Differentiated Design Literature Review

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Abstract

Differentiated instruction is a philosophy that individualizes instruction for the learner based on their readiness, interest, and learner profile. This learner-centered instructional framework is used primarily in K12 education, but should be applied to the area of workplace performance and training in order to insure the individual needs of a diverse workforce are being met. In workforce training, game-based learning is growing in popularity, especially with younger workers, and companies are striving to provide adaptive learning, engagement, and motivation via games and gamification to meet expectations of Millennials. This paper examines the research in differentiated instruction to see if it is being used to meet the diverse needs of learners/employees in the workplace. The keyword search using Google Scholar, Questia, and The University of Birmingham library database began with “differentiated instruction,” “gamification + workplace,” as well as “differentiated instruction + gamification + workplace” and evolved from there. Textbooks, peer-reviewed journals, educational handbooks, conference proceedings, white papers, and dissertations were examined to determine if the differentiated instruction framework was being used to develop workplace, game-based instruction. The research reveals a few gaps in the literature: (1) there is not a well-developed body of research on differentiated instruction for adult learners; (2) it is not clear if targeted assessment of individuals are being done to establish learner profiles and plan personalized instruction accordingly; (3) there is a lack of research to address the quality of, or to quantify the types of, digital games used for training in the workplace (or e learning); (4) there is a need for studies to assess the satisfaction with

game-based training in the workplace with age groups other than Millennials; (5) the need exists for research about how to provide for learners who are unsatisfied with games/gamification in the workplace. Finally, (6) a review of the literature concerning the use of a differentiated instruction as a framework for developing workplace, game-based training reveals that a differentiated instruction evaluation tool should be created (and used) to evaluate whether training meets the needs of diverse populations according to individual readiness, interest, and learner profile.

Introduction

This paper traces the movement of differentiated instruction from the schoolhouse, with the democratic school movement, to the modern workplace, where game-based training and gamification offer opportunities for personalizing training for individuals. Game-based learning is touted as a solution to replace one-size-fits-all training, thereby increasing employee motivation and engagement, but this question remains: Are game-based training and/or gamification in the workplace well-suited to meet the needs of diverse populations by differentiating instruction and providing inclusive experiences for all learners?

Body

Differentiated instruction stands as a contrast to traditional instruction. In traditional instruction, the teacher and content are the center of the learning (lecture-style, whole-group setting), the content is seen as fixed and consumable, the process is thought to be transmission of knowledge from a source (textbook or expert lecture) to the students, and outcomes are described in terms of behavioral objectives where all students are assessed by the same methods and must meet the same standards, under the same conditions. On the other hand, “differentiated instruction is an approach whereby teachers adjust their curriculum and instruction to maximize the learning of all students” (The Iris Center, 2010). A differentiated classroom is learner centered, utilizes flexible grouping of students (depending on the need and the task), provides multiple types of instruction (lecture, videos or role-play, computer software hands-on activities, etc.), allows learner choice with assignments, as well as with assessments (learners co-

direct their learning and evaluations). Formative assessments throughout the learning process allow the teacher to modify and guide the instruction to meet individual learners' needs. For the teacher and student in a differentiated classroom, "'Success' refers to an individual student's academic growth" rather than their test scores (The Iris Center, 2010).

Differentiated instruction has roots in the democratic school movement, which was inspired by critical educational theorist, John Dewey. This movement pushes back against traditional education by proposing that "our schools should emphasize commitment to a democratic system in which each citizen's autonomy and dignity are honored in an open, just, respectful, and pluralistic community, a community that values and encourages a critical approach in the intellectual search for truth and meaning in each individual's life" (Morrison, 2008, p. 51). Dewey believed that the learning experience of the students should be the priority for educators, as opposed to focusing on test scores and traditional academic achievements as markers of success. "Education...is a process of living and not a preparation for future living... Education thus conceived marks the most perfect and intimate union of science and art conceivable in human experience. The art of thus giving shape to human powers and adapting them to social service is the supreme art" (Kesson & Henderson, 2010, p. 213).

Some have also referenced Abraham Maslow's hierarchy of needs to validate the process of differentiated instruction. Carol Tomlinson, considered the founder of the differentiated instruction movement, explains, "Taking into account the progress of Maslow's hierarchy, it is likely that most learners come to school not to seek mastery of

math or literature, but rather to address more basic needs first, such as affirmation and contribution. Once those needs have been met, they shift their attention to things such as purpose, challenge, and power" (Tomlinson, 2010, p. 60). Tomlinson suggests that a philosophy of differentiation should ensure the emotional safety of students while build self-efficacy, creativity, and autonomy into their learning experiences. "Philosophically, differentiation is an approach that commends planning for human wholeness as a primary goal—and that provides for healing when necessary" (p. 42).

The Practice of Differentiated Instruction

Differentiated Instruction has been "most extensively researched and utilized in [K-12] grade levels" along with some studies in higher education (McCarty, Crow, Mims, Potthoff, & Harvey, 2016, p. 38). Such research can be helpful in the discussion of adult learning, including in the workplace. Differentiation specifies that curricular goals be fostered while instruction is adapted to meet the needs of individual learners. Inherent in this requirement is the necessity for targeted assessments of students, individuals who possess varying degrees of readiness and interest, along with unique learner profiles. Specific understanding of each student allows the teacher to access "a variety of instructional strategies designed to meet the needs of all learners" (Beasley & Beck, 2017, p. 552). In differentiated instruction, teachers rely heavily on both pre-assessments and formative assessments to evaluate (1) readiness, (2) interest, and (3) learning profile of students and tailor the instruction accordingly (Beasley & Beck, 2017, p. 552; Tomlinson, 2010, pp. 16-17; McCarty et al., 2016, p. 38; Trinter, Brighton, & Moon, 2015, p. 3).

Differentiated Design

Readiness. Readiness is “a student’s current proximity to specified knowledge, understanding, and skills” (Tomlinson, 2010, p. 16). This term is not to be confused with ability, but rather refers to the Vygotsky’s Zone of Proximal Development (ZPD), where “the cutting edge of learning is not what students can do individually, but what they can accomplish with the help of a more able other” (Hoadley & Van Haneghan, 2017, p. 69). Differentiated instruction was created to meet the needs of mixed-ability classrooms, where learner readiness can vary greatly. The Zone of Proximal Development inspires teachers in differentiated classrooms to provide the help that children need so they may work at their personal level of readiness, operating at the very edge of their abilities and pushing forward (Hoadley & Van Haneghan, 2017, p. 69; Tomlinson, 2010, P. 37; The Iris Center, 2010).

Interest. Interest is “that which engages the attention, curiosity, and involvement of a student (Tomlinson, 2010, p. 16; Scalise, 2007). Appealing to personal interest is key in motivating students by factoring in their “strengths, cultural context, personal experiences, questions, or sense of need” (Tomlinson, 2010, p. 17). Interest, engagement, and motivation to learn are inextricably bound together in, and unique to, each individual learner. “The learner’s creativity, higher order thinking, and natural curiosity all contribute to the motivation to learn. Intrinsic motivation is stimulated by tasks of optimal novelty and difficulty, relevant to personal interests and providing for personal choice and control” (Walczak & Taylor, 2018, pp. 191-192).

Learning Profile. Learning profile is the “preference for taking in, exploring, or expressing content” (Tomlinson, 2010, p. 17). Tomlinson’s learner profile considers

factors like gender, cultural background, learner preferences (in terms of setting and grouping) and other factors (Beasley & Beck, 2017, p. 552). In *The Motivated Student: Unlocking the Enthusiasm for Learning*, Sullo writes, “While our underlying educational objectives may be the same for all students, differentiated instruction allows us to create lesson plans with the need profiles of our students in mind so that more students can achieve academic excellence” (39; Tomlinson, 2010, p. 38; The Iris Center, 2010).

Differentiated Instruction Through Games and Gamification

Game-based learning is being utilized in the classroom and the workplace because games appeal to learners’ sense of fun and play, yet provide the opportunity for instructors to differentiate instruction (Van Eck, Schute, & Rieber, 2017, p. 278; Kapp, 2016, pp. 133, 137; Sota, 2016, p. 82). Game-based learning can be thought of as two different instructional tools. The term “serious games” refers to actual games, like those with virtual environments and avatars, where the term “gamification” indicates the use of game elements—like progress bars, points, and such—to motivate learners or employees to work toward non-game goals (Perryer, Celestine, Scott-Ladd, & Leighton, 2015, 330-331; Cheong et al., 2014, p. 234; Trees, 2015, p. 121). In the classroom, game-based learning is used to achieve learning outcomes, but in the workplace, games and gamification may be used to target learning, teamwork, collaboration, performance, employee satisfaction, and to engage in external marketing and increase customer engagement (Cheong et al., 2014, p. 234; Luu & Narayan, 2017, pp. 111-112)

In the Classroom.

According to the U.S. Department of Education, “digital games offer an ideal tool for… ‘delivering instruction that is paced to learning needs (i.e., individualized), tailored to learning preferences (i.e., differentiated), and tailored to the specific interests of different learners’” (Kapp, 2016, p. 133; Sota, 2016, p. 82; Trinter et al., 2015, pp 91-93). The adaptive technology utilized in instructional digital games adjusts to learner readiness by creating a constant assessment and feedback process during the game. “One way to increase the quality and utility of an assessment is to use evidence centered design (ECD) …valid assessments…real-time estimates of students’ competency levels across a range of knowledge and skills…” Interactive instructional games collect data about learner performance which is used as basis for timely, targeted feedback in order to present new tasks/challenges which are at the edge of the learner’s abilities (Van Eck et al., 2017, p. 281; Scalise, Bernbaum, Timms, Harrell, Burmester, Kennedy, & Wilson, 2007, p. 2307). Enabling students to work at their zone of proximal development (ZPD) is one of the goals of differentiated instruction—readiness. Digital games can “scaffold each student’s learning and foster self-direction to help each individual achieve mastery of knowledge and skills” (Kapp, 2016, p. 133; Tomlinson, 2010, p. 16).

As learners meet goals and see their progress in a game—as they recognize their growing mastery of content—they are motivated to continue, fueled by sustained learner interest (Kapp, 2016, p. 140; Trinter et al., 2015, p. 93). Well-designed games appeal to the interests of learners (another characteristic of well-differentiated

instruction) because games are a form of “play.” Play theory explains the appeal of instructional digital games: When learners are at play they are intrinsically motivated to continue because their enjoyment causes them to be so absorbed that they lose track of time; games are fun (Van Eck et al., 2017, p. 278; Kapp, 2016, 137). Educators hope to engineer the same process with instructional games. Piaget asserted that “play and imitation were core and innate human strategies for cognitive development” (Van Eck et al., 2017, p. 278). Introducing play into the learning environment is “learner-centered and constructivist in nature” (p. 278).

The third aspect of differentiated instruction, the learner profile, has to do with personalizing the instruction based on learner characteristics. In the differentiated classroom, games can be the basis for *establishing* a learner profile in order to target instruction. Tomlinson describes the “get to know you game” where students search for classmates with the specific characteristics (Tomlinson, 2010, p. 79). Differentiated lesson plans can use games to meet the needs of diverse learners in a classroom with games that are designed using the principles of differentiation (Trinter et al., 2015, p. 88). “Because of the multitude of options and flexibility within game creation, a variety of formats can differentiate the *content* and foster an appropriate classroom community for students playing the game” (p. 90).

Teachers are integral to the use of games and gamification in the differentiated classroom, ensuring the best learning outcomes by setting the stage for the game-based learning and differentiating the games/gamification according to readiness, interest, and learner profile (Tinter et al., 2015, p. 88). Teachers should introduce

games and explain learning objectives to the students. After students play a game, the teacher and students should examine the process to highlight what was learned and "how the events of the game support the instructional objectives…[to] ensure that learning occurs from playing the game" (Kapp, 2016, pp. 134-135). With classroom "gamification" some elements of games can be applied to instructional situations to "provide a positive learning outcome without having to create a full-blown learning game" (Kapp, 2016, p. 137; Cheong et al., p. 233).

Classrooms often implement one of two types of gamification: structural or content. In structural gamification, scoring elements of video games like "points, levels, badges, leaderboards, and achievements [are applied] to an educational context" (Kapp, 2016, p.137; Cheong et al., p. 234). "Content gamification" applies game elements, mechanics, and thinking—such as story, mystery, and characters—to alter content to make it more game-like and engaging to the learner (Kapp et al., 2013, p. 237; Kapp, 2016, p. 138). Effective implementation of structural and content gamification will: (1) emphasize learning over winning (2) use teams in the learning process (3) present learning in the context of challenges (4) focus on goal-seeking rather than time spent in the activity (Kapp, 2016, 139-140).

In the Workplace.

"According to results from a recent survey, 55% of people would be interested in working for organizations that increase productivity through the use of games or through the use of gamification techniques" (Cheong, et. al, 2014, p 241). In fact, increased levels of interest in employees, and the desire of employers to harness workers' intrinsic

motivation, along with employee satisfaction and retention, are the main drivers for the introduction of gamification and games in the workplace (Luu & Narayan, 2017, p. 1101-11; Saunders, 2017, p. 7). When interactive digital games are used for training, learners enjoy “challenge, control, collaboration, personalization, engagement, relevance, and feedback” while having “the opportunity to be interactive by choosing different documents, videos, links, and web pages as additional web resources” (Mamula & Coso, 2015; Kapp, 2016, pp. 139-141; Scalise, 2007; Scalise et al, 2007, p. 2307). Games are found to be inherently motivational, being able to mimic real life experiences and “elicit similar psychological processes,” so that games, as team-building or training exercises, increase task and team engagement (Luu & Narayan, 2017, p. 110-111). Effective digital game elements provide: (1) freedom to fail (2) interest curve (maintains interest over time) (3) storytelling (content embedded in story increases learning) (4) feedback (frequent and targeted) (5) Progression (scaffolded instruction) (6) collaboration (7) competition (Cheong et al., 2014, p. 253).

Studies have established that “well-designed games promote learning” (Van Eck et al., 2017, p. 277; Murphy, Redding, & Twyman, 2016, p. iv; Scalise et al, 2007, p. 2307). In fact, well-designed games differentiate instruction as well. Software provides a differentiated learning experience by anticipating what the user wants or needs, making suggestions, modifying the delivery of content or changing the pace of instruction (Scalise et al, 2007, p. 2295; Kapp, 2016, p. 155). Continuous formative assessment, so characteristic of differentiated instruction, is performed by many e-learning products, which employ “a variety of assessment approaches…for such diverse purposes as

adaptive delivery of content, individualizing learning materials, dynamic feedback, cognitive diagnosis, score reporting and course placement (Scalise et al., 2007, p. 2295). Some e-learning tools are able to “take what is known about a person and use statistical models or other approaches to guess, or infer, what should happen next. In other words, such software is ‘assessing’ the user and trying to adjust the information each person receives to fit his or her needs” (Scalise, 2007; Mamula & Coso, 2015; Kapp, 2016, p. 138).

“In recent years, gamification has gained traction as a particularly popular technique to encourage younger workers to engage in enterprise social networking as well as other knowledge sharing learning and network-building opportunities” (Trees, 2015, p. 121). As of 2015, 54% of organizations were already using gamification (or hope to begin doing so within the next 3 years) to motivate, engage, acquire customers, increase sales, or retain employees, (p. 121). As in education, gamification in the workplace applies lessons from the gaming realm to modify behavior in non-game settings (Robson et al, 2015, p. 411-412). Game mechanics (like competition, scores and prizes) and motivation theory (such as self-determinism) are applied to elicit desired behaviors within the workforce, in order to motivate people to make progress or “win” in the context of a game setting (Scalise, 2007; Perryer et al, 2016, p, 328; Luu & Narayan, 2017, p. 111). In the terms of collaboration, gamification encourages employees to communicate and share by making it fun, initiating friendly competition, and highlighting top performers (Trees, 2015, p. 121; Saunders 2017, p. 35; Perryer et al., p. 330; Araújo & Pestana, 2017, p. 725).

Differentiated Design

The literature about game-based learning for adults is primarily focused on the satisfaction of younger workers or college students—the millennial generation, in particular. Employers are targeting Millennials because, as of this writing, researchers predict that, by 2025, 75% of the workforce will be comprised of those born between 1981 and 1997 (Trees, 2015, p. 120; Saunders, 2017, p. 1, 88). Millennials are particularly responsive to game-based learning in the workplace because they expect more of a work-life balance than other generations do; they see fun and community as essential to their work environment. These younger workers value collaboration and community, as well as self-direction and autonomy. In addition, they have gaming experience. Personalized, collaborative experiences made possible by game-based learning can be particularly useful to organizations that wish to engage younger workers (Saunders, 2017, pp. 28, 39; Tree, 2015, pp. 1118-20; Perryer et al., 2016, p. 329; Mamula & Coso, 2015).

Methods

The research approach for this literature review utilized databases such as Google Scholar, Questia, and The University of Alabama at Birmingham online library system (http://library.uab.edu) which accessed Wiley library online, Springer link, ERIC (eric.ed.gov), Elsevier Science Direct, EBSCOhost Education, Galegroup online, and various journal and university websites to find textbooks, peer-reviewed journals, educational handbooks, conference proceedings, white papers, and dissertations relevant to differentiated instruction and game-based learning/gamification in the workplace. Bibliographies and reference lists were helpful in finding additional sources.

Differentiated Design

The review of the literature provided answers for the research question indicated in this study and highlighted gaps in the literature where future research is needed. The exploration of the literature was carried out using keywords and phrases that began with "differentiated instruction," "gamification + workplace," as well as "differentiated instruction + gamification + workplace" and included the following terms, as well:

- Personalized learning
- Elearning
- Elearning + differentiated instruction
- Gamification + elearning
- Adaptive learning
- Adaptive technology
- Personalized + Adaptive Technology + Learning
- Targeted learning
- Behavioral game theory
- Learner centered gaming
- Tomlinson + games + gamification
- Millennials + games + gamification
- Younger workers + gamification
- Older workers + gamification
- Older employees + gamification
- Generation X + workplace + gamification
- Elearning + multigenerational

Sources published within the last two or three years were preferred, but in a few cases the sources were older, but very foundational to the topic.

Questions for Further Research

While the literature is overwhelmingly favorable toward the use of games and gamification in the workplace, there are some potential areas of concern that should be the subject of further investigation. Kapp expresses concern about use of games in the K12 arena—that they have not been shown to be consistently superior to traditional teacher-led instruction; (Kapp, 2016, p. 134). Even less research exists concerning the effectiveness of game-based learning in the workplace. A study by the Naval Air Warfare Center found that “empirical research on the effectiveness of instructional games is fragmented. The literature includes research on different tasks, age groups, and types of games. The research literature is also filled with ill-defined terms, and plagued with methodological flaws” (Hays, 2005, p. 6).

In this review of the literature, no studies were found which addressed the quality of, or quantified the types of, digital games used for training in the workplace (or e learning). In addition, there were no studies assessing the satisfaction with game-based training in the workplace with age groups other than Millennials. Differentiated instruction would a helpful lens with which to examine games and gamification in the workplace because, while well-designed games and gamification have been shown to meet learner needs in terms of learner readiness and interest, it is not clear if targeted assessment of individuals are being done to establish learner profiles and create a plan

of personalized instruction (Kapp, 2016, p. 133; Sota, 2016, p. 82; Trinter et al., 2015, pp 91-93; Van Eck et al., 2017, p. 281; Scalise et al., 2007, p. 2307). For example, competition is an integral part of games and gamification, but some learners feel uneasiness in a competitive environment (Dirksen, 2016, p. 148, Cheong et al., 2014, p. 242). Further investigation into learner profile is necessary —especially in considering differences in age, gender, culture, and personality—in terms of views on competition in gamification and game-based workplace training. Reportedly, employers are interested in fostering community and collaboration, so concerns about competition in games and gamification in the workplace should be examined in the light of social interdependence theory where positive interdependence exists when individuals perceive that the successful attainment of their goals is tied to others reaching their goals (Saunders, 2017, p. 33; Johnson & Johnson, 2017, p. 271; Cardador, Northcraft & Whicker, 2016, p. 359; Trees, 2015, p. 118).

Conclusions/Recommendations

This paper examined the research question: Are game-based training and/or gamification in the workplace well-suited to meet the needs of diverse populations by differentiating instruction and providing inclusive experiences for all learners?

"The philosophy of differentiated instruction provides a framework for addressing the diversity of students' needs" (Trinter et al., 2015, p. 88). Differentiated instruction is a teaching approach that attempts to address individual readiness, interest, and learner profile by arranging multiple ways for learners make meaning and construct knowledge. When designers or teachers differentiate instruction for learners, it stands as an

acknowledgement that students come to class from different backgrounds and with varying preferences and needs (Scalise, 2007; Tomlinson, 2010, p. 8). These assumptions are in keeping with the roots of differentiated instruction, which held individual learners in high regard. The democratic school movement sought to treat students with honor, dignity, and compassion (Morrison, 2008, p. 51). Tomlinson, the author of the differentiated instruction philosophy, drew connections between education and Maslow's hierarchy of needs, saying that learners often come to class with "basic needs such as affirmation and contribution" which must be met before they can "shift their attention to things such as purpose, challenge, and power" (Tomlinson, 2010, p. 60).

Adult learners are no different; they also come to class/training/work with "basic needs such as affirmation and contribution" and must be treated dignity and honor before they can "shift their attention to things such as purpose, challenge, and power" (Tomlinson, 2010, p. 60). Games and gamification at work promote purpose, challenge, and power due to the competitive and performance-oriented nature of games and gaming (Luu & Narayan, 2017, p. 111). Yet, studies have shown that some learners are not motivated by competition, and might even find it distasteful and discouraging (Johnson & Johnson, 2017, p. 271; Cardador, Northcraft & Whicker, 2016, p. 359). The literature reported "Millennials are experienced with games and engage frequently in that activity, [so] their perception of gamification is positive," but there has been no significant discussion concerning perceptions of gaming by other age groupings; the literature is relatively quiet on that topic (Cheong et. Al, p. 43; Saunders, 2017, p. 46). However, employers are advised to "seek buy-in and participation from all the

generations that make up the workforce" (Trees, 2015, p. 122). "It is necessary, for training a multigenerational workforce, to understand the fundamental needs, and [learning profiles] of each generation" (Saunders, 2017, p. 46). More research is needed to adequately answer the research question, "Are game-based training and/or gamification in the workplace well-suited to meet the needs of diverse populations by differentiating instruction and providing inclusive experiences for all learners?" Examining workplace training in terms of game-based training, from the standpoint of differentiated instruction, would assess the needs of, and promote the welfare of, older employees, affording them dignity and respect, while giving them voice. From the literature, it is not clear if targeted assessments of individuals are being done to establish learner profiles, which should be used to personalize instruction.

In addition, the framework of differentiated instruction should be used to analyze the current volume of game-based and gamification workplace programs in order to develop an objective scale for evaluation of such learning experiences. A differentiated instruction evaluation tool would be helpful in evaluating whether training meets the needs of diverse populations according to individual readiness, interest, and learner profile. Then, using this differentiated instruction evaluation tool, game-based training could be surveyed to systematically determine overall quality of instruction in the workplace.

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