CHAPTER 17.

TEACHERS AS HACKERS: A NEW APPROACH TO TEACHER PROFESSIONAL DEVELOPMENT USING A HACKATHON MODEL

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A TRAGIC AND IRONIC INTRODUCTION

This is you: a teacher keen to hone your craft, to better your skills, and to provide enlightened instruction to the students in your charge. And because you care deeply about this, you take full advantage of the fact that your school district encourages you to attend professional-development (PD) workshops. You do this because you know that these are meant to be guided and dedicated spaces for you to reflect on your prior knowledge and experience and also represent a great opportunity to learn about new innovative practices. However, you show up to a workshop and can't get past the nagging feeling that your time could have been better spent. And then it hits you: You are experiencing a living embodiment of *tragic irony*. Part of you wants to scream, but another part realizes that this is sadly par for course.

In fact, you would not be at all surprised that if you looked up the term *tragic irony,* you would be met with a picture of yourself (a teacher), slightly hunched in that familiar "I could be listening/I could be daydreaming" pose, while someone else (an expert) is lecturing at length, remarkably on the dangers of lecturing at length. Furthermore, it would also not surprise you to see that same sad picture under the term *teacher professional development* and tellingly under *teachers as students.*

The above, of course, is an exaggeration of sorts. We are certainly not here to pick on our education colleagues. There are obviously many fine examples of great PD experiences, ones that are highly innovative, interactive, and contextualized.[1] Despite this, the above picture still sounds eerily too familiar, and nowhere is this made more clear than in the long-standing, ever-present, and heated debates over the effectiveness of most professional-development opportunities.

None are so prone to dullness as those activities that follow the *apprenticeship of observation* model, a

1. Such a phenomenon has been well documented by various researchers. For more information, read Borko, H. (2004). Professional development and teacher learning: Mapping the terrain. Educational Researcher, 33(8), 3-15; or Penuel, W. R., Fishman, B. J., Yamaguchi, R., & Gallagher, L. P. (2007). What makes professional development effective? Strategies that foster curriculum implementation. American Educational Research Journal, 44(4), 921-958.

term coined by Dan C. Lortie (1975) in his book *Schoolteacher: A Sociological Study*.[2] This is arguably one of the most common forms of teacher training and is more or less a fancy way of saying that a teacher can learn his or her craft by listening to or watching someone else *do stuff*, usually with the acknowledgement that this someone else is in the know. Or to put it another way, these are PD experiences in which an "opinion" or "demonstration" on best practices is shown—often by a more senior educator. Unfortunately, this is usually less than inspirational; there are few masterful, enlightening Yoda-like experiences here. In fact, Lortie laments that a teacher's worldview is summarily informed by an average of 13,000 hours of such schooling experiences, and therefore perpetuating a stagnant norm—so is it any wonder that a teacher may be heavily influenced by the time he or she stands in front of students? If anything, one can intuit that such practices may inadvertently prime a teacher to become a formidable expert at lecturing, or worse—a formidable expert at being dull. Basically, the apprenticeship model of PD creates situations where teachers are more or less forced to be "end users" as opposed to experiences that encourage them to be "creators." And it's not exactly rocket science to say that this is not ideal, a premise that has been explored in depth by others, including Henry Jenkins's work on participatory culture and Jim Gee's conceptualization of teacher roles in terms of being learning designers versus instructional executors.[3] In general, being stuck in this "end user" category inadvertently takes away chances to encourage iteration (it's OK if it's not perfect right off the bat); downplays the likelihood of evidence-based assessment (Science, it works!); and perhaps most important, represents a lost opportunity to strengthen teacher community dynamics (in which the collected expertise in the room will always dwarf the expertise of the person at the front of the room). Which is why we return to our friend, Tragic Irony, made all the more troubling when one realizes that this apprenticeship model possibly leads to a circular and self-fulfilling prophecy of apprenticeship modeling our poor students to death.

SO HOW ABOUT THIS THING CALLED *INSTRUCTIONAL DESIGN?*

One way to address this problem is to argue that the best PD experiences involve something known as *instructional design*. Here, we use the term not as that thing that happens when you fret over building your IKEA shelves, but more in reference to the formal academic field, one that happens to examine the creation of "instructional experiences which make the acquisition of knowledge and skill more efficient, effective, and appealing" (pp. 2-3).[4] Instructional design is commonly seen in educational activities aimed at students acquiring new content in various professional communities, and it mostly works well because when done well, it benefits from being an academic field that emphasizes evidence-based assessment such as standardized tests. This, unsurprisingly, can lead to observable improvement of various teaching practices, which in the best circumstances would be largely driven by the teaching practitioners themselves. Unfortunately, it's not all rainbows and ponies. The field does appear to place an emphasis on content acquisition as opposed to the more challenging objectives concerning the nurturing of learning identities and processes. Furthermore, like many academic endeavors, the act of incorporating potential instructional-design practices can be logistically impractical (both in terms of resources and timing) and, frankly, mentally taxing because

2. Lortie, D. C. (1975). Schoolteacher: A sociological study. Chicago, IL: University of Chicago Press.

3. Jenkins, H., Puroshotma, R., Clinton, K., Weigel, M., & Robison, A. J. (2005). Confronting the challenges of participatory culture: Media education for the 21st century. Cambridge, MA: The MIT Press; Gee, J. P. (2007). What video games have to teach us about learning and literacy. (Revised and updated ed.) New York, NY: Palgrave Macmillan.

4. Merrill, M. D., Drake, L., Lacy, M. J., Pratt, J., & ID2 Research Group. (1996). Reclaiming instructional design. Educational Technology, 36(5), 5-7.

of the nature of pursuing and adhering to the often complex theoretical elements in this process. Maybe just as important, taking this overly academic route might miss out on the teachers' own valuable, practical, and classroom contextualized expertise.

And herein lies the point: We believe that teachers are more likely to embrace a PD experience if it is something in which they are actively asked to provide their own expertise. This way, the experience is augmented not only because it is interactive, but also because the teachers inadvertently guide the process so that it is *relevant in their own classrooms*. Which is to say that what we really need are PD experiences that not only teach them useful things (for instance, some of the evidence-based principles behind instructional design), but that also actively involve teachers in the creation and assessment of new and usable practices. In other words, teachers should embrace their professional development as opportunities to "do *stuff*" themselves. In a way, teachers get to be in charge of their own destinies, which already sounds oodles more epic than your average PD workshop.[5]

Because everyone likes lists, let's make a list in which we consider all of the above. We believe that an ideal PD experience would have the following goals:

1. Programming that results in the achievable outcome of a "tangible something" (a lesson plan version 1, for instance) being created, shared, collected, and (this is important) with room for further iteration and possible assessment.
2. Content that is primarily teacher driven, if not critically dependent on teacher input, both in terms of their own pedagogical expertise and with the goal that the "tangible something" works well within the nuances of their own specific classrooms.
3. Provision of some instruction and guidance whereby elements of formal instructional-design expertise can be provided and shared with the teacher participants. In other words, someone (perhaps a less wrinkly Yoda type) should have devised a clever framework that guides the creation process so as to maximize the awesomeness of those "tangible somethings" being produced.

And taken together. … Guess what, folks? This sounds an awful lot like a "hackathon."

TOO GOOD TO BE TRUE? SWEATPANTS AND CAFFEINE AT A "PROFESSIONAL" EVENT

So what exactly are "hackathons?"[6] Well, they are a phenomenon that typically describes an event at which a group of experts converge and collaborate intensively. Furthermore, these events are explicitly goal oriented in that there is a "tangible something" to deliver. Also (and this is where it gets fun), hackathons largely thrive on doing all of this in an insanely short time, with lots of juggling of various things and with full realization that you have to make do with limited or no resources. Culturally, this is more about sweatpants and copious amounts of caffeine rather than looking important and taking the expert out for dinner. It's especially common in the technology

5. This isn't a new idea: that learned knowledge in itself is not a useful predictor of success. In fact, this idea has surfaced in many forms, notably in the business and technology sectors. One well-known example comes from Stanford University Business Professors Jeffrey Pfeffer and Robert I. Sutton, authors of The Knowing-Doing Gap: How Smart Companies Turn Knowledge Into Action. In essence, through careful analysis of management practices, they provide evidence that the best way to close the "knowing-doing" gap is to allow people to generate, store, explain, and coach others.

6. Briscoe, G., & Mulligan, C. (2014). Digital innovation: The hackathon phenomenon. London, England: Creative Works London.

sectors, notably in the culture of computer programming, where the term *hack* originated, but these days hackathons are widely used in a variety of forms and involving a diverse range of different disciplines. If you can hack computer software, science, policy, and artistry, why not teaching?

To be fair, we must say that hackathons are not always effective, primarily because it appears that outcomes are greatly dependent on the investment of the participants. However, there have been a number of recent attempts to suggest best practices around the model, all with the hope of teasing out greater chances of success. Regardless of the utility of the end products being created, a number of other benefits are associated with the form that would be of great value to the teacher, especially because they may be perceived of initially as burdens: (a) the significance and value of prototyping (in which failure is not discouraged but presented as a sometimes useful and beneficial step); (b) the inclination for iteration (where progress is open and subject to review and change from *others*, thereby promoting inclusion of outside perspectives); and (c) the hackathon's reliance on intense but usually enjoyable networking as a means to better catalyze community building.

All of this is beneficial because, at its heart, a hackathon requires participants to remain flexible and open to the issues and problems that arise while seeking the best outcome and answers. Success is achieved when all participants collaborate effectively to create a just-in-time solution to the problems by leveraging all accessible resources (intellectual and physical). Indeed, structuring a teacher PD as a hackathon will likely require teachers to interact with their colleagues in unfamiliar and potentially uncomfortable ways. We think that it's not an accident that these last three grand-sounding sentences happen to mirror the general challenges associated with any classroom setting. And we think that a hackathon might be just the thing to produce that lovely feeling of intellectual excitement associated with being challenged, which in turn might lead to an innovative mind-set.

Overall, we believe that the hackathon model has good potential to invigorate many possible teacher professional-development opportunities and in many different subjects. However, given that this publication focuses on game-based learning, the remainder of this chapter will describe a case study of PD via a hackathon model and specifically one that aimed for teachers to include more game-based learning in their curricula. We think that a hackathon model is particularly well suited for this endeavor. Despite their recent rise in popularity, immersive games—"the kind that lend themselves to deep exploration and participation" (p. 5)—in the classroom are still rare.[7] And even when there is the desire to bring games into the classroom, teachers are often overwhelmed and unsure how to effectively use them for student learning. Overall, we believe game-based learning is a great topic for exploring the merits of hackathons in the teacher professional-development setting as it: (a) focuses teachers on relatively novel content, that is, game-based learning; and (b) revolves around a topic that is naturally familiar and comfortable within hackathon culture, thereby allowing organizers to work from past workshop iterations. From this case study experience, we will provide some preliminary thoughts on the process and argue for its being a viable, if not superior, model for teacher professional development and lesson-plan creation. Furthermore, we'll include a next-step tool kit for further investigation.

Interestingly, it is not lost on us that our adoption of the hackathon model is cheekily analogous to

7. Takeuchi, L. M., & Vaala, S. (2014). Level up learning. A national survey on teaching with digital games. New York, NY: The Joan Ganz Cooney Center at Sesame Workshop.

a "hack" that provides teachers with instructional design and game-based learning practices but in a more practical and faster setting. This may be ironic, but it's certainly not tragic.

HACKATHON—CRACKING THE CODE FOR AUTHENTIC PROFESSIONAL DEVELOPMENT

In July of 2014, a 10-day summer workshop that focused on creating digital games was hosted by Pepperdine University and funded by the National Science Foundation in collaboration with Independence High School, a public high school in Bakersfield, California, with approximately 1,900 students in Grades 9-12.[8] The participants created digital games that could teach mathematics and science. The workshop also provided the participants information on how to use games in schools. The workshop was intended to engage teachers who were unfamiliar with game-based learning in a series of activities and conversations about using games in schools. Unlike our proposed hackathon in which teachers and researchers work together, three researchers, 10 teachers, and 10 students collaborated during the summer workshop. Although it was held for two weeks with three follow-up sessions during the school year, we believe that the knowledge gained from the experience provides a strong foundation for our suggestions to host a two-day hackathon for teachers. Brief descriptions of the workshop have been added when they were deemed useful. We also emphasize that the following steps are meant to be a basic framework for teachers to modify and iterate.

Six Steps for Hosting a Game-Based Hackathon for Teacher Professional Development (HACK-IT)

We envision the workshop to have six steps. It begins with participants' self-reflection inventory, which leads to forming functioning groups. After forming groups, the participants engage in group discussions and lesson-planning activities that incorporate friendly competitions into the process. It concludes with an extension plan beyond the hackathon. Please note that a sample agenda for a two-day hackathon appears in Appendix A.

Step 1: "H" Is for Harness the Resources

> The first step of the 2014 summer workshop to create digital games for mathematics and science education involved students and teachers alike sharing their experiences and knowledge about games, which was done before the participants created their own digital games. From this, it became clear that the students had much more game-creation knowledge than did the teachers. As a result, teachers soon began to rely on students to provide additional technical support. During a post-workshop debrief, one student reflected, "The best part of about this is that I got to see myself as my teachers' equal in some things. I knew stuff that some of my teachers didn't know. I liked that I could help my teachers."

In this digitally saturated world, many conventional professional-development providers often neglect the most powerful resource: the expertise possessed by the people in the room. A hackathon model is predicated upon the notion that we as a group, sharing our knowledge through authentic interactions, are smarter than each one of us in isolation. This is true even with the overabundance of online resources. As many social-learning theorists have suggested, social interactions can magnify the impact of learning activities for all participants. That is why teacher professional development should be focused on maximizing the impact from the meaningful interactions among the

8. The workshop was facilitated by one of the authors, Kip Glazer.

participants. Such interactions should be a starting point that can lead to continuous support for the participants.

At the beginning of the workshop, the participants should take a thorough inventory (see Appendix B for the Self-Reflection Inventory form—note that these forms should be considered as only a launching point for further meditation and iteration) of their own skills, knowledge about games, and proficiency in creating lessons plans using game-based learning (this may include digital or tabletop outcomes). In particular, because hackathons thrive on aggregated activity, an inventory on knowledge around various technology and computer tools can be useful, as would access to equipment that allows such use (at least one laptop per group, for instance).

This overall assessment step is crucial in constructing a successful workshop, as well as a great way to prime participants' metacognition skills, and should not be ignored. It also allows smaller groups to be defined by their diversity in expertise: For example, every team might want to include at least one individual who is comfortable using certain technological tools or games, and so forth. After everyone has had a chance to reflect on his or her own strengths and room for improvement, he or she should be given a chance to share that with the group. After the whole-group discussion that highlights the existing expertise among the participants, the workshop organizers should structure the workshop based on the resources in the room to enhance the existing skill sets or supplement any exposed gaps.

One might consider this step to be the toughest part for the organizers because the unknown nature of the knowledge base assumes the need for a workshop that requires continuous and responsive course corrections. However, one way to ensure a less frenetic process is to gather the information before the workshop; this would allow the organizers the option of preplanning the workshop format and of exploring the possibility of bringing in experts who could provide additional expertise and/or resources. Still, not knowing who and what will be in the room can also be one of the best experiences for all participants (including the organizers) because of its similarity to a real-life classroom (where many teachers will not know until the first day of class whom they will be teaching). Effective teachers know the importance of responding to the learners in the room. By creating an authentic experience for all participants, the organizers can model the importance of harnessing the resources in the room.

Step 2: "A" Is for Allow the Formation of Productive Groups

> Although each person was responsible for creating his or her own digital game, students and teachers alike often worked in pairs or in groups based on their skill levels and interests. Typically, a person needing a specific kind of information would seek help from another who possessed that specific knowledge. Once the person gained the necessary knowledge, new groups formed around a different problem. At the end of each day, the whole group met and discussed the progress, which allowed the participants to gain more knowledge from one another (see Figure 1).

Figure 1. A pair solving problems together.

Immediately after surveying and gauging the resources in the room, participants should group themselves around a single goal or task. For example, a group of elementary school teachers wanting to use a game such as *Minecraft* could form a group to create a vertically aligned lesson plan. Or a group of teachers could work on creating a different kind of vocabulary lesson for the same subject area. Regardless, the organizers need to exercise finesse and diplomacy for this step, organizing groups depending on the level of skills and interests of the participants because participants might be hesitant if they think that they must teach the same content area or grade level to be in the same group. Again, following the hackathon model, participants should self-organize to solve a challenge to focus on pedagogy beyond basic content. One suggestion, especially in the realm of digital games, is to consider the Technological Pedagogical Content Knowledge (TPACK) model for Educators.[9] This model posits that for successful incorporation of learning technologies in their classrooms, the teachers using these technologies need competency in their content area (what they teach), pedagogy specific to their content (how a teacher teaches writing can be different from how he or she teaches mathematics), and tools best suited (manipulatives versus games) to enhance their instruction (see Figure 2). The TPACK model asks teachers to consider how these areas intersect in every step of their teaching to create an optimal condition for incorporating technology.

9. A detailed explanation of this model can be found in Mishra and Koehler's 2006 article, "Technological Pedagogical Content Knowledge: A Framework for Teacher Knowledge," and Handbook of Technological Pedagogical Content Knowledge (TPCK) for Educators (2008), edited by the AACTE Committee on Innovation and Technology.

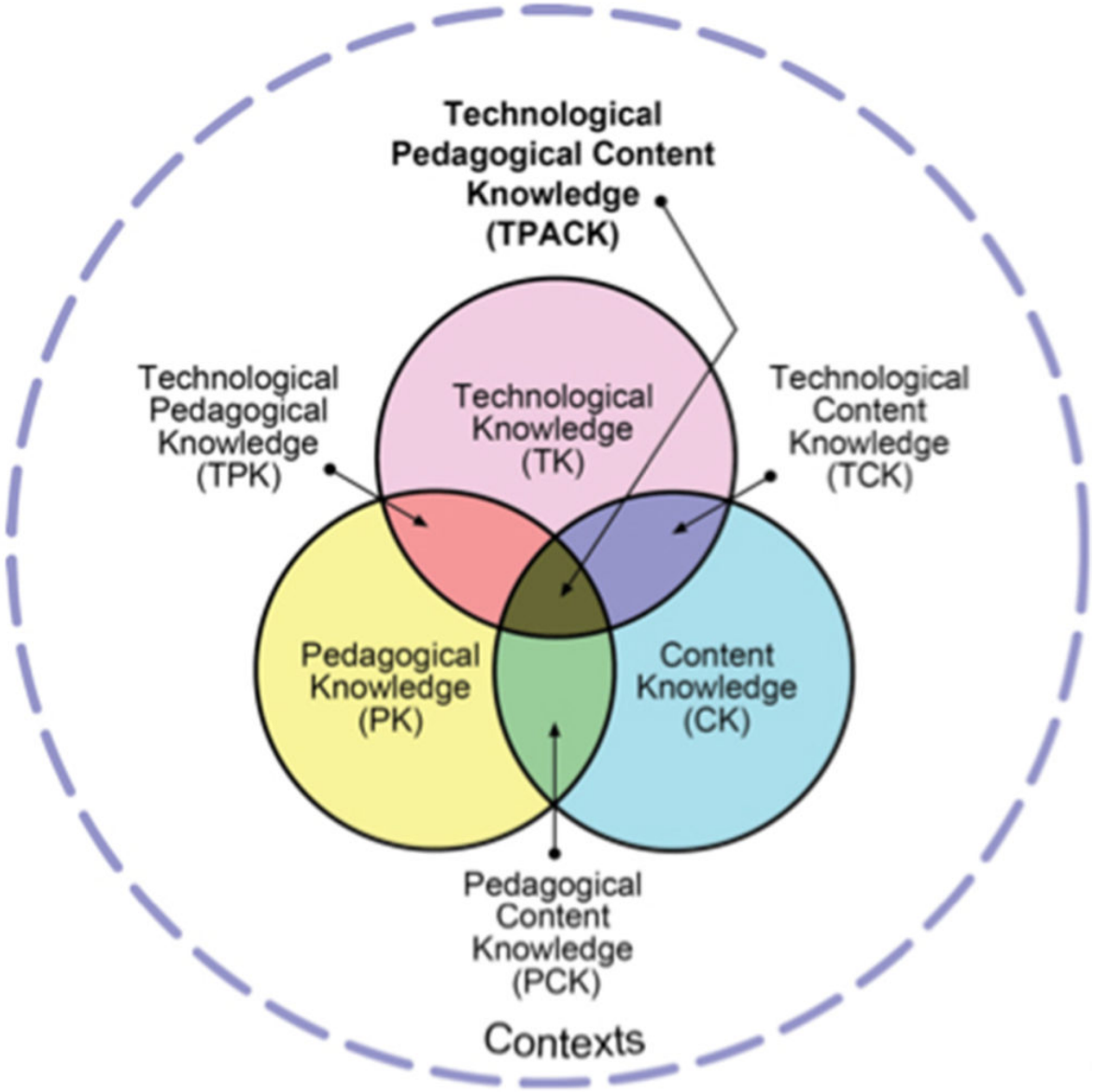

Figure 2. Technological Pedagogical Content Knowledge (TPACK) model for Educators reproduced by permission of the publisher, © 2012 by tpack.org.

First, organizers should ask the participants to identify each item independently. Participants should think about which game, what content, and how to teach a subject separately. Next, ask the participants to consider how two of the items interact with one another. For example, is a particular game useful for teaching math? If so, why? Or should the students play the game individually, in pairs, or in groups? Why? Finally, organizers should ask the participants to describe how all of the items interact in a real classroom. Do the teachers have the right classroom condition to allow their students to use games to learn something specific? If not, what other conditions needed to be met? Organizers should walk the participants through various areas and ask them to rank themselves in each area. Organizers should also encourage the participants to identify their area of need as well as their areas of expertise and strength. By capitalizing on the participants' self-identified strengths and needs, organizers should guide the participants to focus on a value-added approach to successful grouping. What is crucial is allowing the participants to organize themselves around a common goal or problem.

A group with participants who feel competent in technology can tackle a technical challenge while another group with participants who feel competent in content can focus on content-related issues.

Based on the experiences of our one aforementioned workshop, we suggest that each group has three to five participants. However, the participants should have the flexibility to work in pairs if it is agreeable to both participants. We do not recommend having a group with more than five participants.

Step 3: "C" Is for Cultivate Discussions and Planning

Immediately after they form, each group should establish its norms. This includes working out things such as who the reporter will be, and how the group will come to consensus. This step should be used to create social bonds among the group members and be considered a great opportunity to infuse playfulness. For instance, groups could come up with a team name after a game, or create a cheer that they can recite as they reach a milestone.

This should definitely be done with the full consent of the participants to avoid what many scholars have called the "creepy treehouse" phenomenon.[10] This describes a situation in which students are forced to interact on various social media platforms for a purely academic purpose, which creates many uncomfortable social situations among the participants. Many researchers have also argued that subjecting adults to forced social activities can potentially create an environment that violates the participants' basic rights such as privacy and creativity and therefore should be avoided. If any individuals do express reluctance to participate in the nonacademic activities, this could actually serve as an opportunity for everyone to devise various strategies that engage students or teachers who might themselves be reluctant to participate in different activities in the classroom. By privileging the existing context and the immediate and authentic concerns of the participants, organizers can truly empower all participants.

> *During the summer workshop hosted by Pepperdine University, a student suggested that everyone should dress up as a character from a movie or a game. Rather than requiring everyone to do so, the organizers brought various costumes and props for the participants and had them available. While working on creating digital games, students and teachers alike chose various items and dressed up as different characters to ease the stress and break up the monotony. Many of them took selfies and posted online voluntarily (see Figure 3.).*

10. First described in the 2008 article "When Professors Create Social Network for Classes, Some Students See a 'Creepy Treehouse'" by Jeffrey R. Young, published by The Chronicles of Higher Education.

Figure 3. Selfie.

Once the group norms are established, each group should work to create a usable lesson plan using an existing game. At this point, some teachers might profess that they are not "gamers," and here, organizers should take this opportunity to inform educators of the expansive definition of game-based learning, especially by encouraging them to consider the game mechanics of their chosen game. Helping teachers to recognize that using any types of competitions or a reward system counts as game-based learning is important. Organizers can empower teachers by introducing a plethora of game genres and having them consider which games are best for their own classrooms in terms of skills development and content. Furthermore, even though the goal is to create a lesson plan for a teacher to implement in his or her classroom, organizers should always encourage the participants to reflect on the *process* of creating a lesson plan.

Key things in this step to highlight and consider are:

1. **Establishing learning objectives.** What do we want our students to learn and do as a result of being taught the lesson? What type of content standards will the lesson address and why?
2. **Content knowledge.** How much content knowledge will the game teach? Which content will be best taught using a particular game?
3. **Lesson steps.** What should each step be? How much time will it take to execute each step? In what order would you have to arrange each lesson step?
4. **Evaluation plan.** What tools will other teachers need to evaluate the effectiveness of the lesson?
5. **Critical resources.** What additional resources will the teacher need? Where and how would you help them get those? Which resources are critical? Which are not? Why?
6. **Technical skills.** What type of technical skills should the students possess before playing the games? How would a teacher learn and teach them? How well does the game address the acquisition of certain content knowledge? How would you demonstrate that?
7. **Iteration plan.** What will you do to ensure iteration when they return to the classroom? Who will monitor the lesson plan implementation and further iteration?
8. **Organizational culture.** What is the organizational culture for innovative approach? Whom can you collaborate with? What existing structural mechanism can you use or rely on? What innovative systemic mechanisms can you create if you were to continue the practice?

Step 4: "K" Is for Keep It Competitive to Include Playfulness in the Process

One staple element of the hackathon model that can encourage playfulness in the process is friendly competition. Here, specific tasks or benchmarks can be set—votes, badges, or publicity—all so that organizers can entice friendly yet fierce competition that also discourages passive spectatorship. Be sure to reward Bartle's four player types.[11] Once again, demonstrating these processes can help the teachers to think about how they can use their knowledge in their own classrooms. However, the competition must be genuine and authentic.

The competitive element may cause various groups to monitor the ideation and activities of others. This can even be facilitated by creating a public Facebook page or a Google site where participants can post their in-progress lesson plans and then solicit feedback from others. Organizers can also attempt to leverage social media to engage a wider audience. The bottom line is that introducing the spirit of authentic competition will benefit the participants.

Step 5: "I" Is for Iterate and Refine

After each group has created a lesson plan on using games, the organizers should then set aside some time to explore how feedback and iteration can inform the process. This includes discussions on the value of prototyping, in which an incomplete or flawed product is still considered valuable, as well as pointers that address situations in which participants may not be comfortable with publicly giving or receiving feedback. In general, things to consider include:

1. What are some ways to give more targeted feedback? What phrases can you choose to use?
2. What can everyone do to make sure the interactions are positive and productive for all?

11. Bartle identified killers, achievers, explorers, and socializers as four distinctive players. Read John Martin's chapter "Unlocking a Mystery: Designing a Resilient Place-Based Game" in this volume to learn more about Bartle's four player types and how each player type can be rewarded.

Thereafter, there should be a public pitch session for everyone to share his or her ideas and receive feedback. Such a public and interactive iteration is critical in making this hackathon experience successful and is an excellent opportunity to showcase to teachers the value of immediate feedback.

During the digital game-making workshop hosted by Pepperdine University, the participants created screen casts of their games (see Figures 4, 5, and 6). During one of the follow-up sessions, all the other participants viewed the videos and provided suggestions for improvement. Through a public feedback session, the participants were able to gain additional knowledge.

Figure 4. Library Shelving game.

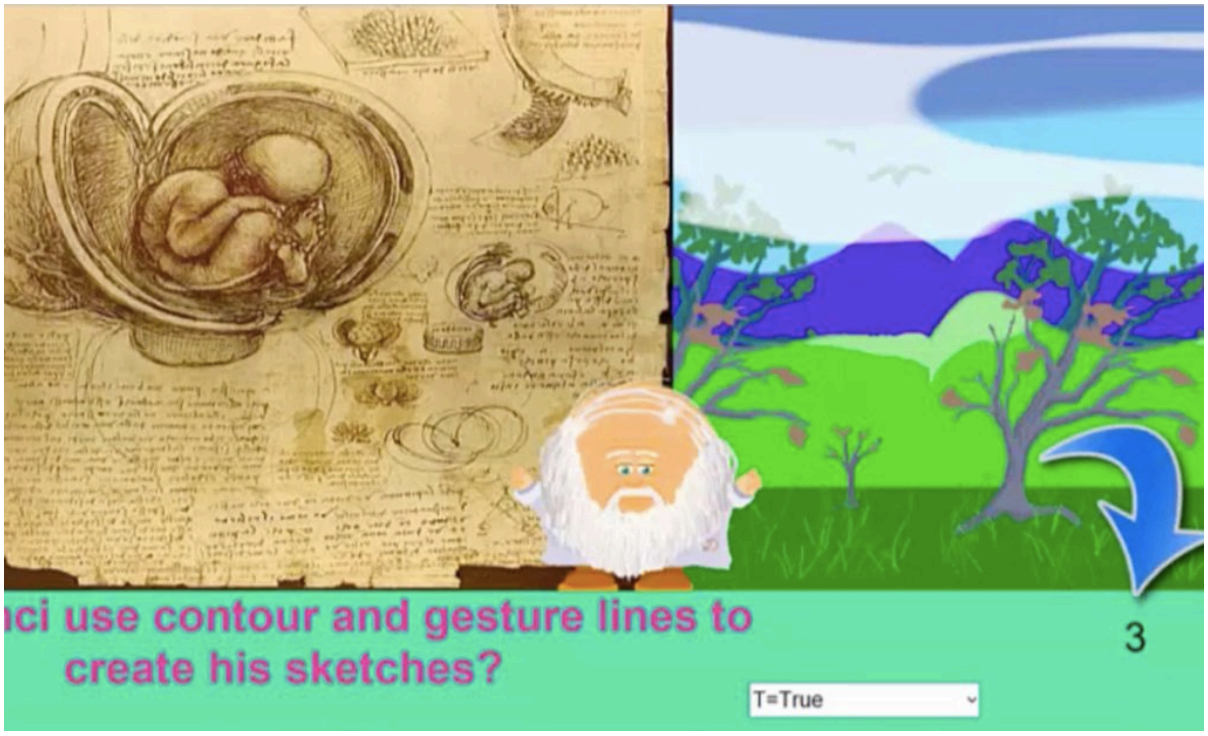

Figure 5. Da Vinci game.

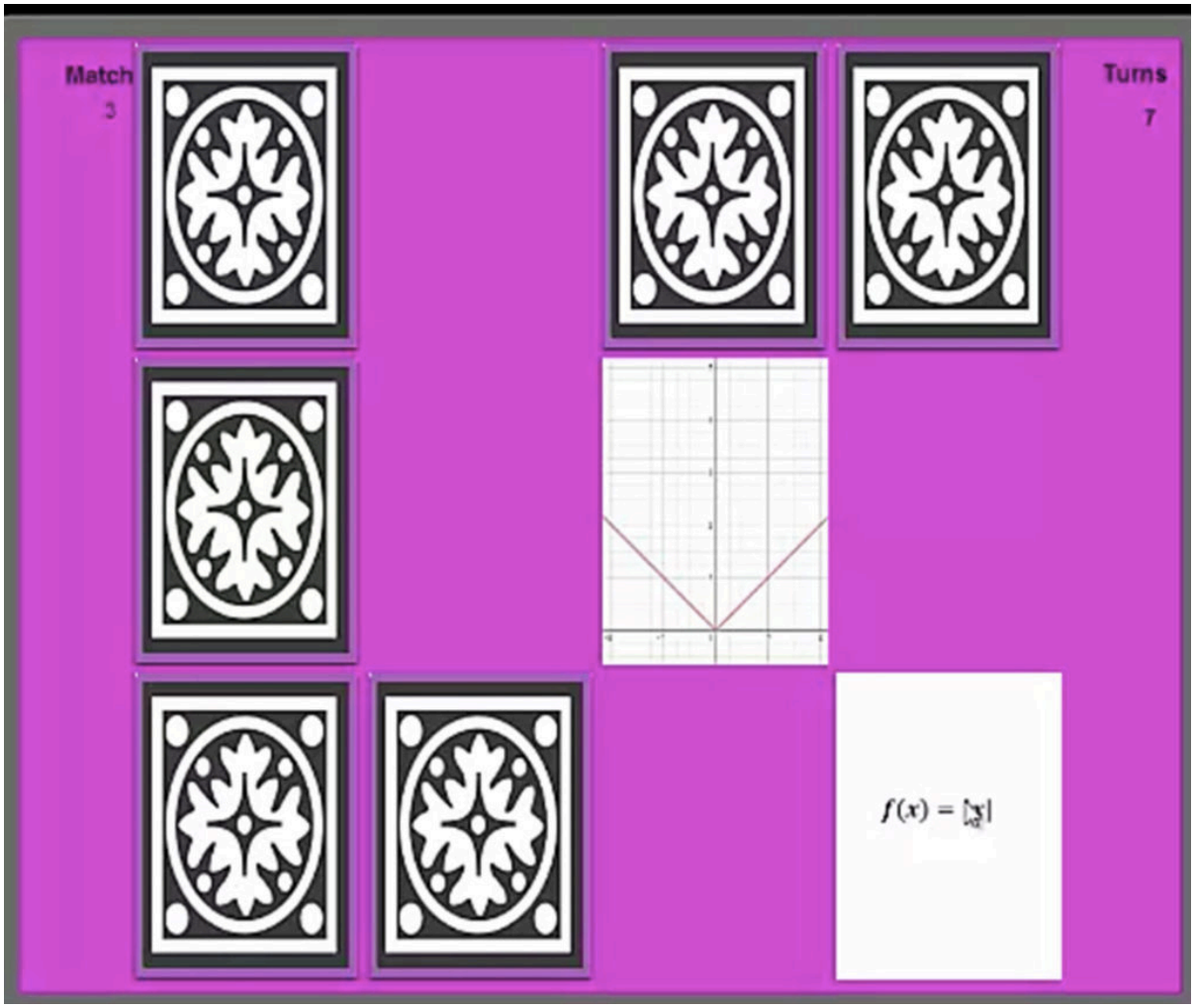

Figure 6. Mathematical Equations and Graphs Matching game.

Once everyone has had a chance to give and receive feedback, a discussion should ensue so that one lesson plan is chosen as a demonstration lesson, using the rest of the workshop participants as students. Note that this chosen lesson plan will be the primary resource material that participants will focus on for this step of the workshop, and so selection criteria could be based on the competitive element. This does not mean that the other prototype lesson plans are wasted, but rather that the subsequently shown demonstration and classroom iteration processes can be used in a less direct way at later stages.

If possible, someone who has not been part of the hackathon should be invited to teach the lesson. At a minimum, someone who didn't participate in creating the lesson should pilot it to ensure that the lesson steps are logical and easy to follow for any teacher. While the lesson is being piloted with the rest of the group as students, all participants should take notes on their impressions around the experience and especially see if such impressions can inform reiteration of their own lesson plans. In particular, members of the original design team should also take notes as to whether the lesson is being executed as they intended. Such a reflective process that is differentiated based on the roles can also demonstrate a way to differentiate a lesson in a real classroom.

Step 6: "T" Is for Teach and Train

Once the refinement of the winning lesson and other lessons based on multiple feedback and iteration has been completed, all lesson plans should be published on a website for others to use in the classroom. Using popular free web tools such as Versal, Haiku Learning, Edmodo, Blogger, or WordPress, the organizers and the participants can curate and publish lessons.[12] Simply collecting lesson plans using Google Docs or Dropbox and sharing with others are also recommended. Using various social media, the participants can publicize their own lessons for others to implement in their classrooms. Participants should also collect reflections after using the lessons in their own classrooms. In addition, the participants who are interested in hosting a hackathon of their own on their campus could use the process that they have experienced. Most important, teachers back in their classrooms should consider using the structure to encourage students to become engaged in problem-solving exercises using a hackathon model. Host a hackathon with the students and watch their creativity come to life!

CONCLUSION

John F. Kennedy once said, "Let us think of education as the means of developing our greatest abilities, because in each of us there is a private hope and dream which, fulfilled, can be translated into benefit for everyone and greater strength for our nation." Teachers who educate 21st-century students must acquire more refined skills for the development of our students. The National Education Association reports that, tragically, nearly 40%–50% of new teachers in the United States leave the profession within the first five years,[13] just when they begin to master their craft. High-quality professional development is not only useful but also crucial in retaining and supporting teachers. Such endeavors must provide highly situated experiences that can be replicated in every classroom. Using a hackathon model for teacher professional development can help teachers have meaningful interactions with their colleagues that can result in an effective professional-development experience.

APPENDIX A

A Sample Two-Day Hackathon Agenda*

Day 1

8 a.m.-9 a.m.: Introduction and sharing of the Interest Inventory

9 a.m.-9:15 a.m.: Break

9:15 a.m.-10 a.m.: Post strengths and needs and complete the chart for the creating groups

10 a.m.-10:15 a.m.: Break

10 a.m.-11 a.m.: Find your tribe

11 a.m.-11:15 a.m.: Break

12. Versal: https://versal.com/; Haiku Learning: http://www.haikulearning.com/; Edmodo: https://www.edmodo.com/; Blogger: https://www.blogger.com/; WordPress: https://wordpress.com/

13. Ingersoll, R. M. (2012, May). Beginning teacher induction: What the data tell us. Phi Delta Kappan, 93(8), 47-51.

11:15 a.m.-11:45 a.m.: Begin establishing group norms and set goals. Set up group laptop for "recorder" (if available).

11:45 a.m.-1:15 p.m.: Lunch (option to do so with your new groups)

1:15 p.m.-3 p.m.: Lesson creation with self-directed breaks

3 p.m.-3:15 p.m.: Break

3:15 p.m.-4 p.m.: Daily debrief

Day 2

8 a.m.-1:15 p.m.: Lesson creation with self-directed breaks and lunch

1:15 p.m.-1:30 p.m.: Overview of pitch and feedback session

1:30 p.m.-2:30 p.m.: Lesson pitch and selection

2:30 p.m.-2:45 p.m.: Break

2:45 p.m.-3:15 p.m.: Lesson demonstration

3:15 p.m.-3:30 p.m.: Break

3:30 p.m.-4 p.m.: Daily debrief

*Times are suggested; however, we insist on allowing the teachers to take lots of breaks.

APPENDIX B

Self-Reflection Inventory Form

1. Technological Skills

(Check one) When it comes to technology, I consider myself to be a:

- Novice – I can check my emails, type my essays, and create a PowerPoint presentation. I can use my smartphone to post pictures on a social media site.
- Competent user – My smartphone is linked to various productivity apps. I am familiar with multiple browser, platforms, and operating systems. I use various multimedia software and other online resources to learn and teach.
- Expert – In addition to using what's available online, I have created and distributed materials on various online tools and platforms. I am familiar with programming languages. I am considered an expert by my institution.

Rate yourself on your level of expertise.

Items	Expert: Can teach a class on it	Advanced: Could learn a little more	Basic user	Heard of it, but use it infrequently	New to me	Other
Email Integration – Outlook and Gmail, etc.						
Cloud-Based Storage – Google Drive, Dropbox, and SharePoint, etc.						
Various Presentation Software – PowerPoint, Google Presentation, Prezi, etc.						
Browsers – Safari, Chrome, Firefox, and Internet Explorer, etc.						
Word Processing Software – Microsoft Word, Google Docs, and Pages, etc.						
Data Processing Software – Excel, Google Spreadsheet, and MS Access, etc.						
Operating System – iOS, Windows, and Linux, etc.						
Apps for Collaborative Publication – Evernote, Blogger, and Wiki, etc.						
Web Publishing Tools – Google Sites, WordPress, and Drupal, etc.						
Coding Languages – HTML, Java, and Python, etc.						
Familiarity With Hardware – Arduino boards, MakeyMake, and Raspberry Pie, etc.						
3-D Modeling and Printing						
Information Network Systems						

2. Learning Theories, Framework, Paradigm Knowledge

Items	Expert: I have fully embraced the concept. I have created lesson plans based on it, and I can teach a class to other teachers on it.	Advanced: I have used in the classroom, but I could learn a little more.	Basic: I have heard of it and attempted to use it in my classroom once or twice.	I heard of it but never attempted to use it in my classroom.	The term is completely new to me.	Other
Project-Based Learning						
Inquiry-Based Learning						
Universal Design for Learning Framework						
TPACK Model for Educators						
Cooperative Learning Framework						
Constructionism						
Situative Learning Theories						
Social Learning Theories						

Please tell us what other pedagogical frameworks or theory you are familiar with.

3. Content Knowledge

My content-area expertise is/are _____
(Please indicate what subjects you have taught/currently teaching.)

I have been teaching for _____ (years).

I consider myself to be:

- A beginning teacher. – I have been teaching less than 5 years.
- A midcareer teacher. – I have been teaching between 5 and 10 years.
- An experienced teacher. – I have been teaching for more than 10 years, but I have not had many opportunities to provide support for other teachers.
- A master teacher. – I have been a master teacher/mentor/coach to other teachers in my content area.

4. Knowledge on Games

1) Personal knowledge as a gamer.

- Noob – I play board games and mobile games infrequently, but I would never call myself a gamer.

1. Emerging gamer – I enjoy playing games and can carry a conversation with others who enjoy games. I own various game consoles and use them when I have time. But I wouldn't call myself a "gamer." I enjoy a variety of tabletop games.

1. Leet – I have dedicated a huge chunk of my life to playing games. I know the latest release dates of popular games.

Please tell us what types of games you enjoy playing and why.

2) Ability to use games in the classroom.

- Noob – I have not or rarely have used games in the classroom, and when I hear the term "game-based learning," I generally think of using digital games during computer time, or as using access to games as a classroom reward.
- Emerging game-based classroom teacher – I have incorporated games in my classroom to teach various lessons. I have used various types of games.
- Leet – I understand what game-based learning is, and I have turned my classroom into a laboratory for game-based learning. I have used games such as *Minecraft, Portal 2*, or other digital games to teach lessons. Sometimes a lesson may revolve around students being involved in the process of game design itself.

Please tell us what types of games you have used in your classroom and what you would like to learn more about it.