Kira & the Spinners: Exploring the Dilemmas of a Structured-Choice Learning Environment in a Public School

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Abstract: We report a case drawn from 6 months of ethnographic and interview research in a STEAM Lab. Free to choose what to work on, students acquired difficult skills and demonstrated what school leaders had identified as valued capacities: collaboration, creativity, and persistence. The teacher struggled, however, to apply conventional grading practices to recognize this learning. We analyze the case of Kira, a 7th grader who learned to design and 3D print an original fidget spinner and began to imagine herself as a designer and entrepreneur. Kira's story came to a surprising and sad end, as she failed to produce the "evidence of learning" required for a high grade. The case highlights the dilemmas of recognizing and assessing consequential learning experiences in project-based environments.

Introduction

This paper explores the dilemmas that can emerge when conventional ways of assessing and grading student work are grafted onto an "alternative infrastructure for learning in schools" (Stevens et al., 2016, p. 1026). The STEAM Lab that was the focus of our study included a FUSE Studio (Stevens et al., 2016) and other student activities that together represent what we call a "structured-choice learning environment." Our analysis shows that what was at stake in this classroom were distinct senses of what should and did count as evidence for learning, differences that we show were highly consequential for Kira, the focal student in our case study. Kira, a 7th grader, learned to use software tools to design and 3D-print a fidget spinner, then expertly guided two classmates who learned from her how make their own spinners. Kira struggled at Eagle Lake, but found a home in the STEAM Lab, calling it a "dream come true." The class teacher Mr. Jacobson was an experienced teacher who was a powerful advocate for the kind of educational experience he was helping realize in the STEAM lab. He watched with pride as Kira developed a complex skill, built a working spinner, taught her peers, and earned their respect. Kira's story came to a surprising and saddening end, but the case has theoretical importance for exploring the dilemmas (Cuban, 2001; Stevens, 2000) that emerge when different logics of education (Meyerhoff, 2020) are grafted together without sufficient thoughtfulness.

Research context

"Eagle Lake" is a school district in a wealthy suburb of a large Midwestern city that prides itself on a long "progressive" history. At the time of this study, administrators explicitly saw themselves as inheritors of this history, and worked to construct the STEAM Lab to represent a contemporary version of this legacy. Diverse, challenging activities including architectural design, 3D printing, e-textiles, and robotics were available to students, who were free to choose what to work on and for how long. At the same time, because the STEAM Lab was run as a course within the school day, Mr. Jacobson faced the challenge of being expected to, in the superintendent's words, "clearly define evidence of student learning" and to assign grades to all students at regular intervals. Mr. Jacobson was given little guidance from administrators in how to adapt the school's assessment and grading practices to the learning environment of the STEAM Lab.

Data collection and analytic procedures

The first author conducted approximately 150 hours of ethnographic fieldwork with student participants and the facilitator Mr. Jacobson between November 2016 and June 2017. This included about 50 hours of videorecording. Limited ethnographic observations and interviews continued from September to November 2017. Our analysis combines field work observations, analyses of interviews with multiple stakeholders, and a modified version of interaction analysis techniques (Jordan & Henderson, 1995; Hall & Stevens, 2015). The case sampled here is representative of the creative, collaborative work that characterized the student experience in the STEAM Lab. With regard to the central actors in this case study, the first author interviewed Mr. Jacobson during and after class each day and discussed Kira's case with him after its potential relevance emerged from iterative data analysis. In addition, the first author conducted semi-structured interviews with 7 school and district leaders based on anonymized case narratives, including Kira's. The case study is composed from synthetic analysis of these data.

Learning in the structured-choice environment

Students in the STEAM Lab chose from 32 FUSE "challenges" and other technology and design activities. They were permitted to work independently or in groups. Previous research on FUSE has documented a range of classroom cultural practices, including help-giving and seeking, peer learning, and the emergence of "relative expertise," in which students develop expertise that becomes recognized within the local classroom culture (Stevens et al., 2016). These cultural practices developed in all 6 STEAM Lab classes at Eagle Lake, and Kira's work with her classmates represents a vivid example of these phenomena.

Designing and making the spinner

Kira started by designing and 3D printing a keychain as part of a FUSE challenge called "Keychain Customizer," making use especially of the video tutorials on the FUSE website to learn TinkerCAD. She then made a "productive deviation" (Stevens et al., 2016) away from the keychain activity and towards an idea of her own: a fidget spinner, a popular toy at this time. Kira went through several cycles of ideation, prototyping, and refinement as she produced her first versions of the spinner. Once immersed in the project, she started coming in on her lunch period to work on it. Creating a spinner that "looked cool"—Kira's stated design goal—became an intensely engaging activity for her. She faced important challenges along the way. As she approached completion of the spinner, she realized she had made an critical mistake at the outset; she had failed to correctly measure a key part. As a result, she produced a frame, but the bearing that allows the spinner to spin did not fit. When class ended, she quietly took a metal file from the studio, violating a rule about taking tools out of the room because she was committed to fixing the problem. She proceeded to work on her spinner during her English class, prompting a aggravated call from the English teacher to Mr. Jacobson and causing him to deliver her a stern reprimand to Kira. These efforts, nevertheless, provide strong evidence of Kira's agency and interest in the project. She learned from her error, as evidenced by the way she drew on the experience in teaching other students.

Teaching Joe and Franklin

Kira's spinner drew attention from many other students in the class, including two other 7th graders, Joe and Franklin. Their interest extended beyond curiosity, as they actively enlisted Kira's help in making their own spinners. In this interactional sequence, Joe recruits an initially reluctant Kira to teach himself and friend Franklin:

1 J: Kira, are you making spinners?
2 K: Yeah. Well, I, I made one. I'm not going to make more. I just made one.
3 J: Can I see it? Does it work? *[Tries it]*
4 K: Yeah.
5 J: Is it hard?
6 K: Not really. *[Turning to face Joe]*
7 J: What program did you use?
8 K: TinkerCAD. I kind of cheated a little bit, because I took an original, like a regular boring one like Franklin's, and then I made it, like, interesting.
9 J: All right. Because I was thinking of doing that when I was done. So I just wanted to know.
10 F: Yeah, me too!
11 J: Yeah, like, Franklin and I might do it together.
12 K: Make sure you measure the bearings that you're gonna use, because I measured different bearings than the ones I used.

Over the next 3 weeks, Kira provided at least 60 minutes of face-to-face, intensive guidance to Joe and Franklin. During this time, Kira's newly developed expertise was clearly in evidence and was explicitly recognized and respected by Joe and Franklin. Joe and Franklin watched carefully as she entered parameters into the TinkerCAD software and adjusted the 3D "views" of the objects being designed. They valued Kira's expertise and actively sought her assessment of their work, even attending closely to the body language conveyed during her response to the work they showed her:

1 F: Does that look cool? Is that how you do it?
[Turning his screen to Kira and Joe, who examine Franklin's spinner]
2 K: Sure.
[Shrugging; pursing lips; shaking her head]
3 F: No. I take that as a no.

Kira's relative expertise, recognized by Franklin and Joe, led to many moments of peer teaching and learning, culminating in Kira making an assessment that they were ready to figure it out themselves. As she put it, "I've

helped you so much … you now know how to use TinkerCAD … that's all you need to know how to figure it out yourself." Franklin and Joe did indeed go on to print their own spinners. Joe proudly displayed his to the first author conducting this fieldwork and announced a plan to extend Kira's design by printing bearing caps to make the spinner easier to hold. Reflecting on her experience, Kira reflected in wonder on her own accomplishments:

> This isn't easy, this is very challenging. It tests your limits. … Last year, I'd be like ... to make my own fidget spinner or make my own toy, like how would you ever *do* that? That seems *impossible*. I'm just a kid! ... I know this sounds like super cheesy, but it's like a dream come true … It's unimaginable that I can do this kind of stuff. I never thought I'd be doing that.

Locating evidence for Kira's learning

We now turn our case study to Mr. Jacobson. Mr. Jacobson had been following the productive work Kira had done to design, refine, and fabricate the spinner and to teach her classmates how to do so. As he put it, "she's interested in it and she's excelling at it and she's collaborating and teaching others…that's the kind of environment that I want to see here and the kind of collaboration and the kind of learning that I want to have going on." He had, then, very clear evidence of Kira's learning, learning that aligned with his core commitments about the kind of environment he had hoped to facilitate in the STEAM lab.

All at this point in this story seems to be as it should be, but here, Kira's story took a surprising turn. Mr. Jacobson, perhaps mindful of language he had reported hearing many times from the district's director of technology, insisted that students "document, document, document" their work. At the beginning of the trimester, he established that he would grade performance in the STEAM Lab through a combination of regular "weekend updates" (short essays, due each Friday, in which students would communicate their progress and "reflect" on their work) and a year-end "portfolio" featuring pictures and descriptions of their projects. Two-thirds of the grade would be based on the weekly reflections and the year-end portfolio, with the remaining one-third coming from "participation" (as Mr. Jacobson explained it, "how you were in class"). Many students had neglected to produce the weekly reflections that Mr. Jacobson had assigned. Using his Google Classroom tool, he kept track of who had and had not done the reflections. As the end of the year approached, he started to consistently remind the class to get their reflections done, making verbal announcements to the whole class and posting messages on Google Classroom that the reflections and portfolio were coming due.

Kira did not heed these public warnings. She did not turn in the reflections or the portfolio and as a result, Mr. Jacobson gave her a D in the class. He did so despite having had the vivid and articulated view that she had learned and had successfully taught what she'd learned, accomplishments that aligned with his vision for the structured-choice, interest-driven STEAM Lab environment. It is worth noting that we also observed a contrasting case, which space does not permit us to describe in detail. This involved a grade-oriented student who turned in all the assigned work, negotiated with Mr. Jacobson for better grades, and got an A. This student, however, did little otherwise in the class, meandering through the trimester making little progress on a hydroponics project.

Returning to Kira, the D affected her personally. According to Mr. Jacobson, Kira cried when he told her he had given her a D, anxious about the consequences she would face at home. Combined with Kira's grades in her other classes, the D also meant that she would be required to take a guided-study class the following trimester, which would make it impossible for her to continue in the STEAM Lab course, an experience that had meant so much to her. Through her tears, she told Mr. Jacobson that she would still come to the STEAM Lab during lunch.

A seemingly common sense question is "why did Kira not turn in the assignments"? Months later, we interviewed Kira about the D and the assignments that she did not turn in that led to him giving her that grade.

P: How did you feel about the grade?

K: It was kind of disappointing. I was mad at myself. I was like, darn I should have, I really should have turned it in. I was just too, like, *distracted*. I was like, no, I just want to keep working on [the spinner]. I don't want to waste my time making the weekly sign-in or check in or whatever. I was just like, I don't want to *do* that.

P: Why did Mr. Jacobson give you a D?

K: Although I was doing a good job in the class—that's what he said—it's that I wasn't putting in the second part where I had to reflect on it. The reflecting was kind of a big part of it. I guess, like, when I was helping [the boys], I guess *that* was kind of a reflection for me. I didn't actually do the reflection that was assigned.

These responses from Kira tell us that she had received what were supposed to be the leading messages about the STEAM Lab—that it was a place for her agency and her interests. She understood retrospectively she should have done the assignments and avoided the D and its consequences, but she was too absorbed (what she called "distracted") by the actual work of making the spinner and teaching her classmates. She saw doing those assignments (which were *about* the work) as "wasted time" as compared to what she "want[ed] to keep working on", was being successful with, and was being recognized for by her teacher and classmates alike.

We also interviewed Mr. Jacobson about why he gave her a D. He said, "she got a D because I didn't have any hard evidence of learning to grade to turn in, to show…if [the district technology director] said, 'Hey, show me what Kira has done,' I would have a couple reflections and that's it." Two things are important to note in this explanation from Mr. Jacobson. First, he makes reference to "hard evidence", which clearly meant something different from the seemingly solid evidence of learning he had observed and articulated verbally. Second, his concern about the technology director potentially calling for hard evidence was envisioned but not real, demonstrated by the "if." In fact, neither the technology director nor any other administrator had done so. Mr. Jacobson made it clear that he was troubled about the D, and he wondered what he could have done differently. He saw the experience of Kira and her grade as part of his own professional learning, "part of my own formative [assessment]."

Discussion

It would be a conceptual mistake to see Mr. Jacobson as the problem. When this case was shared in anonymized form with administrators in the district as part of the research study, all lamented it, but none saw it as a systemic issue, worthy of wider organizational attention or remedies. We interpret the case as a problematic mismatch between two very different logics of education (Meyerhoff, 2020) and two different ways of understanding what can and should *count* as evidence for learning. Evidence of Kira's learning was hiding in plain sight. Clearly, Kira had acquired a difficult skill: fabricating a complex object that was not only functional but also met her peers' high aesthetic standards. Moreover, she had explicitly demonstrated what Mr. Jacobson and school and district leaders, during interviews, had repeatedly identified as valued capacities: collaboration, creativity, and persistence through challenge. Administrators spoke of the importance of recognizing the "whole child," and through her work, Kira had created a safe haven for herself in a school where she reported feeling overwhelmed and threatened by academic and social challenges. Even further, these experiences had led her to reimagine her future self as a designer and entrepreneur. Mr. Jacobson, a passionate advocate for the kind of learning he helped bring about in the STEAM Lab and someone who had seen, valued, and articulated Kira's learning, had nonetheless felt compelled to generate something that seemed "hard" as an assessable. This case resonates directly with a similar story of a student named Ted, doing good work in project based learning environment more than two decades earlier (Stevens, 2000). Taken together, the cases suggest that the problem of mismatch is a chronic one and one worthy of attention from learning scientists who truly wish to stop allowing the tail of faulty assessments from wagging the dog of meaningful and consequential learning experiences.

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