CONCLUSION: GOOD GAME: ON THE LIMITATIONS OF PUZZLES AND POSSIBILITIES FOR GAMEFUL LEARNING

BY JEREMIAH KALIR

In this concluding synthesis, the author examines the 18 chapters of *Teacher Pioneers: Visions From the Edge of the Map* as a project with a challenging and necessary premise: Educators can creatively design games and usefully research game-based learning, and more educator-inspired and gameful approaches to teaching and learning can and should transform schooling. Because this conclusion—like the book as a whole—considers technological and social developments as inseparable, it is possible to map anew the dynamic relationships between school and game, and to better plot how educator design and agency can reorient schooling from puzzle making and maintenance toward the playful. The expressions of educator agency featured throughout *Teacher Pioneers* act as a collective counternarrative to trends such as games as textbooks, and also games as expert assessment tools. Alternatively, a conception of *gameful learning* is advanced to describe educators as committed to playfulness, design, and agency within game-based teaching and learning.

PUTTING ASIDE PUZZLES

Reading *Teacher Pioneers: Visions From the Edge of the Map*, one has the distinct pleasure of spending time with—and learning deeply from—educators who have put aside the material and metaphoric dimensions of school as a puzzle. Consider the crossword puzzle, its architecture and recreation evoking the linear, entrenched exercises of schooling's status quo. Upon completing even the most daunting paragon—say that featured in the Sunday *New York Times*—few players find pleasure in erasing known answers and embarking upon plodded territory once again. There is little, if any, replay value among the intricately arranged collections of clues. Furthermore, the puzzle affirms the importance of one set of right answers, a prescribed patterning of correctness that may not be questioned, only uncovered. And what of the designer? Not only is the expert puzzler at once judge, jury, and executioner, this mastermind is often either unknown or distanced from the minutiae of players navigating across, down, and back again ad infinitum. The games theorist Fred Goodman has observed: "Schools tend to pose problems to students in the form of puzzles. … This can result in students being taught to think that there is an answer to every question, a solution to every problem. … When students leave school they frequently find that problems in the 'real world' tend not to have 'once and for all' solutions. Many problems seem to have no solution at all" (para. 7).[1] The collection of voices contributing to *Teacher Pioneers* cautions readers from accepting that the problems of teaching

and learning—and that the practices of schooling—might be addressed as if by the singular solution to a puzzle.

Yet school, for many students, operates—and, in the worst of cases, oppresses—as an elaborate puzzle. For these involuntary players, schooling persists as an attempt to discern static content guarded inside the expert teacher's head, to decipher the secret of some formula, to scrawl inside small boxes just enough correct answers so that those who credential are convinced of competence. Yet such maneuvering has little replay value for students, whose repetitive schooling-as-puzzling is just that—confusing, irrelevant, and disconnected from everyday interests, or curiosities, or cultural heritages. Just as troubling, teaching—for many educators—has become both puzzle making and maintenance. Often through no fault of their own, educators are seldom supported in cultivating the fluid dispositions of an improvisational musician.[2] Educator agency—-the authority to shape curricula in response to student inquiry, the ability to collaborate across disciplinary silos, the confidence to experiment, and the knowledge that failure does not foretell punitive measures—is celebrated abstractly while seldom ensconced in daily practice. Rather, educators are frequently positioned as engineers who must dutifully service well-worn applications for far-too-predictable student learning outcomes. As the philosopher Maxine Greene eloquently suggests, to neglect imagination and agency as central to pedagogy delimits educators to live and work as "clerks or functionaries" (p. 1).[3]

At a time when the deprofessionalization of teaching and divestment from public education are in vogue, it is additionally disheartening to witness the further coupling of schooling with teachers' puzzle making and maintenance. That so little can be expected from the practice of teaching is, perhaps, inevitable given pressures and prescriptions well beyond educators' locus of control. As American states race atop of some promised education pinnacle, nationwide reforms force local politicians and school leaders to either play within a particular set of puzzlelike constraints or to discard the entire crossword as if it were written in a foreign tongue (for example, four states never adopted Common Core State Standards and three have reversed course and withdrawn, and only 15 states have adopted Next Generation Science Standards).[4] Districts and schools are mandated to report a quantified average yearly progress, often struggling to alter methods of measurement that might better emphasize their distinctive commitments to equity, community, or family relations. Teachers, too, are subjected to demoralizing evaluations of their so-called effectiveness or quality, based largely upon contested value-added models.[5] And those who facilitate teacher professional development are often unwitting accomplices who further curtail the imagination and agency of educators; presenting some tool or list of best apps to the lowest common denominator becomes technodeterminism as distraction rather than an invitation for educators to chart their own inquiry or critical thinking. From policy to pedagogy, a discerning appraisal of schooling reveals the staid influences of Taylorism and "scientific management" as thriving among bureaucratic administration,

1. Goodman, F. (2010). Games, gods, and grades. THEN, 7. Retrieved from http://thenjournal.org/index.php/then/article/view/46/45
2. Sawyer, R. K. (Ed.) (2011). Structure and improvisation in creative teaching. Cambridge, England: Cambridge University Press.
3. Greene, M. (1995). Releasing the imagination: Essays on education, the arts, and social change. San Francisco, CA: Jossey-Bass.
4. CCSS and NGSS adoption data as of November 2015; see http://academicbenchmarks.com/
5. See, for example: American Statistical Association (2014) and Harris and Herrington (2015) in special issue of Educational Researcher (2015, 44(2). American Statistical Association. (2014). ASA statement on using value-added models for educational assessment. Retrieved from https://www.amstat.org/policy/pdfs/ASA_VAM_Statement.Pdf; Harris, D. N., & Herrington, C. D. (2015). Editors' introduction: The use of teacher value-added measures in schools: New evidence, unanswered questions, and future prospects. Educational Researcher, 44(2), 71-76.

teacher isolation, student tracking, mandated curricula and assessments, and the curtailment of academic freedom.[6] Many education stakeholders readily subscribe to the predictable and predetermined while toiling beneath the banner of disruptive innovation. The challenge and prestige accorded in playing to The Gray Lady's weekend crossword puzzle masks both an investment in—and a complicity with—the intransigent familiar.

Most fortunately, the many authors featured in this book share a counternarrative to the machinations of schooling-as-puzzling, teaching as puzzle preservation, and the educator as functionary.[7] Here, a collective evidence is advanced that suggests a provocative premise. It is a premise celebrating the antithesis of puzzle maintenance, rooted in more creative and critical approaches to education. *Teacher Pioneers* captures well—and, perhaps, for an audience unfamiliar with—bell hooks' perception of pedagogy, that "the engaged classroom is always changing. Yet this notion of engagement threatens the institutionalized practices of domination. When the classroom is truly engaged, it's dynamic. It's fluid. It's always changing" (p. 185).[8] Engagement and change, here, manifests as the following: If educators can creatively design games and usefully research game-based learning, then more educator-inspired and gameful approaches to teaching and learning can and should transform schooling.

The purpose of this concluding chapter is twofold: to unpack a thesis about educators as engaged game designers, and to suggest why this generative activity matters as a counternarrative to dominant conventions of formal schooling and traditional teaching. In doing so, I will address two questions. First, how might games and schooling be understood given converging—and conflicting —relations among technology and social practice? And second, what are the possibilities for design and engagement at the intersection of game-based learning, schooling, and educator agency?

INTRODUCING SOCIO-TECHNICAL FORMATIONS

To address this conclusion's guiding questions, I suggest it is necessary to read the prior 18 chapters as a confluence of networked relations: various media and designed technologies that inform patterns of pedagogy, indicators of learning as reflecting the constraint and affordance of multiple settings, and culture as expressed divergently along disciplinary, historical, and ethical dimensions. This patchworked complexity appears noticeably throughout *Teacher Pioneers'* myriad framings of *school* and *game.* These terms are neither assumed nor neutral; rather, they are produced by educator agency.

Based upon context and intent, both "school" and "game" function reflexively as noun and verb, thing and action. Schools, like games, are material technologies; both are products of design that afford particular behaviors (such as demarcating where and how to learn or play), both transmit and also

6. See, for example: Apple (2006); Ross (2010); and Watters (2015). Apple, M. W. (2006). Educating the" right" way: Markets, standards, God, and inequality. New York, NY: Routledge; Ross, E. W. (2010). Exploring Taylorism and its continued influence on work and schooling. In E. Heilman (Ed.), Social studies and diversity education: What we do and why we do it (pp. 33-37). New York, NY: Routledge; Watters, A. (2015). Is it time to give up on computers in schools? Retrieved from http://hackeducation.com/2015/06/29/is-it-time-to-give-up-on-computers/

7. Counternarrative plays a notable role in teacher education and teacher learning research (e.g., Bullough, 2008), and in critical analyses of race and positionality in education and education research (e.g., Ladson-Billings, 2004; Milner, 2007). Bullough, R. (2008). Counter narratives: Studies of teacher education and becoming and being a teacher. Albany, NY: SUNY Press; Ladson-Billings, G. (2004). New directions in multicultural education: Complexities, boundaries, and critical race theory. In J. A. Banks & C. A. M. Banks (Eds.), Handbook of research on multicultural education (2nd ed., pp. 50-65). San Francisco, CA: Jossey-Bass; Milner, H. R. (2007). Race, culture, and researcher positionality: Working through dangers seen, unseen, and unforeseen. Educational Researcher, 36(7), 388-400.

8. hooks, b. (1994). Teaching to transgress: Education as the practice of freedom. New York, NY: Routledge.

obstruct certain values (such as competition or cooperation), and both technologies are deployed to construct meaning (about, for example, accomplishment or failure). Yet so too are schools and games practices, or activities situated within the social world. To school and to game require the acceptance of norms (such as curricular standards or lusory attitudes), the appropriation of culture and identity (namely the costumes, gestures, and dialects indicating who is a student or player), and the mutual creation of conditions for shared engagement (summarized, perhaps most famously, in Paley's *You Can't Say You Can't Play*).[9] The technology of a game overlaps complementary social practices, and vice versa. Consider, for example, how the game *Math Blaster* reinforces and rewards memorization, speed, and factual recall. At the same time, schools require benign activities to manage behavior and tools to assess decontextualized factual knowledge, thereby rationalizing the "integration" of technologies such as *Math Blaster*. In recognizing the technological and the social as inseparable, it becomes possible to map anew the dynamic relationships between school and game, and to better plot how educator design and agency can reorient schooling from puzzle toward the playful.

In her book *Learning Futures: Education, Technology, and Social Change*, the education and social futures scholar Keri Facer describes how the design and affordance of any particular technology is intertwined with "different cultures of use." Designed technologies are interpreted within cultural and social contexts, changing how to understand the promise and pitfalls of a game, or a mobile device, or a model of schooling. A mobile phone, for instance, may help parents supervise children from afar, or provide individuals with an accessible safety net, or strengthen connections between distant lovers, or afford governments the capacity to surreptitiously breach private communication. Ultimately, Facer contends that "a useful way of considering how technologies 'shape' the world is to consider it as a process of 'co-production' between the potential capabilities of the technologies and the ways in which they are perceived and taken up in the social context" (p. 7)[10] Each case in *Teacher Pioneers* affirms that the social context of school matters when designing games and facilitating game-based learning, just as the social context of gaming and play matters to considerations—and (re)visions—of schooling.

Moreover, it is also necessary to recognize associated patterns, or what Facer terms *socio-technical formations*, characterizing how the material, the social, and that which is known are recurrently negotiated and coproduced. A designed artifact such as *Minecraft*, from this perspective, may be understood as coproduced through adaptation by classroom teachers for helping an entire school build Campbell City or for teaching earth science concepts (see Wilmot and Pusey, Chapters 8 and 9, respectively). So, too, might *Minecraft* become part of a civic geography siting youth design of their future cityscapes,[11] or an online iteration of summer camp whereby coding replaces canoeing.[12] *Minecraft*'s varied "cultures of use" reflect broader socio-technical formations about the capacity of media, and game platforms specifically, to alter enduring conceptions of what school and education are, or could become. Like promising coproductions surrounding *Minecraft*, the projects

9. Paley, V. G. (1992). You can't say you can't play. Cambridge, MA: Harvard University Press.

10. Facer, K. (2011). Learning futures: Education, technology and social change. London, England: Routledge.

11. Hollett, T. (2015). Nashville: Building blocks. Civic Media Project. Retrieved from http://civicmediaproject.org/works/civic-media-project/nashville-building-blocks

12. Learn about Connected Camps at https://connectedcamps.com/.[/foot[footnote]Complementing this book, there are a number of organizations and schools exemplifying this stance, including the Institute of Play (and their Quest to Learn schools, http://q2l.org/), The Incubator School (http://www.incubatorschool.org/), and GameDesk's PlayMaker School (http://www.playmaker.org/).

featured throughout *Teacher Pioneers* speak back against dominant socio-technical formations associated with games and schooling while simultaneously advocating in favor of educators' voice and creativity.

Teacher Pioneers is an invitation for educators, school leaders, and research partners to proactively design new socio-technical formations—and possible education futures—associated with games and schooling. One consequence of this book is a call to coproduce alternative school and game mashups in service of greater teacher agency and more equitable student learning[13]. Through descriptions of *Minecraft*, *Mystery Trip*, and many others, the sharing of counternarratives exemplifies a critical stance that discards the sanitized adoption of material technology into the established social norms of teaching and learning. Rather than replicate pervasive forms of school-as-puzzle, these authors share journeys of traversal and transformation; it is that which carries us all to the edge of their maps.

Spanning primary to higher education settings, multiple disciplines and pedagogical commitments, and an array of playful designs, *Teacher Pioneers* looks beyond game and school as immutable and inherited. Having put aside puzzles, and having shared visions from distant horizons, it is difficult to dismiss recurrent themes of more significance than flavor-of-the-month fixations with some new app, game mechanic, or learning analytic. The stakes, as presented and analyzed here, are higher, and the social and technical convergences richer and more complex. Given adequate support and shared purpose, educators' agency as game designers and game-based learning researchers can alter schooling. Doing so reimagines how the coupling of social, pedagogical, and cultural practice with varied technologies can (re)form a more playful—and, as I will later argue, a more gameful—approach to teaching and learning.

SOCIO-TECHNICAL FORMATIONS AMONG GAMES AND SCHOOLING

The possible ways of understanding how the technological and the social dimensions of games shape people's shared reality are many—from leadership development in *World of Warcraft*,[14] to gaming as a platform for global advocacy,[15] to collaborative play that solves long-standing problems in medical research.[16] The authors of *Teacher Pioneers*, however, indicate that there are also particular ways of understanding how the technological and social dimensions of games and school together and recurrently coproduce ways of teaching and learning. Here, I summarize and discuss two such socio-technical formations; both explain certain convergences between games and schooling, and both appear to motivate these educators' sense of agency and creative pedagogy. Specifically, and perhaps unavoidably, the designs, failures, and insights shared in *Teacher Pioneers* both reflect and react against (digital) games as "leveled up" textbooks and also game-based learning as a comprehensive means of assessment. In contrast to these two—admittedly not exhaustive—coproduced meanings regarding games and schooling, I will later argue that the educators in this book represent a third and radically dissimilar counternarrative about the promise of game-based teaching and learning.

13. Complementing this book, there are a number of organizations and schools exemplifying this stance, including the Institute of Play (and their Quest to Learn schools, http://q2l.org/), The Incubator School (http://www.incubatorschool.org/), and GameDesk's PlayMaker School (http://www.playmaker.org/).

14. Wolfenstein, M. (2013). Digital structures and the future of online leadership. In S. D'Agustino (Ed.), Immersive environments, augmented realities, and virtual worlds: Assessing future trends in education (pp. 257-279). Hershey, PA: IGI Global.

15. McGonigal, J. (2011). Reality is broken: Why games make us better and how they can change the world. New York, NY: Penguin.

16. Coren, M., & Fast Company. (2011). Foldit gamers solve riddle of HIV enzyme within 3 weeks. Scientific American. Retrieved from http://www.scientificamerican.com/article/foldit-gamers-solve-riddle/

The Textbookification of Games

Teacher Pioneers challenges a trend in perceiving and deploying games as a more interactive, sophisticated, and—to borrow a well-worn phrase from video gaming—"leveled up" textbook. Whether in print or digital form, the textbook persists as one of the most pervasive educational technologies associated with formal schooling. The emergence of eTextbooks has done little to alter basic conventions; textbooks are produced en masse for blanket distribution, disseminated through lucrative corporate contracts, aligned to the mandates of standardized assessments, seldom vetted by educators, and politically divisive. Furthermore, the textbook's material design complements far too well schooling's more traditional social practices—adherence to scripted curricula, reliance upon conventional and didactic instruction, and little regard for dissenting or critical perspectives. With textbooks, the medium is indeed the message. The tool deftly advances what the critical educator Paulo Freire termed the "banking" model of education, whereby students are arranged as empty containers lacking identity or interest who vapidly await the efficient depositing of expert knowledge.[17]

It is troubling that commercial video games are becoming the textbook's avatar, this generation's deceptively pleasurable rendering of yesteryear's basal reader. The textbook "big three"—Pearson, McGraw-Hill Education, and Houghton Mifflin Harcourt—aggressively market games initiatives under the guise of personalized, blended, and adaptive learning campaigns. Smaller "independent" game-design companies, launched often in start-up technology hubs and backed in some instances by university-based research partners, scramble for their market share. The ease with which educators and school leaders can access, demo, and buy games at scale is exacerbated by well-intentioned efforts to provide every student with a device, or teach 21st-century skills, or close some newly identified gap. Yet this enthusiastic adoption of (digital) games echoes a concerning history of educational technology hype-cycles as documented in Larry Cuban's seminal book *Teachers and Machines: The Classroom Use of Technology Since 1920*.[18] His more recent commentary on the development and marketing of educational technologies is woefully applicable to the creation, procurement, and suggested promise of commercial games:

> The lure of money and doing good (e.g., solving problems of equity, academic achievement, classroom management) draw start-up entrepreneurs into the half-trillion dollar education market daily. Yet treating end-users [i.e., educators] as the customers, knowing their world well before designing and pitching new "solutions" to old problems continues to be the exception, not the rule.[19]

Games are an unlikely panacea for the shortcomings of either pedagogy or student learning; textbooklike proliferation only further cements the status of certain games as silver bullets. Cuban's critique points toward a shared concern for many of the *Teacher Pioneers* authors: Do (digital) games designed by outside entrepreneurs—whether in industry or the academy—meet these learners' needs or address these teachers' pedagogical dilemmas? The marketing of commercial (digital) games for schooling—aided in no small part by everyday social networks, viral media, and promises of

17. Freire, P. (1970). Pedagogy of the oppressed. New York, NY: Continuum.

18. Cuban, L. (1986). *Teachers and machines: The classroom use of technology since 1920.* New York, NY: Teachers College Press.

19. Cuban, L. (2015). District purchasing of high-tech devices: How teachers continue to lose out. Larry Cuban on School Reform and Classroom Practice. Retrieved from https://larrycuban.wordpress.com/2015/06/06/district-purchasing-of-high-tech-devices-how-teachers-continue-to-lose-out/

pedagogical transformation—masks more critical thought about nothing more than an endless buffet of chocolate-covered broccoli.[20]

Like textbooks before them, the commodification of games in and for school—and the ease with which concern for scale outpaces commitments to community—represents the antithesis of how some envision the impact of this technology.[21] Educators' creative agency with games and game-based learning, rather than uncritical and extensive tool adoption, matters to designers and researchers such as Kurt Squire. In his book *Video Games and Learning: Teaching and Participatory Culture in the Digital Age*, Squire reflects upon the coupling of design, agency, and scale, observing: "That [teachers' creative application] is the goal of scaling—not getting 10,000 teachers to all do the same thing at the same time. In fact, if 10,000 teachers were all doing the same thing, our intervention would have failed. We *wanted* [original emphasis] students and teachers to design games about their unique local communities" (p. 211).[22] Playing this out to a hilarious and disquieting conclusion, one shudders at a vision of schooling whereby games become substitute teachers and students sit compliantly before computers dispensing, conveyor belt–style, *Math Blaster*, *Civilization,* and *Minecraft*.

As with the introduction of any material technology, it behooves educators and school leaders to critically question how games relate to, possibly exacerbate, or usefully subvert enduring school inequities and social practices. For example, how are game-design companies responsive to the expertise and interests of educators? The case of Pittman, the game *Portal 2*, and his interaction with Valve (Chapter 6) is encouraging;[23] such collaborations could become models further developed by others. How might gaming platforms or companies support game design in response to local circumstances or student interest? Kavaloski's efforts with the open-source ARIS platform (Chapter 11) and Isaacs's students' creation with *Gamestar Mechanic* (Chapter 16) are both promising exemplars. These are important counternarratives precisely because educators who are content to adopt games bought by administrators and designed by companies far removed from everyday schooling may not recognize how decisions made in the name of innovation inadvertently delimit educator agency. Media consumed uncritically can readily reify the "textbookification" of schooling and a "revelling in the superficial" (p. 217).[24]

Games and the Authority of Algorithms

Teacher Pioneers also contests a narrative that games are a means of thoroughly assessing learning given supposed shortcomings in educators' ability to understand what students know. An ill-informed logic—in the worst of cases—suggests that educators possess neither the skill nor the professional disposition to accurately or adequately assess what their own students have learned during a given lesson or upon completion of a unit.[25] As a tool that exemplifies the mining of big

20. This perennial critique of games and learning has appeared in many forms, including Bruckman (1999). Bruckman, A. (1999, March). Can educational be fun? Paper presented at the 1999 Game Developers Conference, San Jose, CA.

21. A comment from Sujata Bhatt—who agreed to be named as a manuscript reviewer—suggests an alternative relationship between scale and community given various education reformers' concern for scale and impact. She suggests educators' creative agency may be difficult to cultivate en masse until teacher preparation opportunities expand values and pathways.

22. Squire, K. (2011). Video games and learning: Teaching and participatory culture in the digital age. New York, NY: Teachers College Press.

23. Unfortunately, Valve subsequently ended education programming as of early 2013.

24. Brabazon, T. (2013). Take the red pill: A new matrix of literacy. Journal of Media Literacy Education, 2(3), 209-229.

25. Sujata Bhatt reminds readers that games can also serve as a playful form of assessment, particularly when student gameplay is predicated upon their prior content acquisition.

data and the capabilities of embedded learning analytics,[26] digital video games are often lauded as a means of closing this presumably troubling gap in educator competency. Yet when educators do use digital games as a means to assess students, the game—in and of itself—rarely functions as the sole mediator of evaluation. A recent survey of more than 450 classroom educators investigated formative assessment practices during students' digital gameplay. These educators did not passively monitor students' gaming, as some narratives might suggest. Rather, the teachers actively observed their students, interacted with them via questioning, and created opportunities for complementary problem solving.[27] Such relational and in-the-moment assessment practices can deepen and further contextualize students' digital data trails. Video games can serve as a mechanism to assess what students know and can do. From this perspective, however, an outstanding tension concerns the extent to which educators' assessment practices complement—or are ultimately circumvented by—the authority of algorithms.

A number of explanations—some reasonable, others debatable—amplify this depiction of who (or what) can skillfully and meaningfully assess student learning. For starters, the learning "black box" —what really does happen inside a child's mind, or among the social worlds of a classroom, or across a trajectory of schooling?—has long motivated the development of ever more sophisticated education-research methods. Subsequently, a methodological arms race—rife within both academe and industry—reflects an obsessive physics envy, or the idea that so-called "softer" sciences (such as education) can and should develop mathematically valid explanations of foundational concepts (such as motivation or self-efficacy).[28] An inclination to count only that which is reliably measured has also influenced the realm of education policy, where it is now de rigueur to follow big data correlations—from students' standardized tests scores, to educators' value-added evaluations, to compounded averages of a school's yearly progress. Within this context, it is no surprise that (digital) games are used as a quantifiable intervention that can lead to predictable student learning outcomes via reformed assessment practices.[29] The data, in one respect, flow up; if research suggests that a student who plays *Ratio Rancher* is more likely to develop proportional reasoning skills, then she may increase her score on a future mathematics assessment, thereby improving her class's average and reflecting favorably on the school's overall achievement. Finally, it is no accident that advocates of game-based learning seek to advance their own counternarrative given long-held biases against video games as a playground for (mostly male) violent fantasy. Amassing evidence that video games are, to the contrary, powerful learning tools makes it that much harder for detractors to claim that gaming is related to aggression or antisocial behavior. While none of these trends is, in its own respect, necessarily or entirely "bad," a collective influence can magnify unintended consequences. Forced to administer someone else's algorithm—whether via video game or standardized assessment—educators readily lose authority and autonomy as experts in their own classrooms.

26. See, for example: El-Nasr, Drachen, and Canossa (2013); Halverson and Owen (2014). El-Nasr, M., Drachen, A., & Canossa, A. (Eds.). (2013). Game analytics: Maximizing the value of player data. London, England: Springer London; Halverson, R., & Owen, V. E. (2014). Game-based assessment: An integrated model for capturing evidence of learning in play. International Journal of Learning Technology, 9(2), 111-138.

27. Fishman, B., Riconscente, M., Snider, R., Tsai, T., & Plass, J. (2014). Empowering educators: Supporting student progress in the classroom with digital games. Ann Arbor: University of Michigan Press.

28. Phillips, D. C. (2014). Research in the hard sciences, and in very hard "softer" domains. Educational Researcher, 43(1), 9-11.

29. See, for example: D'Angelo et al. (2014); Gee and Shaffer (2010). D'Angelo, C., Rutstein, D., Harris, C., Bernard, R., Borokhovski, E., & Haertel, G. (2014). Simulations for STEM learning: Systematic review and meta-analysis. Menlo Park, CA: SRI International; Gee, J. P., & Shaffer, D. W. (2010). Looking where the light is bad: Video games and the future of assessment. Phi Delta Kappa International EDge, 6(1), 3-19.

Teacher Pioneers highlights a tension about educator agency, algorithms, and assessment. How are methods used to assess student learning authored and then administered? What role—if any—do educators play in these processes? Despite ongoing debate about how to measure and make meaning from the impact video games have on student learning,[30] I raise these questions not to suggest that learning analytics, or benchmark metrics, or evidence-based practices are either unnecessary or invaluable to classroom teaching and learning. On the contrary:

> *The pressing questions aren't which measures to use, but how to rethink assessment and evaluation procedures for a more participatory age. ... People enjoy participating in these [performance and assessment] systems in part because they have a voice in shaping the rules that govern them. This is oppositional to the idea that testing bureaucrats somewhere set standards, goals, and measurements and then see how well others live up to them. (p. 234)*[31]

Numerous cases in *Teacher Pioneers* describe a more participatory approach, whereby the rules—or the literal and metaphoric algorithms—that govern assessment are redesigned. In what is referred to on more than one occasion as "hacking," educators and school leaders do have the agency to alter assessment algorithms by authoring new measurement and competency practices, and by redefining what counts as evidence of student learning. Dikkers (Chapter 18) describes how, as principal of a rural Minnesota high school, he collaborated with his faculty to shift school culture, map new curricular pathways, and implement goal setting and reward structures to better support the success of special education students. After a game-based unit, Saunders (Saunders and Kalir, Chapter 15) supplemented a district-mandated standardized test with qualitative questions aimed at more thoroughly capturing his students' voice and knowledge. Darvasi (Chapter 5) captures well the commitment to agency shared by many of the authors in this book; reflecting upon *The Ward Game* he emphasizes his own "resourceful and playful subversion as an agent of change ... playfully pushing boundaries and reprogramming the structures and routines of my school and classes." Algorithms—whether those programming big data systems, the grammar of schooling, or games as assessments—are created by people with biases (about what counts) and blind spots (and what is not measured tends not to matter). The eager embrace of learning analytics so often associated with game-based learning should accompany a similar commitment to support educators as authors and authorities of assessment.

TOWARD GAMEFUL LEARNING

Teacher Pioneers does more than plot where and how game-based learning has contributed to more playful and less prescriptive schooling. The hallmark contribution of this book is a mapping of that which is just now being traversed: educators as designers of games for their own students, educators who craft gameplay to seed new social practices and interdisciplinary insights, educators as researchers of their own game-based teaching, and educators whose pedagogies are no longer constrained puzzle maintenance. This shared effort guides readers toward a seldom-explored set of contours where educator agency is aligned to a definition of play as "free movement within a more rigid structure" (p. 304).[32] Despite the rigidity of conventional textbook-friendly schooling, and despite the inflexible measures of learning mandated by faceless bureaucratic puzzle masters, an unmistakable counternarrative of "free movement" emerges from these contoured edges. Educators

30. Stokes, B., Walden, N., O'Shea, G., Nasso, F., Mariutto, G., & Burak, A. (2015). Impact with games: A fragmented field. Pittsburgh, PA: ETC Press.

31. Squire, K. (2011). Video games and learning: Teaching and participatory culture in the digital age. New York, NY: Teachers College Press.

32. Salen, K., & Zimmerman, E. (2004). Rules of play: Game design fundamentals. Cambridge, MA: MIT Press.

are writing for their peers, questioning their own biases and practices, and navigating discovered—and recovered—teaching and learning terrain. Here, the concept of *gameful learning* is advanced to capture these commitments to playfulness, design, and agency. In this section, I suggest that the educators and researchers featured in *Teacher Pioneers* represent a promising vision of gameful learning.

The gameful learning presented throughout *Teacher Pioneers* disrupts presumptions about who plays and learns with games. The previous 18 chapters introduce readers to educators who proudly—and publicly—design, play, and learn with games. Educator agency, in this respect, manifests as dedication to reflecting upon novel teaching experiments, documenting honestly ethical implications of gameplay (see Cook and Duncan, Chapter 14), and sharing rich descriptions of pedagogy and curricular development.[33] Whereas game-based learning typically presumes that an intervention—and, perhaps, subsequent research—focus upon K-12 (and, to a lesser extent, higher education) students, gameful learning shifts toward a more expansive framing that does not parse student from educator learning as two independent phenomena. It is not possible, for example, to read Vann (Chapter 12) and distinguish his growth as a first-year teacher from his students' project-based learning. Both "projects," in that case, required mutual goal setting, collaboration, and iteration; "If I expect my students to learn through failures," Vann reflects, "I should as well." Consequently, this book presents a reorientation in discourse and priority, as educators' pedagogy and reflective practice are opened for examination alongside students' interdependent play and learning. Elsewhere, and in collaboration with classroom teachers and teacher educators, I describe how playful attitudes, experimentation with identity, and engagement with uncertainty characterize the necessary "plurality, personality, and difference" of educators designing and then playing games with their students. A gameful learning perspective focused upon teacher growth can usefully discern:

> how educators are creative professionals capable of being held to high expectations for generative intellectual work ... [and] can help researchers to reveal how teachers adapt – and actively design – curricula and tools that emphasise higher-order thinking skills, broad areas of knowledge, and process-oriented activity. (p. 198)[34]

Complementing a focus on educator learning, *Teacher Pioneers* also showcases educators motivated to play with their dispositions—as designers, as teachers, and also as researchers. Not content to facilitate school as a puzzle with one right instructional answer, many authors evidence an inclination toward attributes often described as design thinking, including creating for and with users, prototyping, and iteration. Hergenrader, for example, details six design principles for immersive role-play that "give educators many different pieces with which they can experiment and tailor to their specific purposes" (Chapter 4); Pusey, likewise, describes her own "experiment" with the "versatile" *Minecraft* (Chapter 9); and for Glazer, her design took the form of a "mashup" between *Beowulf* and a role-playing game (Chapter 3). In addition to designing resources and experiences, some authors redesigned themselves—that is, their identity—as teachers. Saunders became Creepor the intergalactic emissary (Saunders and Holden, Chapter 15), Darvasi acted as both Dr. Spivey and

33. See, for example: McCall (2011); McClintock (2011); Squire (2011). McCall, J. (2011). *Gaming the past: Using video games to teach secondary history.* New York, NY: Routledge; McClintock, S. (2011). Counting priests, paladins, & pets. *Mathematics Teacher, 105*(3), 214-218; Squire, K. (2011). *Video games and learning: Teaching and participatory culture in the digital age.* New York, NY: Teachers College Press.

34. Holden, J. I., Kupperman, J., Dorfman, A., Saunders, T., Pratt, A., & MacKay, P. (2014). Gameful learning as a way of being. *International Journal of Learning Technology*, *9*(2), 181-201.

"Big Nurse" Ratched in the simulation of *One Flew Over the Cuckoo's Nest* (Chapter 5), and Fallon feigned being a "Mild-Mannered English Teacher" (Chapter 2). In this respect, gameful learning helps to explain embodied and improvisational identity play foregrounding qualities such as exploration, nonlinearity, and improvisation.[35] Furthermore, all contributors to *Teacher Pioneers* adapted the very real role of researcher. Just as the classroom teachers embraced elements of practitioner inquiry, university-based research partners also developed new inquiry dispositions. As Howell and colleagues note: "Parallel to the ways that e-textiles bridge many forms of expertise across school, family, and friends, we too brought different expertise and were each willing to work across our normal boundaries in order to make this project work. It was unique and atypical for each of us" (Chapter 13). The concept of gameful learning is further useful in describing the sustained agency of play at the intersection of educator design, identity, and research.

When games are adopted as textbooks, assessment systems, or even as rewards to covertly manage student behavior, teaching and learning remain confined within a classroom's walls. The gameful learning evident throughout *Teacher Pioneers*, however, does not adhere to this spatial demarcation. Rather, gameful learning also encompasses a decidedly ecological approach to the design and subsequent activities of gameplay.[36] Some authors detail how they created and sustained novel learning opportunities across settings, whether for students or via educator-facilitated professional development (see Glazer and Ng, Chapter 17). Working in the context of an outdoor summer camp, Martin (Chapter 10) explains how place-based narratives and augmented reality tools shaped youth inquiry and exploration. The cross-setting qualities of gameful learning also emerge from more conventional school contexts. Fallon's alternate reality game *Dolus* (Chapter 2) situated student learning in multiple classrooms, outdoors across the school grounds, and via numerous digital platforms accessible to students anytime and anywhere. In Darvasi's *The Ward Game* (Chapter 5), the social world of *One Flew Over the Cuckoo's Nest* was wrapped around students' classroom, online, and out-of-school lives. These approaches to trans-spatial learning[37]—that is, embracing online, social, interest-driven, and hybrid or mixed-reality configurations both within and outside of school—suggest that games are a viable means of designing learning within and across everyday and academic settings.[38] Gameful learning constructively signifies that educators have the design knowledge and skills to situate student engagement across settings, as well as the ability to leverage various media and curricula to document how expressions of inquiry span multiple learning locations.

The cumulative insight gleaned from considering gameful learning as diverse expressions of educators' agency and growth, willing playfulness, and cross-setting design suggests that a particular way of knowing has been shared throughout *Teacher Pioneers*. This knowledge—about design, play,

35. See Gee's (2007) explanation of identity play as a learning principle in well-designed games.

36. See Salen (2008) for a discussion about the ecology of games and play. Salen, K. (Ed.). (2008). The ecology of games: Connecting youth, games, and learning. Cambridge, MA: MIT Press.

37. Squire, K. (2009). Mobile media learning: Multiplicities of place. On the Horizon, 17(1), 70-80.

38. See, for example: Hayes and Games (2008); Kafai & Peppler (2011); Mathews (2010); Squire, (2010, 2011). Hayes, E. R., & Games, I. A. (2008). Making computer games and design thinking. Games & Culture, 3(3), 309-332; Kafai, Y. B., & Peppler, K. A. (2011). Youth, technology, and DIY developing participatory competencies in creative media production. Review of Research in Education, 35(1), 89-119; Mathews, J. (2010). Using a studio-based pedagogy to engage students in the design of mobile-based media. English Teaching: Practice and Critique, 9(1), 87-102; Squire, K. (2010). From information to experience: Place-based augmented reality games as a model for learning in a globally networked society. Teachers College Record, 112(10), 2565-2602; Squire, K. (2011). Video games and learning: Teaching and participatory culture in the digital age. New York, NY: Teachers College Press.

and the assessment of student learning—is not expressly technical. Readers expecting a prescriptive tutorial on, for example, the craft of game design may be disappointed and should look elsewhere (despite the inclusion of many resources about role-playing, pervasive, and place-based games). Nor have these authors each contributed to a single, universal truth about games and learning—some distanced observation and unchanging understanding regarding how game-based learning may be applied to any classroom or school. Rather, the type of educator knowledge glimpsed distinctively in this book is what Aristotle referred to as *phronesis*—or practical wisdom—a way of knowing that differs from the applied and technical (*techne*) and from the universally true (*episteme).*[39] Here, educators have shared their phronetic knowledge about games and school—and it is a wisdom that depends upon a given learning context, reflects particular ethical commitments, and is oriented toward ongoing practice and agency.

As *Teacher Pioneers* chronicles educators' gameful learning as practical wisdom, the book also surfaces and holds a peculiar tension between charting innovation and prescribing design. As these many authors share pragmatic knowledge accrued from years of teaching, an invitation is proffered for others to develop their own skills, cultivate their own dispositions, and fail in their own spectacular ways.[40] In doing so, readers will avoid the trap of copying whole cloth some formulaic procedure. Indeed, the moment some method is held aloft as the pathway forward for games and schooling—such as gamification, or efforts to "gamify" classrooms—the sooner educator agency is subverted by a return to the technical of puzzle making and maintenance. The difficulty in celebrating *Teacher Pioneers* as an inventive mapping of educators' phronetic knowledge is the accompanying challenge that other teachers, school leaders, and university research partners cannot merely embrace this road map. Recall that these many cases are visions from an edge, not recipes amenable to every palate. Rather, our (or any) efforts must commit leaders and visionaries to creating the conditions for gameful learning. However they may vary across setting and circumstance, establishing the conditions for gameful innovation in education will more likely lead subsequent pioneers to glean with nuance their own embodied ways of knowing and doing game-based teaching and learning.

A FINAL NOTE ON LIMITATION AND POSSIBILITY

For all that it offers—counternarratives to typical and troubling uses of games within school, glimpses of gameful learning, and an indication that educator agency reflects the ongoing cultivation of practical wisdom—*Teacher Pioneers* is an incomplete project. Any journey invariably selects one pathway over another. Subsequent forks in the road determine, as they branch and then branch again, one destination rather than many others. This book, as a collection traced along back roads and blue highways, is no different. The richly contoured edges upon which readers have arrived are both inspiring and an indication that other passages remain to be written. What limitations among this collective pursuit are most notable? First, *Teacher Pioneers* is primarily written by white men. There are many educators whose labors of love agitate against an orthodoxy of disheartening norms and veiled expectations (reflected, unfortunately and more broadly, in the fields of computer science

39. Though the ideas are simplified, readers interested in the relevance of Aristotle's conceptions of techne, episteme, and phronesis to education are encouraged to read Halverson (2004) and Loughran and Berry (2005). Halverson, R. (2004). Accessing, documenting, and communicating practical wisdom: The phronesis of school leadership practice. American Journal of Education, 111(1), 90-121; Loughran, J., & Berry, A. (2005). Modelling by teacher educators. Teaching and Teacher Education, 21(2), 193-203.

40. Beyond the agency of individual educators, Sujata Bhatt challenges readers to further consider questions of scale, suggesting an examination of policy recommendations and theories of change that enable agency among sociocultural, socioeconomic, and sociopolitical conditions.

and educational technology). The distinctive explorations of these pioneers should be celebrated as central to subsequent volumes. Second, a majority of authors are veteran educators, or those who are experienced and comfortable with improvisation. Only two chapters concern the struggles and insights of early career teachers, or individuals just learning to play their scales and chord progressions. Complementary research should examine the shortcomings and successes of more novice educators as they harmonize between new professional practices and gameful learning pedagogies. Finally, *Teacher Pioneers* bypasses a focus on early adopters for a concern with eager, though often isolated, inventors. A forthcoming volume should further explore communication and collaboration dynamics so as to help transform pockets of innovation into generative communities of practice.

In spite of these limitations, *Teacher Pioneers: Visions From the Edge of the Map* is a provocative guide to game-based teaching and learning beyond the didactic, past singularly constrained settings and disciplines, and toward the outer reaches of critique and creativity. The forms of agency and wisdom associated with gameful learning illustrate why educators need not solely instruct to their passive students, delimit learning within the walls of their own classrooms, consume scripted curricula deemed acceptable by others, or perpetuate schooling as a practice akin to a crossword puzzle. Rather, the lived edges of gameful learning require that educators embrace a reflective stance toward practitioner inquiry. So, too, that they champion the trans-spatial affordances of gameplay as stretched across settings and student interests. And—perhaps most important—that educators wisely share how the transgressive possibilities of play foster more engaging and equitable learning opportunities for others.