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**Gamification & ADA Compliance: Considering Equity**

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**Abstract**

**Purpose** – This paper uses the lens of accessibility, as set forth by the Rehabilitation Act of 1973 and the American Disabilities Act (ADA) of 1990, to explore the issue of access to digital technology. More specifically, this article focuses on gamification, considers the needs of all learners, including those who identify as disabled, and raises important inquiries about equity and access to technological instructional materials.
**Design/methodology/approach** – Juxtaposing Kapp's (2012) nine elements of gamification with aspects of accessibility, this paper conceptualizes the challenges and possibilities associated with gamified instructional approaches.
**Findings** – Although there are many benefits of gamification, there also are potential barriers that may exist for disabled learners navigating online educational spaces that include one or more of the following aspects of gamification--game-based, mechanics, aesthetics, game thinking, engage, people, motivate action, promote learning, and solve problems. Notably, online spaces enhanced with gamification elements present potential access barriers and challenges to learners with auditory, cognitive, neurological, physical, speech, or visual disabilities.
**Research limitations/implications** – This paper initiates an important discussion and incepts additional investigations into supporting disabled learners. Withal, by examining gamification through the lens of accessibility, this paper contributes yet another perspective of teaching, learning, and instructional design.
**Originality/value** – In addition to socioeconomic factors that may preclude one from engaging in digital play, there is a larger question of how, if at all, gamification is accessible to learners with auditory, cognitive, neurological, physical, speech, or visual disabilities or impairments. This paper raises important questions for educators, education researchers, and game and instructional designers alike to support ubiquitous access to gamified digital materials in general, and online, gamified materials.

**Keywords** ADA, Disabilities, Gamification, Accessibility, Compliance

Paper type Conceptual

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## Introduction

John Dewey (1902) explained that students' "learning and achievements are fluid and moving. They change from day to day and from hour to hour" (p. 20). Meeting *all* students' needs, in general, is an important, complex task, mainly because learning experiences and needs are continuously changing. For students with auditory, cognitive, neurological, physical, speech, and visual disabilities, the Americans with Disabilities Act (ADA) of 1990 has provided meaningful accommodations to support learners' experiences and achievement.

Almost two decades into the twenty-first century, when "pretty much everything is now 'digital,' or involves digital technology in some way" (Buckingham, 2018, p. ix), ADA preparedness has increasingly become a major concern for educational institutions even if the laws are still in flux. National statistics indicate that, in 2015-2016, 6.7 million learners ages 3-21 received special education services for a variety of disabilities (NCES, 2018). In higher education alone, approximately "2.2 million learners…have a documented disability" (Stevens, Schneider and Bederman-Miller 2018, p. 27). Furthermore, assistive efforts have supported learners' achievements, as accommodation has been connected to "improve[d] grades…and persistence to a degree" (McGregor et al., 2017, para 5). In other words, accommodations not only are necessary for those with a disability, but also make a positive difference in their academic experience.

Although the US Department of Justice acknowledged that "poorly designed websites can create unnecessary barriers for people with disabilities, just as poorly designed buildings prevent some from entering" (Website Accessibility, 2007, p. 4), more recently, that same governmental arm "is evaluating whether promulgating regulations about the accessibility of Web information and services is necessary and appropriate (Federal Register, 2017, para 9). Nonetheless, accessibility for all learners remains an imperative even if the US government is not currently mandating website compliance. Thus, turning specifically to online educational spaces, this article examines elements of gamification considering recent discussions of accessibility compliance to meet the needs of all learners.

## Defining Terms

The amended Americans with Disabilities Act of 1990 (2009), defines the term, *disability,* as:

> A physical or mental impairment that substantially limits one or more major life activities of such individual; major life activities include, but are not limited to, caring for oneself, performing manual tasks, seeing, hearing, eating, sleeping, walking, standing, lifting, bending, speaking, breathing, learning, reading, concentrating, thinking, communicating, and working… the operation of a major bodily function, including but not limited to, functions of the immune system, normal cell growth, digestive, bowel, bladder, neurological, brain, respiratory, circulatory, endocrine, and reproductive functions. (Sec. 12102. Definition of disability, 2009)

Years before the passage of the ADA, Section 504 of the Rehabilitation Act (1973) banned any institutions receiving federal funds from discriminatory practices based on disability. Respectively, Section 504 of the Rehabilitation Act succinctly outlines that

any "college, university, or other postsecondary institution, public system of higher education, school districts, whether private or public" is not to exclude learners "solely by reason of his or her disability, from participation, be denied the benefits of, or be subjected to discrimination under any program or activity" (Section 504 of the Rehabilitation Act, 1973). These legislative Acts, in addition to the 2008 amendments, explicitly set a solid foundation for contemporary requirements, namely that educational technology procured, developed, and implemented by educational institutions be accessible to individuals with disabilities.

Although the ADA and the Rehabilitation Act work in concert to protect those who identify as disabled, their interpretation becomes complicated by the expanding use of technology in education, as well as considerations for the inclusion of technological trends. In the past five years alone, there has been an increased use of Open Educational Resources (OER), mobile learning, Massive Online Open Courseware (MOOC), and wearable technology, many which boast gamified features. Consequently, there is an increased obligation for practical narratives regarding these learning experiences to focus on accessibility, inclusiveness, and implementation methods to avoid digital barriers for learners with disabilities while interacting with these types of educational technology.

Given the scope of "educational technology," this article focuses precisely on gamification and the related potentials and possible pitfalls of gamified approaches in education with regards to ADA compliance and meeting the needs of all learners. Although ADA compliance concerns may, at times, make gamification seem like an unlikely approach to teaching and learning for all learners, this is not the case. As explained in this article, some studies boast the potential benefits of gamification. The purpose of the article is to identify features of gamification that may support some learners but may be problematic for others. Doing so does not vilify gamification; rather, such a focus underscores a sensitivity to learners with disabilities and creates opportunities to refine, supplement, or reimagine aspects of gamification to be responsive to the needs of all learners.

ADA is often discussed as the umbrella of the Rehabilitation Act, as the ADA specifically offers guidance regarding technology use. Moreover, given the relatively new application of ADA compliance with today's technologies, this argument challenges the field to examine equity through an accessibility lens about digital technologies in general, and online gamified approaches.

This article draws upon the features of gamification to initiate a meaningful discussion about the accessibility of gamified digital spaces. Gamified digital spaces may include, but are not limited to, Learning Management Systems (LMS) that typically support web-based content delivery and participant interaction (e.g., Moodle, Blackboard, Canvas); Content Management Systems (CMS) that enable the modification of a website through the use of variety of modalities and program codes (e.g., WordPress); virtual training and professional development through simulations or scenario-based training (e.g., Captivate, Articulate Storyline); online programs and formal web-based curricula that feature adaptive instruction, games or timed activities that involve advancing to the next level (e.g., IXL, iReady). Given the range of digital spaces and the scope of this article, the purpose of this article is to provide a perspective of accessibility to inform the ways gamification is adopted and adapted in and beyond educational spaces.

## Background

Although Congress passed the ADA in 1990, there were earlier efforts to support accessibility for all. In the 1970s in San Francisco, California, communities mobilized a successful campaign for equal access (Mayerson, 1992). These efforts resulted in the issuance of Section 504 on May 4, 1977. Section 504 requires institutions to provide individuals with disabilities equal opportunities to participate in offered programs and benefit from available services. In 1998, given technological changes, Congress added section 508 to the Rehabilitation Act, initially enacted in 1973. Specifically, Section 508 requires Federal agencies to ensure that persons with disabilities (both employees and members of the public) have comparable access and use of electronic information technology. Section 504 and 508 regulations provide the foundation of today's ADA. Any instructional material, including electronic and information technology used, maintained, developed, or procured by a public or private institution, must be accessible to those who are disabled.

Additionally, ADA regulation Titles II and III may help guide institutions on accessibility compliance, but even with these guidelines in place, there is still work needed, especially since gamification is not part of ADA accessibility recommendations (Americans with Disabilities Act Title II Regulations, 1990). Furthermore, the ever-evolving nature of technological designs and approaches need to account for ADA compliance *continuously*. Whereas some programs and interfaces may be accessible to people with auditory, cognitive, neurological, physical, speech, and visual disabilities, the inclusion of gamified approaches or designs might complicate compliance. This article calls attention to how accessibility compliance relates to gamification and initiates important discussions about ways to meet all learners' needs. In what follows is an explanation of additional regulations, as well as an examination of compliance with web-based materials.

## Additional Regulations

### *Title II and III*

The regulations of the ADA Title II require institutions to ensure instructors disseminate course materials to all individuals, providing those who identify as disabled to receive "equally accessible information technology" (Definitions of disability, 1990). Sections § 35.160 of Title II regulations specifically state:

Although the language of the ADA does not explicitly mention the Internet, the Department has taken the position that Title II covers Internet Website access. Public entities that offered services via the Internet must ensure equal access to services "unless doing so would result in an undue financial and administrative burden or a fundamental alteration in the nature of the programs, services, or activities being offered. (Nondiscrimination on the Basis of Disability, 2016)

Although Title II supports a dialogue about accessibility for all, it also provides leeway for programs that are fundamentally gamified to remain as such without making accommodations for learners with disabilities.

Moreover, in 2014, the Office of Civil Rights (OCR)[1] received 176 complaints related to face-to-face classroom technology access (US Department of Education, 2012). The OCR explicitly stated their finding as based on Section 504 and Title II,

[1]The OCR identifies equivalency as timeliness of delivery, translation accuracy, and mediums that are appropriate to the importance of the message and appropriate for all learners to access (Office of Civil Rights, 2015).

requiring schools and colleges to "ensure the technology used is fully accessible to individuals with disabilities or otherwise to provide equal access to the educational benefits and opportunities afforded by the technology"(Office of Civil Rights, 2015).

Whereas Title II is specific to discrimination by state and local government-based institutions, including public schools and universities, Title III of the ADA addresses discrimination by public and commercial institutions, including independent private schools and universities (Frazzini-Kendric and Maher, 2016). Title III protects those who identify as disabled the right to physical access and to "participate in or benefit from the goods, services, facilities, privileges, advantages, or accommodations of a place of public accommodation" (Prohibition of Discrimination by Public Accommodations, 1990). The spaces outlined in Title III include educational, physical spaces, such as simulation rooms and training equipment.

In the effort to provide more specification and clarity for interpretation of accessibility requirements set forth by the Federal government, on October 8, 2010, Congress enacted the Twenty-First Century Communications, and Video Accessibility Act (CVAA) into law, which focuses on access to modern technology, including communication and video programming. Notably, Title II of the CVAA requires explicitly:

> User controls for TVs and other video programming devices to be accessible to people who are blind or visually impaired and requires TVs and other video programming devices to have a button, key, icon, or comparable mechanism designated for activating closed captioning and video description. (Accessibility Act of 2010 - Pub. L. 111-260)

Simply put, the CVAA of 2010 extends legislation and centers on hardware-specific accessibility and the importance of accommodating people with visual and hearing disabilities and impairments.

Transitioning from hardware to software use, the Web Content Accessibility Guidelines (WCAG) may not be a law or Act, but its guidelines initiate an important shift to examine content accessibility. Developed by the World Wide Web Consortium (W3C) "with a goal of providing a single shared standard for web content accessibility that meets the needs of individuals, organizations, and governments internationally" (Web Content, para 1), Web Content Accessibility Guidelines (WCAG) were incepted as robust and pragmatic, intending for any entity posting online content for an audience. More specifically, W3C's WCAG guidelines define web accessibility as follows:

Web accessibility means websites, tools, and technologies designed and developed so individuals with disabilities can access and utilize them. More specifically, access and utilization are in the form of their ability to:

- perceive, understand, navigate, and interact with the Web
- contribute to the Web

Web accessibility encompasses all disabilities, including:

- auditory
- cognitive

- neurological
- physical
- speech
- visual

("What is Web Accessibility," 2018)



This article focuses on these six disabilities when addressing gamified online learning regarding accessibility concerns. In the effort of initiating the conversation on gamification and accessibility, disability terms are initially defined, followed by an introduction to gamification, and lastly a discussion of gamification about issues of accessibility based on W3C's WCAG guidelines.

## Defining W3C's Noted Disabilities[2]

In addition to the ADA definition of disability, the W3C's list of disabilities helps to facilitate a discussion of accessibility compliance regarding digital technology and online spaces. In what follows are definitions of each of the disabilities above, along with W3C-based suggestions for accommodation.

Auditory, or hearing, disabilities may impact for those experiencing slight to severe hearing impairments, including permanent hearing loss (Van Naarden Braun et al., 2015; Web Accessibility Initiative, 2017). There are some ways to support people with auditory disabilities. These include, but are not limited to, offering transcripts of audio content, providing users the ability to adjust the speed and volume of the audio, and emphasizing foreground sound (thereby separating it from background noise).

Cognitive and mental health disorders also classify as a disability, even if they are not necessarily neurological. Notably, the disability affects one's dexterity or ability to perform major life activities (Outcalt et al., 2015; Web Accessibility Initiative, 2017). Cognitive disabilities encompass a range of impairments and disorders, including, but not limited to: anxiety, seizures, memory impairment, attention disorders, processing disabilities, learning disorders, and socio-cognitive impairments related to Autism spectrum disorder. Thus, online sites need to consider how the structure, labeling, and presentation of information may agitate and support the learner. Some users will need sound or images to help facilitate their reading of a text, and others may need consistent buttons and functions across the site. Additionally, some may need simple and short sentences, and others may need to adjust the size and presentation of information on the screen.

*Neurological* disabilities do not necessarily affect one's intelligence, yet they impact the nervous system with secondary impairments of dexterity, hearing, sight, and comprehension (Mung'ala-Odera et al., 2006; Web Accessibility Initiative, 2017). Although some of the accommodations for those with cognitive disabilities may also apply to those with neurological disabilities, there are specific changes that can be made to meet the needs of those with neurological disabilities. For instance, online sites need to offer users the ability to turn off or diminish any animation, as well as blinking, flashing, or bright lights.

*Physical*, or motor, disabilities range from muscle weakness to total loss of

[2]It is difficult to discuss disability without recognizing impairment as the two relate to a range of noted limitations. Oliver (2017) defines impairment as the functional limitations of physical, mental, or sensory within an individual (p. 41), and this is the leading definition for many recognized research institutions. Moving to a more severe state, disability is "any restriction or lack (resulting from an impairment) of ability

to perform an activity in the manner or within the range considered normal for a human being" (Oliver, 2017, p. 41, as cited in Disabled Peoples International, 1982).



sensation. Physical disabilities affect dexterity (e.g., arthritis) or muscle control (e.g., Parkinson's disease) (Web Accessibility Initiative, 2017; Macías, Meza, Garcia and Bozada, 2018). In addition to offering large clicking surface areas, more time to complete operations, the use of auto correction, and other ways to support those with navigation bars", and incorporate design aspects to support those with cognitive or visual disabilities (Diverse Abilities and Barriers, 2018, para 5).

*Speech* impairments or disabilities may affect one's ability to produce sound (e.g., aphonia) or present secondary to a primary neurological condition that affects their ability to understand speech produced by others (e.g., aphasia) (Web Accessibility Initiative, 2017; Alfonso, and Flanagan, 2018). Sites that include a voice-related feature, such as team talking or phone numbers for customer service, are to offer text-based alternatives for users with speech disabilities. Alternatives include text-based options for interactions, such as email, forums, feedback forms, and internal messaging.

*Visual* impairments or disabilities are similar to hearing impairments in their range from mild to severe, or permanent. Additionally, color blindness affects 8.5 percent of the United States population and may impair one's ability to see specific color or decreases their tolerance to high contrast, or bright colors (Shogren, Luckasson and Schalock, 2017; Web Accessibility Initiative, 2017). It is essential for online content providers to offer customizable text, colors, images, and layouts that maintain the same information, even when resized. The combination of visual and non-visual cues, such as audio descriptions or "text-to-speech synthesis of the content" also assist visually disabled users (Diverse Abilities and Barriers, 2018, para 10). Additionally, sites are to remain consistent with navigation features and offer the use of keyboard tools that enable users to customize authoring and interaction.

Given the W3C's definitions of and related suggestions to support learners with auditory, cognitive, neurological, physical, speech, and visual disabilities, there is room to discuss gamification and accessibility considerations. In the next section, following a general overview of gamification, there is a discussion of its elements in accounting for accessibility to learners with disabilities.

## Gamification

Gamification may be related to gameplay, but it originated in the business sector and included a system of rewards that, ultimately, was intended to motivate the end user. For example, airlines and credit card companies are known for offering frequent flyer and reward points, and these awards incentivize product interest and use. Indoor cycling classes boast leaderboards to spark competition (with self or others). Even classrooms include similar approaches when points or other types of rewards, such as gold stars, classroom privileges are used to regulate learner behavior and motivate production. Gamification often is associated with rewards-based approaches, and although they seem useful initially, they may defy the importance of the interactivity, engagement, and feedback that are fundamental to gameplay and part of gamification. Kapp (2012) explained that gamification *extends beyond rewards to inspire engagement and personal and collective challenge*:

> Don't think of gamification as only the use of badges, rewards, and points. Instead, think of the engaging elements of why people play games--it's not just for the points--its [sic] for the sense of engagement, immediate feedback, and the success of striving against a challenge and overcoming it. (p. xxii)

In other words, gamification is not a simple concept *solely* associated with points, badges, and accolades. It is about the use of "game thinking and game mechanics to solve problems and engage audiences" (Zichermann and Cunningham 2011, p. ix), and it often involves engagement in challenges at an adaptive pace (Author2 and Colleague, 2015).

Lee and Hammer (2011) suggest that gamification exists on a spectrum, and conceptualizing gamification in this manner highlights the wide range of ways in which to adopt the approach. More specifically, at one end, instruction includes rewards and game-related monikers, and, at the other end, there is a fully integrated curricular design based on game principles:

> At one end is gamification at the *micro-scale* -- individual teachers who gamify their class structures. For example, Lee Sheldon, a professor at Rensselaer Polytechnic Institute, discarded traditional grading in favor of earning "experience points" and converted homework assignments into quests (Laster, 2010). At the other end of the scale, *Quest to Learn*, a new charter school in New York City, uses game design as its organizing framework for teaching and learning. Game designers work together with teachers to develop playful curricula and incorporate game elements into the entire school day. (Corbett, 2010, p. 2)

Lee and Hammer further suggested to integrate gamification with various school activities, and the authors underscored that gamification "can only provide tools" to enhance education (p. 3); educators and education researchers need to consider what problems will be solved and how gamification tools will support, not supplant instruction.

A systematic review of the literature of gamification suggested that gamification "seems to contribute to collaborative work and team performance positively, enjoyment and well-being" (Ferreira et al., 2017, p. 287). However, that same study also revealed a need for more empirical studies to determine the role of gamification in the workplace. Others (Zichermann and Linder, 2013) argued that gamification could engage people in a "eustress behavioral loop" which essentially promotes good stress as one experiences achievement. In other words, gamification has a host of potential benefits, from engagement and collaboration to adaptive learning and feedback.

Despite these positive possibilities supported by gamified approaches, when it comes to accessibility compliance, the question of access becomes central to the discussion. In addition to socioeconomic factors that may preclude one from engaging in digital spaces, there is a larger question about how, if at all, gamification is accessible to those with auditory, cognitive, neurological, physical, speech, and visual disabilities.

When defining gamification, Deterding, Dixon, Khaled, and Nacke (2011) suggested that the term denotes "the use of game design elements in non-game contexts" (p. 10) and relates to "*games,* not *play* (or playfulness)" (p. 11, emphasis in original). This distinction is important because it underscores the rule-bound design space of games and gamified approaches, and, regarding accessibility, it suggests that there are discrete features of games that can be examined to determine accessibility.

Whereas Deterding and colleagues (2011) clarified the concept of gamification through features, such as gamefulness, gameful interaction, and gameful design, Kapp's (2012) nine elements of gamification—game-based, mechanics, aesthetics, game thinking, engage, people, motivate action, promote learning, and solve problems—help to pinpoint and categorize specific elements of gamification that can illustrate areas needing attention with regard to accessibility. As such, Kapp's framework helps to facilitate a discussion about the elements of gamification regarding accessibility compliance.

In what follows, there is an explanation of each of the nine elements, a discussion of their potential benefits, along with words of counsel and caution for those in and beyond the field of education as they contemplate gamification of digital spaces in consideration or auditory, cognitive, neurological, physical, speech, and visual disabilities and accessibility compliance. This article does not intend to privilege a specific gamification element, nor does it suggest that gamification is an inappropriate pedagogical choice. Instead, through an accessibility compliance lens, this article calls attention to possible affordances and constraints of gamification in meeting the needs of all learners. More specifically, the discussion draws upon Kapp's (2012) nine elements of gamification that highlight potential benefits, while also outlining potential accessibility challenges. Across the nine elements, one or more of the six disabilities is addressed, developing a comprehensive discussion of *possible* accessibility concerns related to gamification.

### *Game-Based*

According to Kapp (2012), an approach that is game-based involves "a system in which learners, players, consumers, and employees engage in an abstract challenge, defined by rules, interactivity, and feedback that results in a quantifiable outcome and, ideally, eliciting an emotional reaction" (p. 11). Game-based learning also is associated with collaborative problem solving, knowledge-sharing, and reflective, critical thinking (Author2, 2017; Chen, Wang, and Lin, 2015; Shih et al., 2010), and Kapp acknowledges that the game-based mechanics are related to problem-solving. Kapp's distinction of game-based also calls attention to overarching features that address the task (e.g., "abstract challenge"), the boundaries ("rules," "quantifiable outcome"), aspects of collaboration (e.g., "interactivity"), and player response ("emotional reaction"). These all have the potential to support and promote personal engagement and investment in the task at hand.

Kapp's definition of game-based also is helpful when discussing accessibility because the aforementioned game-based features identify categories—from the task to the desired outcome—and support an examination of these constructs in light of accessibility considerations.

#### *Accessibility Considerations*

##### *Auditory*

Given that game-based features may involve sounds denoting success or failure, or the movement of images/entities on the screen, those with auditory disabilities require visual cues to accompany sounds.

##### *Cognitive and Neurological*

In consonance with Papagno and Trojano (2017), cognition is related to one's level of responsiveness, recall, information-processing, decision-making, or communication. Kapp acknowledged the importance of game levels in creating the coherence and structure needed to sustain player engagement, reinforce and apply skills, and create "achievable goals" (p. 39). Individuals who are cognitively disabled are more likely to require sequenced learning activities (Van Hees, Moyson and Roeyers, 2015) that can be supported by well-designed, scaffolded levels. However, it may be problematic for some learners if the gamified approach includes branch-like scenarios wherein specific moves and conditions present options to explore different (and possibly bifurcated) contexts, including, but not limited to, new directions, realms or levels. With over 16 million individuals in the United States living with cognitive-related disabilities (CDC, 2011), a large segment of the population may experience barriers using this form of learning depending on how—and in what ways—gamification informs the instructional sequence. Consequently, there may be a digital divide among peers who do not identify as disabled and those who do. These are points to consider regarding compliance.

Additionally, based on the provided definition of game-based, there are concerns regarding the "emotional reaction" for those who have increased sensitivities to sounds, moving images, and feelings of failure, as these features may startle learners who are cognitively sensitive. Though gamification results in many positive outcomes, a review of the literature revealed that responses to gamification could be idiosyncratic; not everyone enjoys competition and not all respond the same way to gamified approaches in the classroom (Faiella and Ricciardi 2015). Through the lenses of accessibility, one may become more aware of the range of responses to gamified approaches.

### *Mechanics*

Based on Kapp's definition, mechanics inform the reward system of the game. "Gamification can contain multiple levels such as a mini-game and other techniques and mechanics to bring a learner from a lower place in the knowledge hierarchy to a higher place." Such leveling-up often is associated with rewards in the form of points and badges, as players maneuver within the structure of the game; the latter includes, but is not limited to, the rules, time constraints, and feedback systems. Kapp noted that games include relatively constant feedback that includes information about accuracy (being right or wrong) and provides guidance (for more about the intricate nature of feedback and feedback loops in games and video games, see Author2 & Colleague, 2013, in press; Salen and Zimmerman, 2004). Regarding accessibility compliance, educators, education researchers, and designers of gamified spaces need to question ways a feedback system hinges on a specifically chosen modality (e.g., sound, image, motion) that may help some, but not all, learners.

#### *Accessibility Considerations*

##### *Visual and Auditory*

It also is possible that the feedback system may privilege those who are not disabled. Real-time feedback methods used in gamification includes, but is not limited to, alphabetic text accompanied by images (e.g., thumbs up or a green check to signal achievement), options to receive audio feedback, and the opportunity to view highlighted errors or suggestions for improvement.

*Cognitive and Neurological*

The ADA and Rehabilitation Act protects individuals who are physically or cognitively disabled, as their uniqueness substantially affects a major life activity (such as seeing, hearing, learning, reading, concentrating, or thinking) or a significant bodily function (Hastings and Harrell, 2017). If a gamified approach involves time-based activities or kinesthetic movement for navigation, then it is possible that those who are disabled may not have equal advantages as others.

*Physical*

Moreover, individual physical abilities may influence success or achievement in gamified activities. For instance, The National Council on Disability (NDC) (2011) research indicated that a digital divide exists among those who identify as disabled and those who do not. This NDC case study also found barriers and challenges among participants with low or no vision in navigating by keyboard and performing utility functions (p. 182), while attempting to partake in the learning activity. Lastly, the study participants also expressed a lack of awareness that certain technologies even existed (p. 183).

### *Aesthetics*

For this section, Kapp focuses on the "look and feel" of the game space graphics or the overall experience. In Kapp's review of literature of aesthetics, learning and virtual spaces, Sköld (2012) acknowledged that "some scholars argue that the realistic aesthetic of some three–dimensional virtual spaces can be utilized to efficiently convey information about the physical world" (para 39).

To Kapp's point, aesthetics helps to shape the overall gamified experience. Kapp explains, "How experience is aesthetically perceived by a person greatly influences his or her willingness to accept gamification" (2012, p. 11). Aesthetic perception also seems related to Gee's (2003, 2007) concept of the projective identity, which ultimately underscores the personal responsibility the player feels for his/her on-screen actions even if they are fictitious. Kapp, too, discusses the importance of games not being too realistic because "people easily relate to nonhuman characters…because when we interact with a highly stylized or abstract character we are comfortable" (pp. 47-48). The compromising of comfort when the avatar "becomes too humanlike to be considered non-threatening…[and] the learner can become 'creeped out' by the avatar and be unable to relate" (p. 48). Therefore, aesthetics can evoke and provoke an emotional response from the learner.

*Accessibility Considerations*

*Cognitive or Neurological*

Given that aesthetics involves the graphics of the space, it will be important for any flashing or brightly lit images to be modifiable for those with cognitive or neurological disabilities. Likewise, it is possible that the overall experience "feeling" like one is in the game may cause anxiety or emotional distress, or, as Kapp noted, may cause the learner to feel "creeped out" (p. 48), and these factors should be examined more closely with accessibility concerns in mind.

*Visual*

Learners who are visually disabled and have low or no vision require an alternate means to consume the "look and feel" of a game — specifically, learners who never experienced sightedness compared to those whose vision-loss or impairment occurred when they were old enough to recall relatable memories and the ability to access their mind's eye. Kapp (2012) purported that aesthetics are vital to one's acceptance of gamification, and it is important to consider ways to convey the "look and feel" of gamified learning activities to meet the needs of all learners.

### *Game thinking*

What Kapp calls "the most important element of gamification" (p. 11), game thinking hinges on the combination of competition, collaboration, narrative, experimentation, and discovery. Although these features are part of game-based learning, the specific emphasis on game thinking helps call attention to the method learners use to develop interpersonal relationships and critical thinking skills. Furthermore, the relationship between competition and cooperation is a game-related concept Author 2 (2017, 2018) has explored in secondary classrooms and has found to encourage social responsibility. Certainly, related to the civic duty noted in Author 2's work, the honing of leadership skills through game thinking is something Kapp underscores.

#### *Accessibility Considerations*

##### *Auditory, Visual, and Physical*

Access and equity challenges and barriers may be present for those who identify as disabled because of factors including, but not limited to, the (a) use of hand-held devices, (b) timed tasks, (c) auditory and visual feedback, and (d) multi-level or branching scenarios.

##### *Cognitive and Neurological*

Competition, collaboration, and cooperation in a game-related activity may pose challenges for individuals who are disabled in cognition and dexterity. Their peers may present a competitive advantage, as most educational gamified activities that require collaboration and team competitions gear towards those considered as non-disabled learners.

### *Engage*

Engaging people in a task is "an explicit goal of the gamification process" (Kapp 2012, p. 11). Kapp notes the importance of involvement, and the narrative implies an aspect of sustained engagement. After all, beyond the initial novelty of gamification, interest, and engagement in a task supports' learners as they attempt to level-up. Although motivation is one of the nine elements, and, thus, separate from "engage," the learning theories that support Kapp's discussion of gamification inherently hinge on or lead to engagement in a task.

#### *Accessibility Considerations*

##### *Cognitive and Neurological*

Dependent upon the learner's recognized disability, games that focus on sustained engagement can be beneficial, specifically for learners who identify with

attention deficiency. However, Ronimus, Kujala, Tolvanen, and Lyytinen (2013), who examined gamification and responses of players without disabilities, found that a gamified reward system and sustained involvement in the program, GraphoGame, did not necessarily advance learner learning, nor increase total playing time.
Although slightly dated, a study published by the Australian Journal of Educational and Developmental Psychology discovered that using the game, Wild Divine, in the classroom was particularly supportive for disruptive learners or those who identify with Attention Deficit/Hyperactivity Disorder (ADHD) (Amon and Campbell, 2008). This study also indicated that gamification oriented toward assisting learners to regulate their breathing and heart rate positively influenced their classroom behavior (p. 49). Despite this positive outcome, it is likely that learners with auditory, cognitive, physical, or visual disabilities would experience barriers using a game, such as Wild Divine, as its navigation requires the use of a mouse and keyboard interchangeably, does not possess captions, and uses color to indicate success and achievement.



Kapp (2013) explicitly indicated that "engagement is the primary focus of gamification" (p. 11), yet more research is needed to examine gamification and increased or sustained engagement, especially for learners with disabilities.

*Physical*

Many learners are limited in dexterity, which may restrict them to using only the keyboard or other assistive devices for digital content navigation.

*Visual*

Engagement is often implemented in the form of feedback as the game progresses. According to the National Eye Institute (2015), 8.5% of Americans are color blind. As certain individuals may face challenges and barriers in seeing low contrasting color and color blindness, content developers are to avoid incorporating online instructional content that uses color to indicate success, progress, or achievement.

### *People*

An important part of gamification is the person involved in the activity. After all, gaming—and gamification—typically involves social activity because of collaborative play and competition. More specifically, Kapp explains that the "people" element consists of "students, consumers, or players" (p. 11), providing the assumption of all people as learners, consumers, and players. After all, by engaging in the activity and with the technology, people are learning, they are consuming—and producing—and they are playing as they explore receiving adaptive feedback.

Accessibility Considerations

*Auditory, Cognitive, Neurological, Physical, Speech, Visual*

Based on the Prohibition of Discrimination by Public Accommodations clause (1990), it is discriminatory to exclude persons by disability, and they must have the opportunity to participate in, or benefit from, services or activities that are equal to that afforded to others. Also, individuals must receive similar, or the same, services or activity benefits as provided to other individuals, unless the optional opportunity is as effective as that provided to others. Considering that Kapp (2012) recognized people and individuals to include "learners, consumers, or players" (p. 11), there is a potential deficiency in the discrimination of individual uniqueness among all people and

approaches to employ gamification that accounts for these distinctive characteristics among all people. In other words, if gamification is going to be part of an activity, then it must be accessible to all.

### *Motivate Action*

Kapp (2012) cites Vygotsky's (1978) concept of scaffolding, as well as the Zone of Proximal Development, which explains that people will remain engaged when appropriately challenged. Doing so calls attention to how a gamified approach typically builds upon prior knowledge and motivates players to continue playing. Kapp's discussion of motivation also underscores the Vygotskian point that, for one to work within the Zone of Proximal Development, "the challenge must not be too hard or too simple" (p. 12).



*Accessibility Considerations*

*Physical*

There are several drivers of motivation studied by use of computer educational games. In a dated publication, Malone and Lepper (1987) outlined heuristics for designing individual motivational learning environments to consist of a challenge, curiosity, control, and fantasy. Interpersonal motivators consist of cooperation, competition, and recognition (p. 246). More importantly, Malone and Lepper define a challenge as "continuous optimal level of difficulty" (p. 248). Hence, as the learner advances, the level of difficulty increases. Regarding gamification for adult learners in higher education, this taxonomy does not delineate whether the learning impacts the content of the game or some other factor, such as speed or mechanical actions.

Additionally, Malone and Lepper defined competition as creating an activity in which a competitor's actions affect each other (p. 249). More recently, Cagiltay, Ozcelik, and Ozcelik (2015) found that undergraduates' motivation and post-test scores increased when learners encountered game-based drill competitions and practicing through online games. Finally, Jensen and colleagues (2016) examined the failure of engagement in digital training games and found that learners who experienced failure, also experienced increased cognitive engagement despite initial effective responses.

*Cognitive and Neurological*

Sailer, Hense, Mayr and Mandl (2017) concluded game elements, such as badges, leaderboards, and performance graphs have the most impact on increased motivation and positively correlated to meeting the participant's psychological needs and satisfaction. The study's results support other empirical research (Domínguez et al., 2013) that reports game design vitality and its influence on motivation. Though Dominguez and colleagues address the possible affordances of gamification, there are other considerations to address. For instance, learners with cognitive disabilities may not experience motivation, however. Instead, they might experience anxiety from the competition and badge-earning component, and others might not be able to process performance graphs and leaderboard information as quickly as others.

### *Promote Learning*

Essentially, Kapp (2012) purported that gamification is rooted in foundational pedagogy and practice while offering a contemporized approach to feedback, rewards,

and encouragement. What Kapp may not have considered, however, is the overwhelming burden the current assessment system rooted in grades and points has placed on the contemporary learner. In other words, even though points may motivate many, reports have shown that students are increasingly overwhelmed and stressed by academic pressures related to grades and testing (Lahey, 2017; NPR/Robert Wood Johnson Foundation/Harvard School of Public Health, 2013; Pope, 2008).

*Accessibility Considerations*

*Cognitive and Neurological*

As Kapp (2012) argued, gamification is a technique to promote learning using game-related features that support meaningful feedback and collaboration. Rigid and inflexible curricula and assessments impose barriers for many learners, particularly those who identify as disabled (Black, Weinberg and Brodwin, 2015; Dalton, 2017; Everett and Oswald, 2018). Furthermore, if feedback and motivation are primarily point-driven, then the process of learning can become second to finding the "right" answer.



***Solve Problems***

Related to the element of game-thinking, the element of problem-solving calls specific attention to the collaborative nature of problem-solving and the role of competition in helping people to achieve: "The competitive nature of games encourages many to do their best to accomplish the goal of winning" (p. 12). Here Kapp's definition seems short-sighted as the element's title is "solve problems" but the focus appears to be winning, and, as such, gamification appears to be more about winning than it is about the process, which is a common misconception.

*Accessibility Considerations*

*Auditory, Cognitive, Neurological, Physical, Speech, Visual*

Kapp's (2012) association of problem-solving and winning as the goal of gamification, in the classroom, misaligns with educator's providing instructional and assessment materials to meet the needs and strengths of all learners. Several researchers (Hamari et al., 2016; Ronimus, Kujala, Tolvanen and Lyytinen, 2013; Looyestyn et al., 2017) expressed the ideology that gamification is best used for engagement appropriately supports the use of technology and technological devices for learning, primarily attributable to accessible and inclusive learning environments. In today's learning environment, there is a mix of learners, learners who identify as disabled, as well as learners from multiple socioeconomic backgrounds. These factors are influential for access to technology and bridging the digital divide, which affords some learners more benefits over others.

## Implications for Future Research

This article initiates an essential discussion about gamification considering accessibility compliance. Although political agendas may influence federal regulations, the ethos of the ADA and the Rehabilitation Act help to promote the inclusion and achievement of *all* learners. Content analyses of websites and programs will support a growing discourse about where and how to address accessibility. Educators, education researchers, and policymakers should begin examining and documenting compliance

issues they confront and offer solutions and best practices that not only support compliance but also generate sensitivity and responsiveness to the needs of all learners.

The definition of gamification presents a potential issue for educational institutions lacking standards and transparency of accessibility compliance. Based on the Prohibition of Discrimination by Public Accommodations Code (1990), institutions need to consider the legal obligation to ensure participation of equal benefit and reasonable participation.

Developers of technologically gamified, high-stakes or low-stakes, activities are to include explanations for images, such as the "alternate text" feature, ensure captions are available for recorded media, allow keyboard navigation of the program, and permit user control for audio, and text size, to repair existing gamified learning programs. As an added measure, online course designers and developer may choose to optimize the visual contrast and avoid using color to convey essential information.

Even though this article addresses accessibility concerns about the gamification of digital spaces, the non-digital classroom space needs attention as well, especially since educators may attempt to gamify non-digital spaces for increased learner engagement. Likewise, learner needs must be identified and considered regarding the activity or instructional approach. Here, too, digital technologies may offer another layer of complication, but there are possible solutions given the relative speed and adaptability of gamified instruction.



Additionally, future research might include the examination of Universal Design for Learning, which underscores the importance of offering multiple ways for learners to access and approach instructional material (UDL) (Gordon et al., 2016). Instructional methods that are flexible underpin an accessible transformation between the course content and various mechanisms for instructional delivery and learner consumption. Accessioning content development with UDL dogma as a theoretical foundation might ensure inclusiveness for all learners without regard to abilities.

Furthermore, researchers are encouraged to consider a host of approaches to supporting learners with disabilities and addressing compliance concerns. Looking to the six identified disabilities, one might consider approaches that include, but certainly are not limited to, the following ways to modify gamified instruction to support learners.

## Implications for Design: Modifying Gamified Instruction

The ADA sets forth inclusive teaching practices, which support all learners in obtaining the course instruction. However, this pedagogical approach is flexible enough to all alterations in how they consume the content. The federal accessibility guidelines support multiple modes of instruction, so long as the learning outcomes remain the same. Developing reliable and pedagogically sound learning outcomes allows flexibility in learning paths to achievement. Consequently, exclusive learning outcomes are inaccessible and more restrictive in assessing knowledge attainment.

### *Auditory*

Audio/video communication, or social informatics, in online courses can strengthen learner's connection with peers (Ching & Hsu, 2015) and provide them with a pervasive discernment of the subject area by conducting multidimensional functions to support collaboration and thought-partnering (Alam and McLoughlin, 2018). Written transcriptions accompanying both audio and video files can satisfy WCAG 2.1

(2018) accessibility guidelines. Closed or open captioning transcribe video and typed transcriptions that are compatible with screen reader technology can accompany lectures or audio feedback to support those with auditory disabilities. Moreover, developers need to include a mechanism to pause, stop, or adjust the volume of any audio that automatically plays for more than three seconds by implementing or embedding a universal player (Pfeiffer and Green, 2015), such as MP3 for audio and MP 4 for sound.

*Cognitive and Neurological*

Kapp acknowledged the importance of game levels in creating the coherence and structure needed to sustain player engagement, reinforce and apply skills, and create "achievable goals" (p. 39). Although gamified approaches may promote learning (Mathrani, Shelly, and Ponder-Sutton, 2016), the WCAG recommends that online instruction contain no more than three consecutive flashes in order to be accessible to learners with cognitive and neurological disabilities (WCAG 2.1, 2018).



*Physical*

WCAG 2.1 (2018) suggests that course developers provide learners with the ability to disable motion animation within the online course or learning activity. Specifically, this guideline helps to prevent physical interactions from being the *only* method to (a) trigger motion animation, (b) complete the learning activity, or (c) obtain information. The only exception to this guideline is if the physical interaction is essential to achieving the learning objective.

*Speech*

Developers are to include a description of a virtual item element's function or its label to provide an alternative learning activity reference that allows learners the ability to partake without any knowledge of its shape, size, or relative position. Typically, these are learning activities that solely rely on sensory characteristics, such as shape, size, visual location, orientation, or sound (WCAG 2.1, 2018) to meet this criterion.

*Visual*

Learners with visual impairments and disability express difficulty with screenshots (Ondin, 2015), or graphical instructional materials which lack adequate textual descriptions for translation by screen reader assistive technology. WCAG 2.1 (2018) suggests that the use of headings, spacing, tabulated tables, and form fields can support learners with visual disabilities. Likewise, gamified instructional activities heavily reliant on color to convey instruction, to indicate an action, to prompt a response, or to distinguish elements from one another can be problematic; alternative text for assistive technology translation and auditory cues may help support the visually disabled.

Finally, the concerns addressed in this review extend beyond the educational space, considering that employers are also using gamification for assessments that determine an applicant's candidacy. As technology advances, gamified assessments can account for player behavior, reaction acknowledgment, measures awareness, and additional characteristics that associate with an applicant's' job performance. The assessment then provides a numerical score to correspond with the likelihood of each

player becoming an outstanding employee (Behm, 2016). According to the amended ADA, such tests "*tend* to screen out an individual with a disability or a class of individuals with disabilities unless the standard, test or other selection criteria" *(ADA Amendments Act, 2008)*. More research is needed to identify the extent to which gamified employment and hiring practices have impacted applicants who identify as disabled.

## Conclusion

Overall, this article initiates the important discussion of accessibility compliance about gamified online educational spaces, and it calls for future research to address ways in which all learners' needs can are met inside and outside of the classroom. Within and beyond the field of Education, gamified approaches can be complicated or straightforward, supplemental or integrated. What is clear is that, despite best intentions to motivate and engage learners or determine knowledge and skill sets, gamified designs may not be accessible to those with auditory, cognitive, neurological, physical, speech, or visual disabilities.

Furthermore, accessibility compliance may not necessarily be in an educator's or even a designer's full control. With greater attention to ADA and WCAG guidelines, as well as future regulations that support access for learners with disabilities, educators and designers may be able to enhance the benefits of gamified learning approaches and meet all learners' needs. Likewise, increased sensitivity to and awareness of accessibility compliance may support the creation of gamified curricula, activities, or programs that are responsive to all learners' needs, while also supporting educators' and designers' ability to refine and share best practices that honor accessibility.



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