriculums, how it is going to be assessed, develop evidence that using wearable technology teaches students at least as well as current pedagogical methods, and convince a group of passionate practitioners to embrace wearable technology.

Further research is needed. To fully implement wearable technology into schools, further research needs be conducted related to how to use wearable tech and how it improves instruction. Since the idea of wearable technology in schools is so new, there is little content in the literature related to how it will function in schools. Like the robotics of the recent past, wearable technology has found a niche in after school clubs and summer programs. The book Textile Messages by Buechley, Peppler, Eisenberg, & Kafai (2013) cites many different wearable textile projects. These projects are incorporating concepts like engineering design, circuits, conductivity, and electronic components into a textile product that students design and create. Preliminary evidence shows that students seem to have a better understanding of circuits than with traditional methods (Peppler & Glosson, 2013). Evidence also appears to show that girls show more interest in wearable textiles and consequently STEM because of participation in these projects (Buechley et al., 2013). Although these initial findings are promising, there is much work to do in relation to the value of wearable technology as a part of school curriculums and how to actually implement wearable technologies in schools.

School leaders will need to be on the forefront of learning about how wearable technologies fit in schools. Currently, a National Science Foundation iTest grant has wearable textiles being incorporated into five pilot schools in Nebraska (Barker, 2014). The wearable textile implementation is being conducted in both formal and informal educational settings. In the original grant proposal, it was thought that formal education would teach circuits, conductivity and other scientific content needed to successfully create a wearable textile, and informal education (after school clubs) would be responsible for the sewing to actually create the textile. The pilot schools are finding is that the pairing of formal and informal educators to form a strong team has been the biggest challenge (N. Grandgenett, personal communication, April 30, 2015).

Conclusion

Wearable technology has become more prominent in society and has the potential to change schools. It can serve to aid or improve students' personal lives. Wearable technology might even impact curriculums in schools in a similar way that computers and tablet devices recently have. If wearable technology is going to become an educational tool, more research on the educational benefits of wearable technology will need to be conducted, and cutting edge teachers and school leaders with the right skill set will have to guide the implementation. Coalitions will need to be formed and professional development will need to be created and implemented. We are at the beginning of a possible wearable technology revolution in schools and as teachers, educators, policy makers, and constituents we all have the ability to shape exactly how wearable technology will effect schools. Personally, I believe that wearable technology has the ability to improve education if we can find the people and leadership to face the challenges.

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