Chapter 16
Advancing Personal Learning Using the Internet of Things:
Creating Bonds for Societal Inclusivity

Barbara Truman
University of Central Florida, USA

Jaclyn M. Truman
Columbia International University, USA

ABSTRACT

Personal learning is a unique ability and requires self-determination to master. Personal learning also involves constructing representational learning artifacts that are used across life into work and society. Using avatars to foster identity within collaborative virtual environments (CVEs) can represent expressions of selfhood useful for participating in diverse communities. The Internet of Things (IoT) provides a spectrum of emerging technologies that can connect physical and virtual world activities resulting in new realms of human-computer abilities. Interconnected smart devices automate services and provide timely information resulting in safety, security, and efficiencies, especially for vulnerable populations such as persons with disabilities. The relationship is explored when IoT applications are combined with use of CVEs, avatars, and a discipline of presencing. Inclusivity becomes probable. Future research is described how individuals, organizations, and communities can be impacted by personal learning influenced by the inevitable growth of IoT and virtual learning.

INTRODUCTION

This chapter explores the notion of generating greater responsibility for a concept of personal learning framed through the use of avatars and collaborative virtual environments. The premise of responsibility for cultivating identity will be shown as a function of transparency aided by new information made possible by emerging technology and sensor data arising from the phenomenon that is the Internet of Things (IoT). The authors posit that improved self-discovery and self-determination contributes to the development of authenticity and ownership of identity. Future developments in IoT are discussed for

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applications of personal and environmental uses that when combined and integrated into virtual environments provide the potential for transformative benefits. Further, as empowered individuals discover greater personal abilities through courageous self-examination, community involvement becomes more likely increasing the imaginative uses of IoT for societal benefit through experimentation. Implications for supporting under-served populations such as persons with disabilities are considered within the frame of an enabled, smart community.

BACKGROUND

Educators have probably experienced the occasional pang resulting from the glut of ever increasing volume of new information, new technological devices, and manner of which to consume media. Lifelong learning is an essential habit an educator must embrace to stay current in one's field. Lifewide learning, a strategy that involves authentic settings is recommended to increase social consciousness. Building habits of mind to engage cognitive agility can help navigate the educational possibilities to promote teaching and learning with emerging technology. Practicing the development of habits of mind require embracing *personal mastery* so that we shape technology more than it shapes our humanity. An essential component of the discipline of personal mastery involves taking the time to focus and reflect on our vision so we can see objectively (Senge, 2006, p. 136).

The Internet of Things represents an opportunity for educators and leaders to research the emerging technology to better cultivate personal mastery and create new abilities through self-discovery of strengths. IoT is made up of smart sensors that when used personally can improve health and fitness using wearables. The explosion of IoT technologies made up of often inexpensive and miniaturized components are resulting in the development of smart cities where services are created to support safety, sustainability, and economic development. Emerging IoT capabilities can be used for advancing the development of human-computer abilities when we can answer the question, "How does an individual create and use his own assistive service from the various devices present in the environment?" (de la Guía, et. al., 2015, p. 64). As individuals practice their new IoT-discovered abilities and participate in their communities to exchange and validate contributions, the positive impact for society is dramatic. The potential to create *enabled*, smart communities using IoT capabilities designed to integrate the physical world with cyberspace and virtual environments poses the affordance of radical inclusivity for involving everyone irrespective of age or disability (p. 63).

The World Wide Web Consortium (W3C) has been a champion of inclusivity through advocacy of accessible content on the Internet. Various working committees are continuously researching how to make rich media accessible to persons with disabilities. One W3C working group is involved in IoT and has created The Web of Things (WoT) to research how smart objects in a physical environment can be integrated with the Web (Domingo, 2012, p. 588). Such integration would lead to enabled environments that may include sensors to illuminate pathways or detect obstacles that interact with shoes, canes, wheelchairs, haptic devices, and report to dashboards on mobile devices for users and administrators.

As IoT matures, new capabilities to bridge health, wellness, and education will be possible through the additional information offered from data obtained from our states in varied contexts. This IoT-enabled information can lead to improved personal mastery when combined with what Stephen Covey (2006) describes as the Seventh Habit, a commitment to continuous improvement of the whole person, or Kaizen (p. 156). The whole person paradigm is what distinguishes the educational offering of insti-

tutionally-offered personalized learning and organically-developed personal learning. In order to fully take advantage of discovery and development of IoT-enabled abilities, a personal learning approach is required. Educational institutions often provide support to build learning capability from workshops and instructional content focused on metacognition, but personal learning encompasses the whole person over time and across contexts of learning. Downes (2016) cites personal learning as, "like shopping at a grocery store. You need to assemble the ingredients yourself and create your own meals…you control the experience, and you control the outcome" (p. 3).

Oelofsen, (2012), describes personal learning as how you interact with the experiences you have that involve self-awareness and clarity on how your personal history, past experiences and personality affect your approach to your work role (p. 295). Social learning is not distinct from personal learning and is often intertwined. Seeing the connections among one's role and job to others involves interdependence. Lankau and Scandura (2002) refer to this type of personal learning as relational job learning. Another type is personal skill development that leads to improved working relationships based on acquisition of new abilities and skills (p. 3). Frequently in the workplace, professional development organizations try to capture and emulate scenarios to promote the acquisition of the types of personal learning that cannot be trained. Personal learning is directly related to what constitutes a person's individuality and identity, i.e. their selfhood.

Key Factors that Contribute to the Development of Personal Learning

Formal education has the potential to diminish the curiosity and creativity of learners over time. Attaining a sense of self-mastery may also be fleeting as the neuroscientist Damasio (2012) states, "The self permits a view of the mind, but the view is clouded (p. 13). Even in medical school where candidates are selected for their abilities appear to experience erosion of professionalism during the course of their training (West and Shanafelt, 2007, p. 2). The personal factors were grouped into 1) personal well-being 2) individual characteristics and 3) interpersonal qualities and skills. These elements were described as being combined with the environmental factors of 1) institutional culture 2) formal/informal curricula on professionalism and 3) practice characteristics. All six factors and their sub-elements combine to create professionalism among physicians (p. 3). While it is often not possible to directly influence the environmental factors within organizations in the physical world, it is possible to model environments in the virtual world to explore how the personal and environmental factors can be construed. West and Shanafelt concluded that, "Modeling of and support for desirable behaviors in the informal and hidden curricula should support the formal curriculum for professionalism" (p. 6). The findings did not envision the use of personal learning, collaborative virtual environments, and the Internet of Things.

Self-responsibility contributes to the development of personal learning. Taking ownership of one's self and identity poses the question of the chicken and the egg. Which comes first, assuming responsibility for one's self or exercising personal learning? The two are directly related and when exercised lead us in most circumstances to ask, "…what is the best thing I can do under these circumstances?" (Covey, 2006, p. 133). Can we effectively learn without being self-responsible to influence everything in our power to improve? The motivation to improve is also a factor that develops personal learning. Integrating motivation, specifically autonomous motivation into the sense of self represents the ideal of incorporating both intrinsic and extrinsic motivation. "When people are autonomously motivated, they experience volition, or a self-endorsement of their actions." (Deci & Ryan, 2008, p. 182).

Understanding our self is the opportunity posed in delving deeply into personal learning practices in order to identify fears and negative associations that may create bias that impedes our abilities. The practice of presencing advocated by Senge, Scharmer, Jaworski, & Flowers (2005), improves understanding of self and others. Building a habit of listening and observing openly is key to experience presencing. "If we can simply observe without forming conclusions as to what our observations mean and allow ourselves to sit with all the seemingly unrelated bits and pieces of information we see, fresh ways to understand a situation can eventually emerge" (p. 31). Practicing presencing while not inducing comfort can lead to greater wellbeing through understanding. Improved wellness contributes to personal learning across life within activities that span work, school, leisure, and personal domains. These domains involved cognitive, social, affective, physical, emotional, and spiritual health.

The connection of mind-body health and wellness are served through the development of personal learning and vice versa into the development of personal learning through pursuit of wellness. The study of how immersive virtual worlds for clinical therapy, pain management, and rehabilitation and recovery are beyond the scope of this article, but the attention to spiritual health is. Mounting evidence illustrates the value of embracing the whole person paradigm to enact personal learning for self-health, especially with the data offered by using IoT personally. "… Widespread advances in technology, enabling researchers to track the pathways of mind and immunity, are finally overcoming the resistance of the scientific community to the notion that the brain and the immune system can and do communicate" (Sternberg, 2001, p. 6). One pathway of communication involves emotions and how we respond to translate them into feelings. Emotions scientist, Barbara Frederickson (2013) quotes Harvard psychiatrist George Vaillant who summarized, "Love is the shortest definition of spirituality I know" (p. 182). She also asserted that how we think about love reshapes the way our bodies experience love (p. 189). More scientists are scrutinizing the impact of positive emotions on health to obtain patterns across societies and cultures. How we as individuals calibrate our emotions through deliberate awareness exercises will improve the potential for including others in meaningful experiences and interactions, especially love. Frederickson cites a worldwide collapse of imagination when it comes to our limited view of obtaining the health benefits from experiencing micro-expressions of love with anyone (2013, p. 189). She also cited that love is compassion and when it is focused on others, the person most changed is us (p. 153).

Claiming responsibility for one's identity requires self-awareness and courage to take leadership of stewardship over what is possible to improve under given circumstances. The relationship between identity stewardship and development of authenticity becomes apparent as personal learning matures. Authenticity goes beyond understanding and involves acting, doing, or behaving. Gardner et.al. (2011) reported on a literature review performed on authenticity and conclusions that authenticity documents a range of mental and behavioral processes. Over time and across situations, people discover and construct a core sense of self where four central themes emerge: "authentic functioning of people's:

1. Self-understanding;
2. Openness to objectively recognizing their ontological realities (e.g., evaluating their desirable and undesirable self-aspects);
3. Actions; and
4. Orientation towards interpersonal relationships" (p. 1121).

The literature also reinforced actions based on one's true preferences and values. Authenticity is not associated with securing rewards or avoiding punishment and involves a relational orientation of

achieving and valuing truthfulness and openness in close relationships (Gardner et.al, 2011, p. 1121). Self-awareness is seen as a key component of authenticity informed by the true self (Ladkin, & Taylor, 2010, p. 5). The true self must be discovered using personal learning.

Maintaining a commitment to self as entity in its own right was described as a serious concern more so than in performing role identities such as parent, teacher, volunteer etc. (Erickson, 1995, p. 126). Considering how the self is simultaneously shaped and is shaping by social interactions within environments, the self must be seen as a social force within environments in order to participate in social construction (p. 127). . The authors assert that this is especially true when learners are engaged in using an avatar within collaborative virtual environments where users have constructive power over the environment. Maintaining commitment to self as entity was described by Erickson as evidenced by relative authenticity, the extent of fulfilling expectations one has for self (p. 13).

Another key factor that contributes to the development of personal learning is self-affirmation. Cohen & Sherman, (2014) report that a barriers and psychological threats are lifted in a situation when affirmation is used (p. 358). The effect is similar to outcomes within resiliency research such as stress reactivity, self-regulation, and information processing. "The core areas typically affirmed—relationships, family, and spiritual and religious values—dovetail with the hot spots for intervention in resilience research" (Cohen & Sherman, 2014, p. 360).

Creating New Abilities with Combined and Emerging Technology

Psychological research on identity and self has been conducted for decades, but the rise of social media use has made study richer as more people easily engage in communication and content sharing. The use of immersive, virtual environments within the last decade has created dynamics impacting professional identity and personal learning, especially in higher education. Stanford's Virtual Human Interaction Lab is one example of a university that has performed research on the relationship of avatar use, empathy, awareness of self, and community interactions (Yee, N., & Bailenson, J. N. (2009). In many cases, creating an avatar leads to the development of a persona that is used across social media and various virtual worlds. The avatar can also be construed as a learning artifact representing expression and evidence of the cultivation of identity.

The avatar also represents a kind of mirror to the self. Sparrowe (2005) describes seeing oneself as an other as a means of narrating our selves. By creating the avatar as an object of self, we can reflect upon and examine our authentic life as suggested in leadership theory (p. 429). The question of: "Is the authentic self the self that is constant (sameness) or is it the self that is faithful to its promises though fluid and changeable (selfhood)?" Sparrowe suggests that it is neither one alone. The narrative unites them [*self that is constant and self that is faithful*] (p. 430 emphasis mine). The notion of creating a story for our self could have transformative implications for resiliency and wellness as we hone the ability to see what is happening through personal learning. Sparrowe (2005) cites examples from cognitive science based on the research of Roser & Gazzaniga (2004), Turner (1996), Dennett (1991, 1992) that suggest a convergence between interpretative and functionalist paradigms in relation to understanding self and identity. Narrative identity need not and should not be constrained by the limits of either paradigm, although research from a functionalist paradigm on autobiographical memory can illuminate how individuals, including leaders, misrepresent themselves to themselves (Sparrowe, 2005, (p. 434).

For some people attachment to the avatar does not occur and for others embodiment is readily felt. There is insufficient research on which persons and their associated factors contribute to avatar attach-

ment. For some users somatic flexibility, a means of transcending the physical body but not, embodiment is achieved (Young & Whitty, 2011, p. 537). Somatic flexibility is thought to be appreciated most by persons with disabilities who enjoy the affordances of using an avatar in a collaborative virtual world where parity is impossible in the physical world. Social interaction using avatars is enhanced by presence, which Ratan (2011) describes as the way people connect to their avatars on three levels: body, emotion, identity (p. 1). Social interaction plays a significant role in the establishment of positive traits in individuals. Sustainment of positive traits is supported within virtual communities where individuals engage in social presence (Stricker, McCrocklin, Calongne, Scribner, & Holm, 2010, p. 5).

As embedded and worn sensors become common, new forms of identities will be possible. It is hard to imagine the artistic and creative abilities that may become possible through new forms of human-computer ability. Clark (2007) suggests that our choices of biotechnological unions create soft selves, new forms of hybrid cognitive and physical being that represent who and what we are (p. 279). The emphasis on choices is key. The question of deliberation remains of whether choices have been made with deliberation as a manner of creativity and stewardship of identity. Csíkszentmihályi, the researcher who developed the Theory of Flow, said: "It is easier to enhance creativity by changing conditions in the environment than by trying to make people think more creatively" (1997, p. 1). In constructive, virtual worlds, dynamic change of the environment can be a means of expression and dialogue.

Incorporating the Internet of Things

IoT, also referred to the Internet of Everything (IoE) represents a revolution that has the potential to be 'staggeringly transformational' and highly disruptive at the same time (ISACA, 2015, p. 4). Goldman Sachs (2011) represents IoT as the third wave in the development of the Internet itself (p. 1). As of early 2016, the United States government and funding agencies are attempting to catch up with Europe's lead in supporting the development of cities and communities that employ devices using embedded networks, computing, and other information processing capabilities. IoT is also represented as cyber-physical systems in the literature. The US National Science Foundation and some companies are offering funding for high profile X prizes for IoT-related innovation, especially those innovations that can be replicated and are interoperable. Security does not appear to be priority, although with mounting cyber security attacks, requirements will soon be tightened.

The measurement of individual health metrics has been one of the biggest IoT growth areas. Metrics are available by biosensing applications such as self-tracking gadgets, Wi-Fi scales, remote clinical monitoring, and wearable sensor patches. The quantified-self movement (http://quantifiedself.com) has brought awareness of the use of sensors in everyday activities for creating information useful for building personal awareness, behavior change, and reflection (Specht, 2014, p. 2). The $10 million Qualcomm Tricorder X Prize will be announced in early 2017. The tricorder is for the development of a handheld device that has the capability to detect 12 diseases to accurately diagnose 13 conditions. The prize represents a shift to home-based care that will enable aging in place with the assistance of artificial intelligence, image diagnostics, wireless sensing, molecular biology and lab-on-a-chip. The tricorder must non-invasively monitor and diagnose health conditions in real-time. Nokia has also created a prize called Sensing X Challenge (http://sensing.xprize.org) that will award $2.25 million for sensor technology that can bring about new ways to monitor, access, and improve consumer health (Swan, 2012, p. 218).

Sensor-enabled technologies will allow us to take greater charge of our health in the physical world. When we combine the use of these technologies with the virtual world, our identities will aspire to new

abilities on the neurological level that are hard to imagine. "This new generation of quantified-self experimentation allows individuals to heal, fix, optimize, tinker, and engage in curiosity-driven research in new ways than were possible previously, and which may have deeply meaningful solutions" (Swan, 2012, p. 239). Smart sensors fuel the potential for societal transformation within the Internet of Things, especially when individuals practice the discipline of presencing to become smarter citizens.

Improving Awareness of Inclusivity across Society

For persons with disabilities and the elderly, the Internet of Things represents new means of accessibility that can impact personal security, wellness, economic livelihood, and educational attainment. Frequently what was created to support accessibility has other benefits to society such as the ability to transport goods over wheel chair accessibility ramps. Educators must recognize the opportunity to explore and test new ways to use IoT capabilities that can result in breakthrough empowerment for themselves, their organizations, and communities. An ethos of radical inclusivity made possible with IoT initiatives may unlock cognitive capabilities and appreciation for minds that are trapped in frail bodies. IoT creates enabling environments by offering people with disabilities assistance in access to buildings, transportation, information and communication (Domingo, 2012, p. 594).

In mid-2012, about 28.3 million men and women had a disability. This percentage represented the civilian noninstitutional population age 16 and over (Bureau of Labor Statistics. United States Department of Labor, 2013). This number may be low as many people are not comfortable in registering their status with employers. The US Census Bureau assesses disability difficulty and the need for assistance with self-care and independent living activities. The data is examined at a population level to provide important information for long-term care planning and support. The Census Bureau uses two scales: activities of daily living (ADL) and instrumental activities of daily living (IADL) that were developed as clinical tools for evaluating individual patients' long-term care needs. The scales have also proven useful as tools adapted for population surveys. Activities of daily living include difficulty getting around inside the home, getting into/out of bed, bathing, dressing, eating, or toileting. The instrumental activities of daily living include difficulty going outside the home, managing money, preparing meals, doing housework, taking prescription medication, and using the phone (United States Census Bureau, 2012). Physical rehabilitation is also needed for members of society who get injured and may experience temporary disability and veterans who may live with injuries sustained in conflicts.

Peraković, Periša, & Prcić, (2015) describe ISO 9999, Technical Aids for the Disabled- the widely accepted overview of the assistive technology and technical aids adopted by CEN (European Committee on Normalisation). This classification includes:

- Aids during treatment and therapy;
- Orthoses and prostheses;
- Aids for mobility which enable personal mobility or transport;
- Home aids and equipment;
- Equipment intended for adjustments in the house;
- Aids for communication, information and signalisation;
- Aids for handling other items;
- Aids and equipment for environmental improvement; and
- Recreation aids, (p.4).

Concerning access to higher education for persons with disabilities, eleven percent of undergraduates in both 2007–08 and 2011–12 reported having a disability (U.S. Department of Education, National Center for Education Statistics, 2015). Again, this number is low as accessibility officers report that people do not want to register to receive accommodation perhaps because they do not wish to be singled out. It is unclear how large the population of students with disabilities is, although campuses such as the University of Central Florida are trying to anticipate needs to assure academic access and success.

Living with a disability affects families who may also face economic challenges due to the inability to access health services, education, and employment opportunities. If assistive technology services are not received at an early age, opportunities may be severely limited later when challenges are greater due to differences in ages of peers. For example, deaf children often need additional exposure to American Sign Language (ASL) because most parents of deaf children are hearing and not fluent in ASL. An interactive IoT system is available for deaf children to take with them from school to home. The most difficult vocabulary can be reviewed until it is understood and memorized, perhaps involving other family members. Learning barriers are reduced with the innovative, game-based learning system. Can IoT-enabled services provide an intervention capability to serve cross-generational learning? A strong correlation exists between early signed language exposure for deaf children and later academic achievement (Domingo, 2012, p. 594).

Another opportunity for educators is the fact that physical world environments can be modeling virtually to provide a low cost means of designing IoT capabilities. Insights on usability and ergonomics can be discovered before implementation to improve an environment that supports personal learning. In some cases, the physical and virtual world may be linked through the use of visualized data and dashboards produced from data received by IoT in the physical environment. The ability to participate in communities will increase as more physical environments have corresponding virtual representations that people can access easily online. As spaces are networked, new forms of communities will be possible offering participants options for whether they participate in face-to-face fashion or electronically. Greater independence and interdependence will become more affordable. Full participation of persons with disabilities in everyday activities is achieved through support for mobility, accessibility, place of residence, transportation and education (Peraković, Periša, & Prcić, 2015, p. 22).

The Internet of Things is a global phenomenon that enables communities to learn from each other. In the United States, the National Institute for Standards and Technology (NIST) has a program called Ignite that conducts periodic events to showcase smart city activities. Action Cluster Teams involve municipal employees to join in on the design and implementation of IoT capabilities. International involvement occurs as well and according to the 2014 ISACA Risk/Reward Barometer, a survey of global ISACA members in 110 countries, "43 percent of businesses are already addressing IoT: 28 percent already have plans in place to leverage IoT, while another 15 percent will be creating those plans in the next 12 months" (ISACA, 2015, p. 6).

Integrating Selfhood and Society with Virtual World Communities

The global higher education community has been engaged in the use of immersive, virtual environments for over a decade. Educators use their computers to access the Internet and log into their avatar accounts that enable them to gather, speak, teach, and co-construct virtual environments. Community events are held every day around the world online where classes are conducted, concerts and performances are held and groups champion their cause such as the Relay for Life put on by the American Cancer Society.

The group, Virtual Ability Inc., is a 501c3 registered nonprofit in the state of Colorado in the United States that champions the needs and abilities of persons with differing abilities. Virtual Ability is made up of over 1,000 members from six continents that help members integrate into virtual society. The group has virtual regions and conducts events in the virtual world Second Life. In addition to providing services to members, the group engages in research projects such as with the School of Medicine at the University of Pennsylvania and a project on aging with the University of Arkansas. Virtual Ability conducts its own events based on fundraising and participates in events such as the annual Virtual Worlds Best Practices in Education (VWBPE) Conference. The founder and Chairman of the Board of Virtual Ability, Alice Krueger, provides perspective in a video called, What Second Life means to me, with Gentle Heron https://youtu.be/0ZKC4R81zzc

Figure 1: *Virtual Ability Panel*, shows members gathered within an amphitheater for a session conducted as part of the 2015 Virtual Worlds Best Practices in Education Conference. Panelists made a live presentation from their locations around the globe to discuss their perspectives on the virtual world experience. Members are active within the Second Life, virtual world community and raise awareness for a variety of persons with disabilities. The ability to play, socialize, and dance virtually provides such happiness that health benefits translate. Personal mastery is illustrated through personal learning where users have more control of their virtual lives than in their physical lives.

The community bonds within the group Virtual Ability have transferred activism and agency into other communities who are transformed from the empowerment experienced by such courageous individuals. Frequently virtual world community members share activities conducted in their physical communities to translate benefits. It is expected that such community activists will design, test, and champion the Internet of Things to serve persons with disabilities who may be family members.

Inevitably, the virtual world platform will evolve and gains made for accessibility may be interrupted. Community disruption is something that Celia Pearce studied through her research at Georgia Tech. She described the concept "intersubjective flow," that situates the flow state between people, rather than within the individual. The concept was built upon Csikszentmihalyi's Theory of Flow and DeKoven's

Figure 1. Virtual ability panel at the 2015 Virtual Worlds Best Practices in Education Conference. Image credit: Barbara Truman.

Co-liberation. Within intersubjective flow, the state "moves from the realm of the psychological to the realm of the social. Intersubjective flow serves to accelerate a form of intimacy that is unique to play" (Pearce, 2009, p. 133).

Communities like Virtual Ability are participatory in their events and activities. Stricker et. al. (2011) found the use of an immersive virtual reality (IVR) ecosystem for collaborative-design based (CDB) -prototyping can help foster a sense of place, purpose, and community identity. "Innovation prototyping, using an IVR landscape to span physical and virtual geography, offers breadth, depth, and endless frontiers for enhancing learning, instruction, and discovery" (Stricker, Holm, Calongne, & McCrocklin, 2011, p10). Virtual Ability members are often found at social events for other communities in the virtual world Second Life and also among some of the other open source grids that have been appearing. The outreach of the Virtual Ability community simply would be too costly and time consuming to replicate and participate in the physical world. For some members there would be physical risk to participate as well. Virtual participation affords a low-cost, low-threat alternative to refine personal learning. Communities like Virtual Ability exhibit 'eudaimonia' a form of happiness that seeks happiness and pleasure as desired end states in contrast to hedonism (Gardner, Cogliser, Davis, & Dickens, 2011).

Ironically, nonprofit organizations operating in physical spaces such as churches are not required to comply with federal disability laws to provide reasonable accommodation for parishioners with disabilities. Truman (2015) reported on how the deaf in the church are reduced to "objects for which 'ministry' is offered rather than individuals deserving of access to the gospel delivered in the complexity of their native sign language by qualified interpreters" (p. 2). Churches frequently do not have funds at their disposal to make significant building renovations, but they also enjoy a tax-free status. Churches often take care to preserve their cultural affiliation using scriptural stories, songs, and psalms to cultivate a cultural identity. Diehl & Prins, (2008) describe how when people actively mobilize through communication adapting shape based on the economic, historical, social and political contexts, cultural identities are not fixed entities encompassing differences that move beyond region and ethnicity as the chief sources of cultural identity (p. 108). The most positive impact and interaction with individuals with disabilities results from an approach incorporating virtue-based ethics (Truman, 2015, p. 5).

Community engagement is necessary to support personal learning and wellness. Figure 2: *New Forms of Blended Communities*, illustrates a spectrum of engagement that range from individual access to enterprise involvement using face to face and fully online, immersive virtual worlds for meetings (Truman, 2014). The question arises for the amount of time involved and whether individuals attain avatar attachment. Experience has shown that when people gain avatar attachment that the associated empowerment leads to greater community engagement and activism. Some activism transfers to the physical world where people attempt to connect constituents who are among both worlds into a virtual, blended world network.

Some attachment arises to the milieu associated with the immersive, virtual world activities, but typically only if there was significant use of the environments where users were able to gain attachment to the avatar. Just as personal learning is idiosyncratic to individuals, variations in time associated with attachment to an avatar or milieu depends on nascent factors. More study is required to tease out the associations. As the Internet of Things begins to have an influence on how communities engage in face to face meetings and networked, virtual meetings, new attachments may be possible, especially as visualized data becomes richer to experience across worlds with augmented reality. How will identities shift with the new possibilities of blended realities?

Figure 2. New forms of blended communities. Image credit: Barbara Truman.

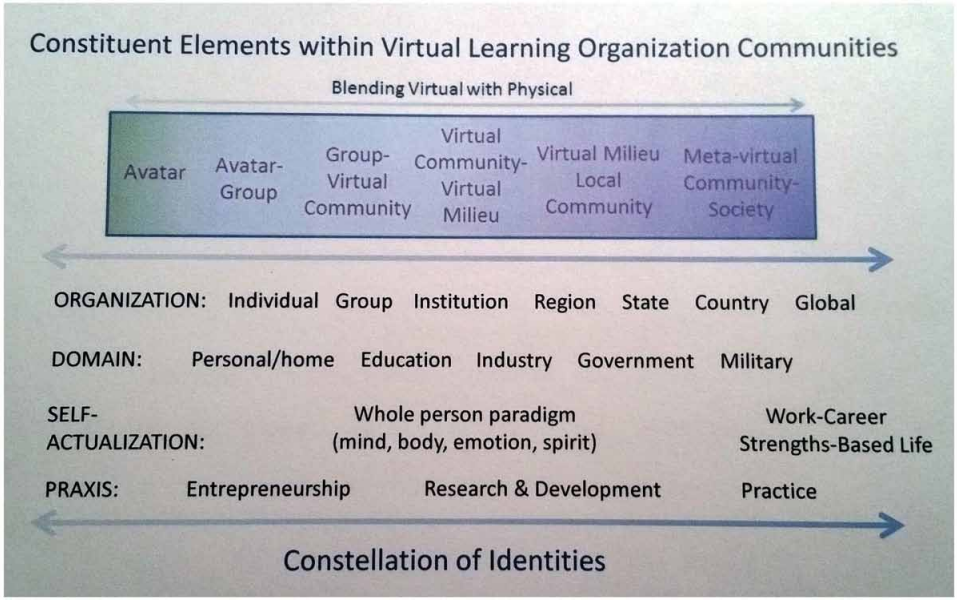


Figure 2, New Forms of Blended Communities, highlights the whole person paradigm where community involvement is experienced not only at work, but across life at home, school, church etc. involving cognitive, emotional, spiritual, and physical dimensions. Will a new type of community architect arise who can masterfully blend place, time, identities, and technologies?

The combination of identities and communities imply that new forms of expression will be created adding richness to language and meaning at the cost of complexity. Networked communities that visit each other in person and with embodied avatars will play a vital role in translating meaning between groups. Senge et. al., (2005) describe an ability of seeing from whole that is attained from practicing the discipline of presencing, an activity requiring full attention to listen and open heart, mind, and will. "The key to 'seeing from the whole' is developing the capacity not only to suspend our assumptions, but to 'redirect' our awareness towards generative process that lies behind what we see" (Senge, Scharmer, Jaworski & Flowers, 2005, p. 42). Active, iterative, experiential engagement provides understanding of new information with the constructivist learning view, "People construct understanding based on life experiences and beliefs to help associate new knowledge" (Stricker, McCrocklin, Calongne, Scribner, & Holm, 2010, p. 10). Using a combinatory approach, educators have the potential to pioneer new forms of enabled, experiential learning communities that generate inclusivity and cross-cultural understanding.

Risks and Limitations

The gains for inclusivity made possible from combinations of virtual worlds, physical meetings, avatar use, and IoT-enabled environments do not come without their challenges. Viewing one's self as object online in a virtual world may lead to what Young & Whitty (2011) describe as an idealized self rather than an ideal self-committed to continuous improvement. Marginalization may result when one's offline self does not compare and fulfill the need for identity development and authenticity. "With regard to

the phenomenal self, the line between the authentic and inauthentic is somewhat fuzzy because, in each case, one's embodied experience is a genuine experience" (Young & Whitty, 2011, p. 553).

The Internet of Things does not offer a seamless, integrated experience. Interoperability is being worked on by several nations. The most significant challenge involve privacy, trust and security." (de la Guía et al., 2015, p. 60). For persons with disabilities, authentication into their trusted, IoT-enabled applications requires research and development. Providing greater flexibility in how authentication in managed will allow greater numbers of people to connect to secure services, information, and communities. Such security is necessary for members of the community to thrive (Griffin, 2015, p. 5).

FUTURE RESEARCH DIRECTIONS

A future area of study involves the exploration of how people dynamically adapt, recover, and evolve into new realms of consciousness when using IoT-enabled collaborative virtual environments in a combinatory approach with face-to-face, augmented reality environments. Will all aspects of the whole person paradigm be equally affected or will there be cognitive trade-offs on the level of an individual? How hardy will the relationships be when identities shift with greater frequency? Will authenticity become more adaptable based on environmental context? Will communities become stronger as they are dynamically networked or will they marginalize some members such as those individuals whose assistive technologies require greater time to use? IoT-enabled communities will result in the availability of greater numbers of data flows. Many different elements and dimensions can be analyzed perhaps in real time. Hypothesized data relations and seemingly unrelated data flows can be used for decision making. "Machine learning algorithms and other techniques can be used to seek patterns in large data sets" (Swan, 2012, p. 239).

Attentional focus on and awareness of internal body sensations involve a construct of body awareness (Mehling et. al. 2009, p. 1). Smart vests are an example of an IoT-enabled wearable currently being used for military and law enforcement. As smart vests become available to consumers to wear as part of daily living, the wearable physiological monitoring system that measure heart rate, blood pressure, body temperature, galvanic skin responses will add to the available information that make up body awareness. Smart vests can even perform an electrocardiograms (ECG) (Appelboom et. al., 2014, p. 2).

Another construct related to body awareness is 'body image' implying that body awareness includes a visual channel of perception. Awareness of physical sensations that relate to emotions is necessary for regulating affect and for the sense of self (Mehling et al., 2009, p. 2). Truman (2014) posited a construct called virtual physioception that was made up of sensations combining interoception, exteroception, and proprioception while using avatars in collaborative virtual worlds. Quantifiable measures were lacking and may be better aligned now that the Internet of Things has more sensors available to provide data.

Mehling et al. (2009) described a theoretical model for the body awareness construct made up of following four inter-related dimensions 1) Perceived body sensations 2) Quality of attention 3) Attitude of body awareness 4) Awareness of mind-body integration (p. 12). With sensor data available using the Internet of Things it may be possible to have a much greater understanding of the brain. Insights on mental performance optimization techniques and a variety of emotion reading, mapping, and management programs may be possible to track over time and within various contexts (Swan, 2012, p. 224).

Cultivating identity and stewardship of self requires behavioral change that may break habits and form new ones. A possible progression of the personal monitoring required to invest in behavior change with IoT tools is 1) start tracking 2) obtain data 3) analyze data in infographics 4) interpret and determine

meaning 5) try a behavior change 6) maintain the behavior change through the three week required for new habit development 7) produce a long-lasting change (Swan, 2012, p. 240). Interpreting motives for change may be the holy grail of IoT use. Behavior change may be more possible from having access to the more fundamental drivers of human behavior, both at the individual (self) and overall human (society) level. "In the near-term it may be possible to have 24/7 access to more rigorous neural data streams, emotion-mapping information, motivation triggers, productivity determinants, and other transformative new data flows" (Swan, 2012, p. 243).

An additional area of future research will surround how communities use social media, virtual worlds, and IoT for participatory design of smart communities. Micro-electro -mechanical systems (MEMS) or very small devices that will interact with human biology and interconnect within smart communities across society.

MEMS and sensors are ubiquitous in products including cars, kitchen appliances such as toasters and wearables representing an $11B industry forecast to grow to $22B by 2018. Industry groups including MIG, IEEE, MIPI Alliance, iNEMI are working together to create standards that will promote scalability of IoT. A testing certification program has been proposed to provide conformity assessment. With standards around data sheet naming, definitions, testing procedures, and reporting, independent testing would not be necessary. More resources could be allocated for designing IoT applications. Currently there are over 14 types of sensors, over 18 sensor vendors, over 26 sensor product lines, and over five software libraries among third-parties (IEEE, 2015).

Collaboration in support of operating and maintaining communities is predicted to increase as public safety concerns heighten from severe weather. The consulting group IDC cited that IT investments will rise 30% for predictive needs for cities and counties as the number of chief digital officers grows fivefold by 2018 (Government Technology, 2015).

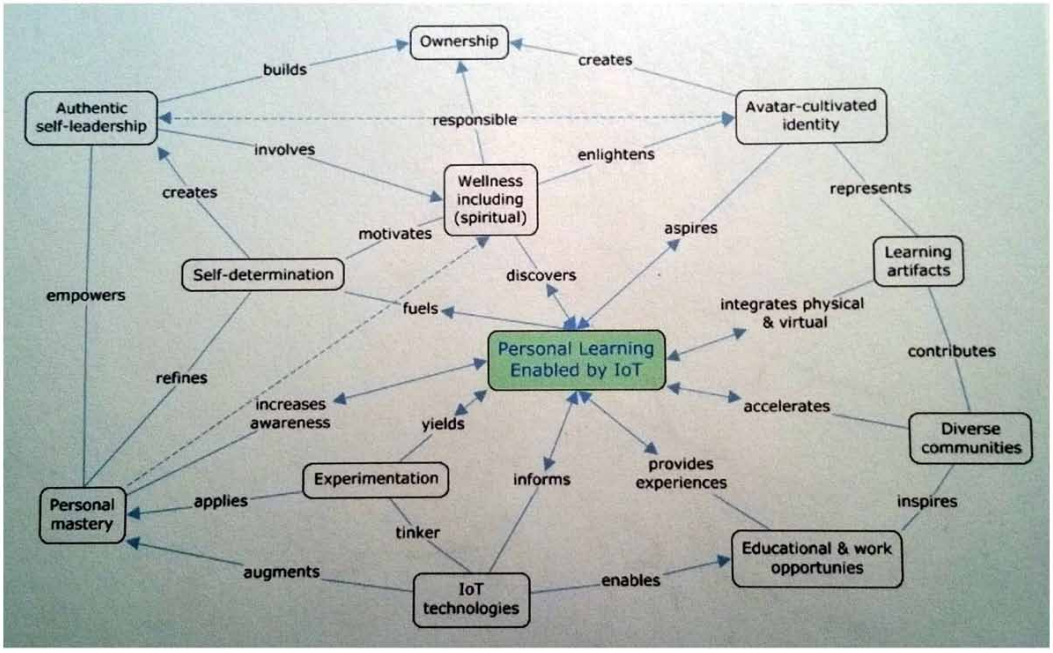
CONCLUSION

In summary, Figure 3: IoT-Enabled Personal Learning Concept, depicts the associations related to the elements that constitute the opportunity to engage in personal learning using the Internet of Things (IoT). The practice of presencing involves sensing, which is deeply personal and essential to co-create the future with others. This practice can become a discipline used in combination of face-to-face interactions and with mediated, collaborative virtual worlds used in virtual learning. The practice of presencing leads to the pursuit of Selfhood over selfhood and involves a commitment to personal mastery.

Personal learning represents a frontier to awareness of selfhood and society when taking into consideration the potential transformative capability of using Internet of Things. Practicing authentic self-leadership is predicted to become easier from IoT-enabled data that shapes identity made available from body awareness and body image. Practicing authentic self-leadership may become more of a challenge as environments shift more frequently due to the IoT-enabled augmented reality layers that provide greater expression of self across contexts.

Persons with disabilities and the elderly stand to benefit the most of IoT-enabled, smart communities that are hopefully designed, tested, and approved with members of these groups. Aging in place and healing in place are two other areas that can be transformed by the use of personal learning incorporating IoT-enabled physical environments that are connected through data visualization to constructive virtual worlds.

Figure 3. IoT-enabled personal learning concept. Image credit: Barbara Truman.



For educators, engaging in experimentation with personal learning using avatars, collaborative virtual environments, and IoT for personal use represents an opportunity to practice personal mastery and lead to greater awareness of selfhood. The authors believe that the quest for personal mastery will lead to a more informed self that will result in greater wellness for the whole person: physically, cognitively, emotionally, and spiritually.

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KEY TERMS AND DEFINITIONS

Authenticity: Genuine, accurate, true to one's own character and spirit.

Avatar: An electronic image that represents the embodiment of a person in a virtual world that can be manipulated in appearance, movement, and gesture.

Collaborative Virtual Environment: A virtual space where people can interact with each other using avatars and create sharable content while distributed anywhere in the world through Internet access.

Identity: The distinguishing characteristics that make up a person's qualities, values, and beliefs.

The Internet the Things: Networked/embedded physical objects that collect and exchange data across devices, society that make up smart cars, homes, cities, communities, etc.

Persona: An individual's image or personality that makes up a social façade that someone projects to others.

Personal Learning: Idiosyncratic, self-guided and self-motivated synthesis and mastery of knowledge, skills, and experiences that result in an individual's growth.

Personal Mastery: One of the five disciplines created by Peter Senge representing continuous clarifying and deepening of personal vision, focus of energy, development of patience, and seeing reality objectively.

Micro-Electro -Mechanical Systems (MEMS): Technology of very small devices made using microfabrication such as microsensors and microactuators that convert a mechanical signal into an electrical signal.