Tinkering, Failure, and Overcoming Fear

"Do or do not. There is no try."

—Yoda, *Star Wars: Episode V—The Empire Strikes Back*

Innovation is a process accomplished by connecting and building from ideas in order to solve problems. It's an iterative process, with designers in a constant loop of finding the problems, designing solutions to the problems, and then evaluating their solutions. And as educator Micah Shippee (social studies teacher at Liverpool Middle School in Liverpool, England) reminds us, "Innovativeness is the pedagogy for the future."

In chapter four, we introduced various tools that relate to the ISTE Standards for Students. In this chapter, we look at the tinkering mindset, stretching even further with the student standard of innovative designer. This standard aligns well with the designer and facilitator ISTE Standards for Teachers, prompting these questions: How can you, as a teacher, model stretching the standards? How can you design lessons that foster learning and learner empowerment by modeling stretching for your students? How can we use what exists to "hack the box" and model the ISTE Standards for Educators?

The Tinkering Mindset

One way to embrace an iterative approach is to develop a tinkering mindset, but what exactly does this mean—to tinker? Merriam-Webster defines tinkering as working with things in "an unskilled or experimental manner." However, there is another way that we can view tinkering that sheds a more positive light. As Alec Foege (2013) argues in his book *The Tinkerers,* tinkering can be a disruptive act that takes existing materials and transforms them into something entirely new. He shows how the tinkering mindset generates some of the most innovative ideas throughout history, such as the US Postal Service and Apple computers. The tinkering mindset is about being proactive, courageous, daring, and confident. It requires creative confidence and the ability to fail forward (i.e., use failure to push yourself forward). The process of tinkering is also about rapid prototyping and being in the here and now. This means no more waiting and no more "thinking about trying." Embrace the unknown, the discomfort, the messiness of creativity! It is in the action that we transform.

Thinking Outside the Box

There is no such thing as a perfect edtech tool—what works for one school or teacher may not work for another. Every tool has its quirks and every project/school/population/lesson is different. You need to find what works best for *you* and *your students.* Sometimes that means thinking outside the box. In chapter four, we gave you a toolbox containing some lesson ideas and technology resources that can be helpful as a starting point, though you may already have your own collection of resources. Now, we want you to reflect on how you can think *outside* the box.

For example, you can be agile in your use of edtech tools. Just because a tool is designed for a specific purpose does not mean you are limited to using it for that purpose only. Try out the tinkering mindset and "hack" tools to make them your own. Instead of starting from the beginning every time, take an existing lesson or tool and modify it to serve your purpose. Adaptation can be helpful in this situation. Do you want students to practice to

reinforce a particular topic? Find an existing Kahoot or Quizlet set, copy it, and make it your own. Do not feel that you have to create your own—people share their resources and tools on the internet for a reason. They want you to adapt, modify, and share! Just be sure that you are giving proper credit when needed and that you are not copying anything that is protected under copyright. If you need help with this, refer to the "Edtech Tools to Enrich Your Practice" section in chapter four on digital citizenship. Even though that chapter focuses on students, many of the resources work for educators too.

Edtech Integration in Action

The first step in technology integration is awareness of what tools are available, as we shared in chapter four. But once you are aware, how do you put your awareness into action? The next step is to implement edtech tools in the moment, when a need arises. Though this process may be challenging as you learn the best ways for you and your students to integrate new edtech tools, remember that the ultimate goal is to make edtech integration invisible. As technology is ubiquitous and versatile, it should flow and become a natural part of your lessons.

According to Sinek (2011), the WHAT is the result of our actions (the HOW) that are driven by our purpose (the WHY). When it comes to integrating edtech into your lessons, we recommend that you don't start with the tech tools. It's useful and reassuring to have lists of edtech tools and to have them aligned with the ISTE Standards; however, lists and tools are not useful by themselves. It's only when we integrate the tools into our pedagogy that they enhance or accelerate the learning of our students.

The following table shows practical, mini lesson plans that showcase deliberate teaching for deliberate learning, or how we can plan backward to meet the needs of the students. As educators, we observe our students and, in so doing, we know what they might require to learn their next lesson. As we identify students' needs, we can design the steps that generate learning, but we can also adjust and alter our plans to address unforeseen classroom

needs. Use the stretching exercise after the table to explore some of your own deliberate-teaching-and-learning lesson plans.

Before we proceed, let's revisit the four phases of learning explained in chapter two:

- Phase 1: Be aware that there is something new to be learned.
- Phase 2: Explore through trial and error.
- Phase 3: Practice until it's automatized.
- Phase 4: Transfer to another learning situation.

Note: if your content is totally new to students, you might want to deliberately plan learning engagements that promote phases 1 and 2 in one lesson and then continue to phases 3 and 4 in another lesson (or two).

Examples of "Deliberate Planning for Deliberate Learning"* Lesson Plans

Deliberate-Planning Practice: Teacher Action	Deliberate-Learning Practice: Student Impact
1. I want the students to learn . . . 2. So my success criteria include . . . 3. Therefore, I will need to . . .	1. Students gain . . . 2. ISTE Standards for Students that apply include . . .
Teaching a Grammar Point in French	
1. I want the students to learn the difference between *une* and *la* in French. 2. So my success criteria include: (a) students become aware that there are two concepts to learn, (b) students can apply the two concepts in different situations, and (c) students have the opportunity to transfer their understanding of the difference between *une* and *la* to *un* and *le*, where the gender changes from feminine to masculine. 3. Therefore, I will need to (a) plan visible and tangible situations that trigger awarenesses (a demo using Cuisenaire™ rods), (b) get students to pay attention to the situation (observations to be recorded on Socrative), and (c) have students practice in pairs (to create the voiceover of a situation given on Seesaw) and alone (replace the word "rod" with something of their choice), and create three sentences on Google Classroom for the next class, along with an object they bring.	1. Students gain valuable foreign-language practice and skills within a particular language and grammar point. 2. ISTE Standards for Students that apply include: ✦ Empowered Learner (1) ✦ Knowledge Constructor (3) ✦ Innovative Designer (4) ✦ Creative Communicator (6)

(continued on next page)

Examples of "Deliberate Planning for Deliberate Learning"* Lesson Plans

Deliberate-Planning Practice: Teacher Action	Deliberate-Learning Practice: Student Impact
1. I want the students to learn . . . 2. So my success criteria include . . . 3. Therefore, I will need to . . .	1. Students gain . . . 2. ISTE Standards for Students that apply include . . .
Teaching How to Identify "Fake News" in Digital Literacy	
1. I want the students to learn how to identify "fake news" and apply critical thinking when informing themselves and others. 2. So my success criteria include: (a) students become aware that not everything online is true, (b) students realize that they need tools to analyze news, (c) students can create a fake-news video on a topic of their choice to demonstrate some of the components of fake news, and (d) students know how to review each others' news. 3. Therefore, I will need to (a) understand students' prior knowledge, (b) provide space for students to research and inquire about what the components of fake news might be (the black-and-white and the grey areas), and (c) show students how to create a fake-news video and how to evaluate one another. ✦ GRASPS Assessment—Fake News: goo.gl/2RKsJT ✦ GRASPS Template: goo.gl/CJ6fro	1. Students gain valuable digital-age skills, including critical thinking and information literacy. 2. ISTE Standards for Students that apply include: ✦ Empowered Learner (1) ✦ Digital Citizen (2) ✦ Knowledge Constructor (3) ✦ Creative Communicator (6) ✦ Global Collaborator (7)

Examples of "Deliberate Planning for Deliberate Learning"* Lesson Plans

Deliberate-Planning Practice: Teacher Action	Deliberate-Learning Practice: Student Impact
1. I want the students to learn . . . 2. So my success criteria include . . . 3. Therefore, I will need to . . .	1. Students gain . . . 2. ISTE Standards for Students that apply include . . .
Teaching 2D-to-3D Visualization in Math	
1. I want the students to learn how to manipulate flat patterns (2D objects) to create 3D shapes. 2. So my success criteria include: (a) students can match a 2D shape with its 3D shape, (b) students can create a 2D flat-pattern design that they can successfully turn into a 3D shape. 3. Therefore, I will need to (a) understand students' prior knowledge and attitudes toward math, (b) provide exercises to help students develop their visualization skills, and (c) create a project that allows students to apply their learned knowledge in a constructive situation.	1. Students gain valuable visualization skills for use in STEM subjects and real-world, problem-solving situations. 2. ISTE Standards for Students that apply include: ✦ Innovative Designer (4) ✦ Computational Thinker (5)

(continued on next page)

Examples of "Deliberate Planning for Deliberate Learning"* Lesson Plans

Deliberate-Planning Practice: Teacher Action	Deliberate-Learning Practice: Student Impact
1. I want the students to learn . . . 2. So my success criteria include . . . 3. Therefore, I will need to . . .	1. Students gain . . . 2. ISTE Standards for Students that apply include . . .
Teaching Circuits in Science	
1. I want the students to learn the basics of circuits. 2. So my success criteria include: (a) students can identify basic circuits, (b) students can tell the difference between an open and a closed circuit, (c) students understand how to construct a parallel circuit and a series circuit, and (d) students understand the purpose of using circuits. 3. Therefore, I will need to (a) understand students' prior knowledge; (b) provide content knowledge related to the basics of circuits, including vocabulary; (c) introduce concepts of electrical engineering and its social impact; and (d) provide opportunities for students to explore concepts using tangible objects.	1. Students gain knowledge and understanding of circuits and how to apply them to real-world situations. 2. ISTE Standards for Students that apply include: ✦ Knowledge Constructor (3) ✦ Innovative Designer (4) ✦ Computational Thinker (5)

*The phrase "deliberate planning for deliberate learning" was coined by educator Daisy Rana.

Stretching Exercise

Deliberate Teaching for Deliberate Learning

Now that we have provided some examples of deliberate teaching for deliberate learning, it is time for you to think of some ideas from your classroom experience.

Deliberate-Planning Practice: Teacher Action	Deliberate-Learning Practice: Student Impact
1. I want the students to learn . . . 2. So my success criteria include . . . 3. Therefore, I will need . . .	1. Students gain . . . 2. ISTE Standards for Students that apply include . . .
[Lesson Title]	
1. _____ 2. _____ 3. _____	1. _____ 2. _____
[Lesson Title]	
1. _____ 2. _____ 3. _____	1. _____ 2. _____

The Importance of Failure

When you seek to be innovative, you will encounter failure—something many people fear—but failure *and* fear are important parts of the process of change. "How can fear be important to the process?" you ask. "Isn't it a *bad* thing to be afraid?" On the contrary! Change is hard *because* it's scary; fear is proof that you are trying something new and different—that change in on the horizon. Fear is a necessary phase of the growth process.

In her research, Carol Dweck (2015) defines the terms *fixed mindset* and *growth mindset*: A fixed mindset views intelligence and skill as innate with no chance for development. A growth mindset, however, views intelligence and skill as things to be developed through learning. Dweck says that a person with a growth mindset looks at failure by saying, "Mistakes are so interesting. Here's a wonderful mistake. Let's see what we can learn from it."

We all have fixed and growth mindsets in certain aspects of our lives. However, experiencing failure and learning how to fail gracefully give us opportunities to develop and work on reinforcing and supporting our growth mindset. Having a growth mindset does not mean that change is easy; it means that you are able to achieve *in spite of* the fear. So don't shy away from failure. As educator Jennifer Garner (@educatorjenn) says, "Accepting failure is a stage of growth. Learn from it and go on." We need to let failure be part of our learning journey, as we can only move on by bouncing back first.

Educators are encouraged to create learning situations that the students are *almost* able to do. This is a way to challenge students appropriately and adapt the teaching to the needs of students for deliberate learning. In these situations, the students will learn through a trial-and-error process. Gattegno (1977, p. 1) describes *mistakes* as "mis-takes" (which happen unintentionally when we "*take* something for what it is not") (emphasis added) and talks about *errors* as evidences of learning—evidence of being in the unknown and striving. The difference can be significant in the way we see learning: "Errors underline the matter with which we are linked; mistakes underline the person who is involved in the activities" (Gattegno, 1977, p. 1). Gattegno also says that errors are "gifts to the class" (Favre, 2015, p. 68).

Indeed, errors offer us the opportunity to try again, to try better, and to ultimately succeed.

Learning to fail can also teach grit. Researcher Duckworth (2013) says that "Grit is passion and perseverance for very long-term goals. Grit is having stamina." As educators, we want our students to develop passion for learning, perseverance when life is difficult, and the stamina to develop and attain long-term goals. These are skills that will not only be useful when learning in the classroom but also throughout life. Because, as we all know, failure is a part of life. It is inevitable no matter how hard we try to avoid it. What we can do, though, is work on how we react to failure when it occurs.

If we want to work on developing our learning-to-fail muscles, we need to try new things. We need to create opportunities for failure! Then we need to embrace failure with gratitude and an open mind. This is something that is important for us to model as educators so that we can guide our students toward developing these muscles in themselves.

We might also see the situation from a different perspective when we encounter failure. Educator Tania Driskill (from Bolivar High School in Bolivar, Missouri) shares her insight about how what we perceive as problems in our teaching can become learning gifts for our students: "When a lesson idea doesn't work, stay calm, nod, and feel glad this happened, because one important skill for the future, one that our students need to develop, is to effectively respond to crisis or problems."

Stretching Exercise

Creating a Bug List

Have you ever heard of a bug list? A bug list is an idea from Tom Kelley in *The Art of Innovation* (2013). It is a way to keep track of a list of things that bug you about the world. The point of this list is not to complain or get down on the world but to identify potential problems so that you can then develop potential solutions. Start your own bug list on the next page.

1. _____

2. _____

3. _____

4. _____

5. _____

6. _____

7. _____

8. _____

9. _____

10. _____

Making Fear Your Friend

"What would you do if you weren't afraid?" asks Sheryl Sandberg (2013, p. 12) in her book *Lean In: Women, Work, and the Will to Lead*. Fear is a feeling that educators are often in contact with. Fear can be seen as a problem. In his fantastic children's book, *What Do You Do With an Idea?*, Kobi Yamada (2014) explains what to do with a problem: "Initially, we resist change, we are worried about it, [and] we ignore it or try to shoo it away; but it's only when we face and tackle problems that we find something beautiful in them: *opportunities*."

Educator Mark Reid (a Varkey Foundation teacher ambassador and the Looking@2020 project leader) shares his experience on making a friend of fear: "My professional life changed the moment I started saying 'yes!' to opportunities and challenges that once scared me. Knowing your skills and abilities as an educator must include knowing your worth and being willing to adapt or apply those skills to new experiences. I discovered a whole new realm of possibility for myself and for my students."

Like Reid, if we acknowledge fear and allow it to be an opportunity rather than a problem, it can motivate us! We can use it to our advantage to push through and stretch ourselves, but this comes with practice. In embracing the fear and learning to live with the discomfort of it, you will be able to stretch further than you ever could without it.

Take a Breath

Tackling Fear

Here are some tips for dealing with fear.

- Use breathing exercises. Try using the box breathing method to calm yourself. Breathe in four counts, hold the breath for four seconds, breathe out for four seconds, hold the breath for four seconds, repeat. This will calm your body and allow you to feel better about being in a "fearful" place. If breathing is not enough, try jumping up and down or some other physical movement. This might even be a good time to try a power pose (remember those from chapter two?).
- Be honest with your students. Tell them, "We are going to try something new today. It may go well or it may not, and not knowing the outcome can be a little scary. But it's all okay, because we are going to learn something either way!" Being open and transparent with your students builds a level of trust and understanding in your classroom. It also models to your students how to embrace fear as part of the learning process.

(continued on next page)

- Of course, the same classroom model on fear also applies to you: don't be afraid if things go wrong. As long as you have a backup plan, it will allay your fears—you won't be caught stuck in an awkward situation—and the lesson will go on. (You will learn something either way!)
- Make sure that you are balanced and centered. In the next chapter, we will go into more detail about how to practice balance to avoid stress—because if you are stressed, you will be more vulnerable to succumbing to your fears. You need to have a base level of health and mindfulness before thinking about stretching beyond.

Creativity takes time. This means that you may need to hang out with fear for a while before the creative juices start flowing. Pink (2010) says that in order to reach high levels of creativity, we need intrinsic motivation, which is defined as "the drive to do something because it is interesting, challenging, and absorbing" (p. 46). We all know the truth of the matter: even when you come up with a new idea, it might not work. So whenever you start the creative process, there will be a fear of failure, but your *drive* (your intrinsic motivation) can help you to overcome the disappointment when the process doesn't go according to your original plans.

Remember what you tell your students: it is okay to fail! And the more time you hang out with fear, the easier it will become to embrace it and stretch beyond your comfort zone. Use the following meditation prompt to reflect on the fear that might come for you with change, then work on changing your habits of comfort when it comes to this fear.

Meditation Prompt

Embracing Fear

Use this space to reflect on what you want to change in your teaching practice. Think about what your fears might be when it comes to making that change. What is holding you back or blocking your path? Consider how you could allay those fears—or embrace them! How could you turn your fears into an opportunity to learn and to grow?

Inspiration

Learning to Create, Creating to Learn

Here are some additional resources to further your learning of this new way of thinking and being:

- *Invent to Learn: Making, Tinkering, and Engineering in the Classroom* by Sylvia Libow Martinez and Gary Stager (Torrance, CA: Constructing Modern Knowledge Press, 2013): This book provides a clear explanation of how to bring the maker movement to your students, the active learners at the center of the classroom. With that in mind, the authors provide the what, how, and why of classroom makerspaces at *any* budget and level.
- *Beautiful Oops!* by Barney Saltzberg (New York: Workman, 2013): This is a fun and colorful children's book that teaches all of us that it's okay to make mistakes!