

RONALD A. BEGHETTO

WTF?

**BUILDING STUDENTS'
PROBLEM-SOLVING SKILLS
THROUGH COMPLEX
CHALLENGES**



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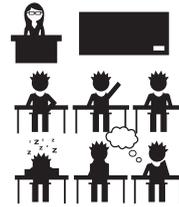
WHAT IF?



BUILDING STUDENTS' PROBLEM-SOLVING SKILLS THROUGH COMPLEX CHALLENGES



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Introduction

Toward the end of 3rd grade, my daughter got in trouble for passing a note in class. The note read, “I hate this worksheet factory!” I found this somewhat humorous and even beautiful in its resistance, but also a bit disconcerting. When we talked about it, my daughter explained that she didn’t like how she was asked to learn in school. She preferred challenging herself to craft accessories for her dolls and gifts for friends and family, seeking out and putting her own twist on information she gleaned from YouTube videos and other resources.

I explained to her that the worksheets in school were practice exercises that could help her learn important information and skills and that even if she didn’t see the value in what she was practicing now, she might someday realize its benefit. Perhaps unsurprisingly, my daughter did not find my argument compelling or persuasive.

I admit that weakly appealing to the Neverland of “someday” has never sat well with me as a parent or as an educator—but neither has the idea that learning should somehow always be easy, fun, or immediately applicable. Deep domain knowledge is necessary for competence in any field, and developing that knowledge takes guided practice, persistence, and a lot of hard work (Ericsson, Krampe, & Tesch-Römer, 1993). Like many important endeavors in life, the process isn’t always fun. Moreover, not everything we learn or know needs to have immediate or even future *practical* value. There is beauty to be found from delving deeply into a subject area; the process can be challenging and rewarding in itself.

Still, my daughter had a point. Schools are not giving students enough opportunities to grapple with complex challenges. Instead, we go to great lengths to clearly define the problems that students will solve, how they should solve them, and what the outcomes should be. Such assignments have their place—students

do learn from working through routine assignments that have predetermined outcomes and ways of obtaining those outcomes (Lee & Anderson, 2013), and learning thrives in a supportive and structured environment (Reeve, 2009)—but relying too much on this type of learning experience has serious drawbacks.

The Power of the Unknown

Given that a fundamental goal of school is to prepare young people for the unknowable future, it makes sense that students should learn how to respond to uncertainty. Providing students with opportunities to learn how to respond productively to uncertainty will help prepare them for the kinds of real-world challenges they face now and will face in the future. Routine assignments fall short in this regard because they are designed to remove uncertainty, not insert it (Getzels, 1964). Further, such tasks offer limited opportunities for student initiative, or what motivational researchers call *agentic engagement* (Cheon & Reeve, 2015; Reeve & Tseng, 2011). Agentic engagement refers to students proactively contributing to their own learning and instruction by, for instance, identifying problems they want to solve and coming up with their own ways of solving them.

Not much of what students learn and do in school relates to actual problem solving. If you already know how to move from *A* to *Z*, then you don't have a problem; you have an exercise (Robertson, 2017) or, at best, a "pseudo-problem" (Getzels, 1964). A problem is not a problem unless it involves some level of uncertainty. The more uncertainty, the more complex the problem.

It may seem as if we are caught between two opposing aims. On the one hand, routine tasks play an important role in helping students learn academic subject matter, but they don't provide opportunities to engage with uncertainty. On the other hand, real problems encourage students to deal with the unknown, but we can't simply throw our students into the deep waters of complex challenges and hope that they will somehow learn to swim by themselves.

What's in This Book

What if we could provide opportunities for students to respond productively to uncertainty in the context of a structured and supportive learning environment? And what if we could use the routine tasks of school to prepare students to engage with more complex challenges in the classroom and beyond?

This book takes on the challenges issued in these two questions, providing the insights and tools necessary to help your students respond productively to uncertainty in a range of challenges both inside and outside the classroom.

The book is organized into two parts. Part 1 focuses on how classroom challenges can complement and serve as a warm-up for more complex, beyond-classroom challenges. The chapters in Part 1 discuss the nature and basic structure of challenges, how challenges can range in complexity, the importance of providing students with a structured and supportive learning environment, and principles that you and your students can use to design and solve complex challenges. Part 1 concludes with a chapter that introduces *lesson unplanning*, a process you can use to transform existing routine exercises into more complex classroom challenges.

The chapters in Part 2 introduce a powerful form of complex challenge known as *legacy challenges*. Legacy challenges are shot through with uncertainty because they require students to identify a problem, establish an argument for why it matters, develop a solution for addressing the problem (in collaboration with outside partners), and establish a plan to ensure that their work makes a lasting and positive contribution. Despite their complexity and scope, legacy challenges adhere to the basic framework of any challenge and require a structured and supportive learning environment. Legacy challenges represent an ideal vehicle for unleashing student problem solving because they continually drive students to encounter and respond to uncertainty. Chapters 5 through 11 include detailed sample activities and protocols that you can use to guide your students through such challenges.

The book concludes with an appendix of frequently asked questions. In addition, blank versions of some of the forms included throughout this book can be downloaded at <http://www.ascd.org/ASCD/pdf/books/Beghetto2018forms.pdf>.

Taken together, the ideas, tools, and activities presented in this book provide an accessible and practical approach for using complex challenges as a vehicle for students to engage with uncertainty. Doing so will help ensure that students like my daughter move away from viewing school as a worksheet factory and toward seeing it as an opportunity to develop their capacity to successfully deal with the complex challenges they face in school and beyond.





What Is a Challenge?

What if there was a way to unleash your students' problem solving by using challenges to invite good uncertainty into your classroom?

A challenge literally means an *invitation* or a *call to action*. Challenges vary in scope and complexity. When you ask students to complete academic assignments or tasks, you are presenting them with *classroom challenges*, which can range from simple to complex. When you invite students to engage with larger problems facing them, their school, the community, or beyond in ways that require them to push their learning beyond the walls of the classroom, you are presenting them with *beyond-classroom challenges*, which are invariably complex.

Although classroom and beyond-classroom challenges differ in several key ways, they share the same basic structure. Understanding this structure will enable you and your students to identify the kinds of challenges you already use and prepare you to design and implement increasingly complex challenges.

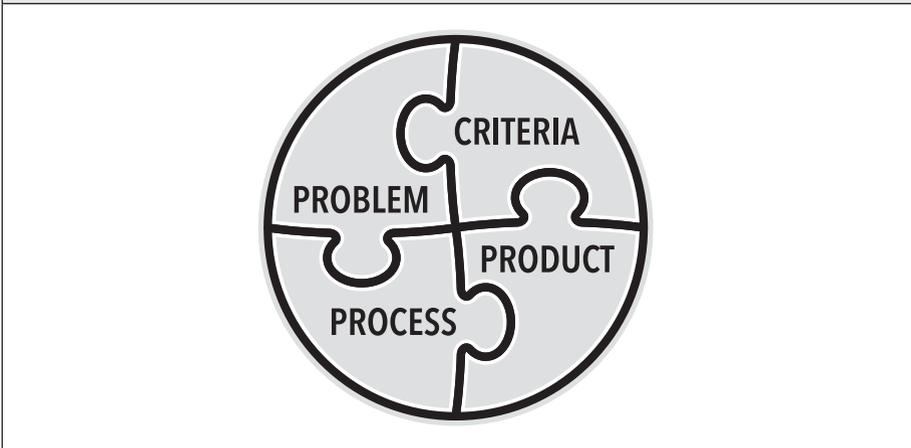
The Basic Structure of Challenges

There are four basic features that all challenges share, regardless of whether they are simple or complex, classroom or beyond-classroom challenges. I like to envision this four-part structure as a puzzle (see Figure 1.1).

Here's a rundown of the four parts of this framework:

- The **problem** is the task, question, or issue students will address or solve.
- The **process** is the approach, method, or procedure students will use to solve the problem or complete the task.

FIGURE 1.1
The Basic Structure of a Challenge



- The **product** is the solution, outcome, or demonstration of solving the problem.
- The **criteria** are the guidelines, rules, and standards for evaluating success.

If you use this basic architecture as a lens for viewing your existing assignments and tasks, you will start to recognize how those assignments align with these four features and see differences between simpler and more complex challenges. For example, let's consider a routine assignment in language arts:

Read the assigned text and demonstrate your comprehension of the central ideas that the author is trying to communicate. Use the strategies that you were taught for identifying central ideas. Provide a written description of the central ideas and use descriptive examples from the text to justify your claims.

Figure 1.2 breaks down this assignment into the four core features of a challenge.

Note that all the components of this challenge have been determined before it's been assigned to students. This would be considered a simple classroom challenge—not because it is necessarily easy for students to complete, but because the amount of uncertainty has been minimized. Remember: *the more uncertainty students face, the more complex the challenge is.*

Now, let's take a look at a complex beyond-classroom challenge. It represents an example of the legacy challenges introduced and discussed in Chapters 5 through 11:

A group of bilingual high school students recognize that Spanish-speaking members of their community are not receiving key health, educational, or

FIGURE 1.2

Example of a Simple Classroom Challenge**Topic:** Central ideas of a story**Subject area(s):** Language arts**Full challenge statement:**

Read the assigned text and demonstrate your comprehension of the central ideas that the author is trying to communicate [**problem**]. Use the strategies you were taught for identifying central ideas [**process**] (e.g., *What is the topic? What does the title tell you? Which ideas in the introduction and conclusion seem to be most important? What clues can you find in the headings and subheadings? What other hints do you see of the writer's purpose, such as repeated ideas and comparisons with other topics and ideas? Can you quickly summarize the central ideas in a few words and provide a few brief examples, or do you feel like you are getting bogged down in too much general information?*). Provide a written description of the central ideas [**product**] and use descriptive examples from the text to justify your claims [**criteria**].

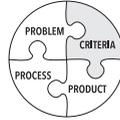
Feature	Definition	Description
Problem	The task, question, or issue students will address or solve	Read the assigned text and demonstrate your comprehension of the central message of that text.
Process	The approach, strategies, or procedure students will use to solve the problem or complete the task	Use the strategies you were taught.
Product	The solution, outcome, or demonstration of solving the problem	Provide a written description of the central message.
Criteria	The guidelines, rules, and standards for evaluating success	Use descriptive examples from the text to justify your claim.

community-based information. In response, they partner with local community agencies, businesses, and the school's Languages, Business, and Technology programs to develop a student-run translation service for members of the community. Students successfully maintain an operations plan (for running the service) and a succession plan (to pass the service on to incoming juniors and seniors) and provide timely and high-quality translation services to their community (as measured by satisfaction surveys).

Although this beyond-classroom challenge, broken down in Figure 1.3, is rather complex, it contains the same core features as the simpler language arts assignment.

The key difference between these two challenges is the degree of uncertainty they present. The language arts challenge is a routine academic exercise (Robertson, 2017). All of its features are predetermined and designed without student input.

FIGURE 1.3

Example of a Complex Beyond-Classroom Challenge

Topic: Community translation service

Subject area(s): Spanish, entrepreneurship, web design

Full challenge statement:

A group of bilingual high school students recognize that Spanish-speaking members of their community are not receiving key health, educational, or community-based information [**problem**]. In response, they partner with local community agencies, businesses, and the school's Languages, Business, and Technology programs to develop a student-run translation service [**process**] for members of the community [**product**]. Students successfully maintain an operations plan (for running the service) and a succession plan (to pass the service on to incoming juniors and seniors) and provide timely and high-quality translation services to their community (as measured by satisfaction surveys) [**criteria**].

Feature	Definition	Description
Problem	The task, question, or issue students will address or solve	Help members of the community who are not receiving key health, educational, or community-based information.
Process	The approach, method, or procedure students will use to solve the problem or complete the task	Partner with local community agencies, businesses, and the school's Languages, Business, and Technology programs to develop a student-run translation service.
Product	The solution, outcome, or demonstration of solving the problem	The student-run translation service ensures that key information is translated and made available to community members.
Criteria	The guidelines, rules, and standards for evaluating success	Students successfully maintain an operations plan (for running the service) and a succession plan (to pass the service on to incoming juniors and seniors) and provide timely and high-quality translation services to their community (as measured by satisfaction surveys).

Moreover, once students complete the assignment, the challenge is over. By contrast, the core components of the translation service challenge are not known in advance; students must face the uncertainty of identifying the problem and then developing a way to address it (Beghetto, 2017a). Even once completed, the challenge lives on in the form of a community-based translation service that is passed from one group of students to the next.

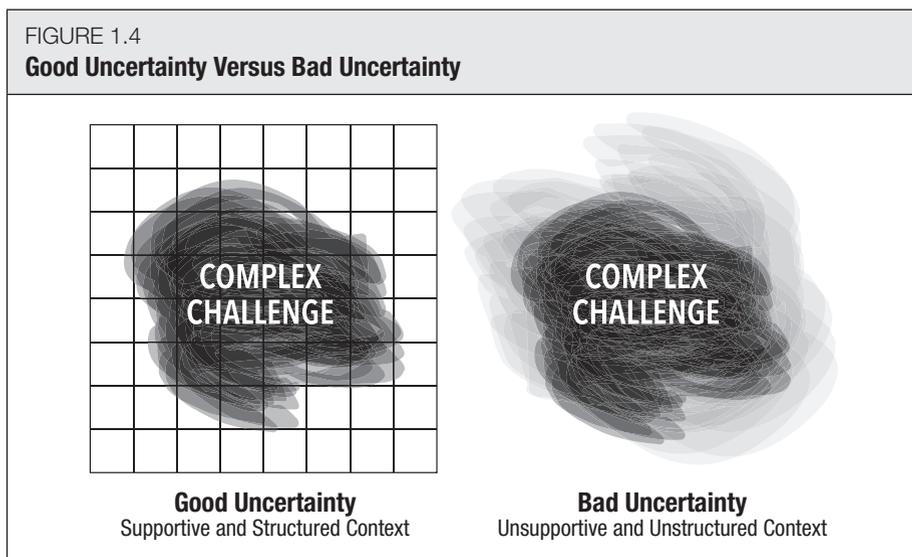
Note that both of these challenges are designed and implemented in the context of a structured and supportive learning environment. Providing this context is particularly important with more complex challenges. But how can teachers go about blending uncertainty with a supportive structure? The first step is to recognize that there are two types of uncertainty.

Good Versus Bad Uncertainty

In the context of the classroom, there is *good uncertainty* and there is *bad uncertainty* (Beghetto, 2016a). As Figure 1.4 illustrates, good uncertainty provides an opportunity to engage with an open-ended problem or a complex challenge in the context of a supportive and structured learning environment. By contrast, bad uncertainty emerges from learning experiences that confront students with uncertainty but fail to provide the necessary support and structure.

Although complex challenges by design do not have predetermined procedures or outcomes, students still need guidance to navigate the uncertainty they face along the way. In situations creating bad uncertainty, students have no idea what is expected of them, how to get started, or whether, when, or how they will receive support. Asking students to tackle the uncertainties of complex challenges or open-ended problems in the context of an unstructured learning environment invites chaos into your classroom (Reeve, 2009), creating a double whammy of uncertainty that could easily overwhelm even the most accomplished problem solvers (Beghetto, 2017b). Fortunately, this need not be the case.

You can minimize bad uncertainty and maximize good uncertainty by presenting challenges in a supportive and structured environment. First, actively monitor how students are experiencing the challenges you have designed for them. In some cases, you may quickly recognize that students are experiencing bad uncertainty. Common signs include visible frustration, confusion, and misunderstanding (Gettinger & Kohler, 2006). You might, for instance, notice that the majority of your students are no longer paying attention or that even the



students who typically engage with learning tasks are becoming frustrated and distracted and giving up. In such cases, it is important to . . .

1. **Stop.** (“Let’s stop for a moment.”)
2. **Check in with students.** (“I’m noticing that several of you seem frustrated or confused by this assignment.”)
3. **Address the situation.** (“Let’s talk about what might not be clear or what seems confusing.”)

Stopping in the middle of a lesson or an activity may seem awkward, but being able to spot and resolve bad uncertainty is crucial if we want students to successfully engage with complex challenges. Unless we provide students with the necessary support, they are unlikely to be willing to engage with more complex challenges, seek out assistance when necessary, or productively respond to the uncertainty they are facing.

In other cases, bad uncertainty may be more subtle and difficult to detect. Fortunately, simple formative assessment strategies (Wiliam, 2011) like entry/exit tickets and other brief check-ins can help you become aware of how students are experiencing the challenges you have designed and provide any needed supports. Figure 1.5 provides examples of before, during, and after check-ins that you can use.

FIGURE 1.5 Quick Challenge Check-Ins				
Before the Challenge	During the Challenge	After the Challenge		
<p>After introducing a challenge but before students get started, take a moment to have your students indicate to you whether they are ready to start (thumbs up), have a quick clarification question (thumbs sideways), or feel lost and need more intensive help (thumbs down).</p> <p> Ready!</p> <p> Quick question.</p> <p> Help!</p>	<p>In addition to checking in with individual students or groups, periodically stop the whole class and have students again provide a quick indication of whether everything is OK (thumbs up), they are a bit unsure about what they are working on (thumbs sideways), or they feel stuck and need immediate help (thumbs down).</p> <p> All is well.</p> <p> A bit unsure . . .</p> <p> Stuck!</p>	<p>After students have completed their challenge, have them complete a simple checklist (digital or paper-and-pencil) to indicate their perspective on the level of challenge. You can also have them comment on what they feel they “got” and what they feel they still “need.”</p> <p><input type="checkbox"/> Not challenging enough</p> <p><input type="checkbox"/> About right</p> <p><input type="checkbox"/> Too challenging</p> <table border="1" style="margin-left: auto; margin-right: auto;"> <tr> <td style="text-align: center;"><i>Got</i></td> <td style="text-align: center;"><i>Need</i></td> </tr> </table>	<i>Got</i>	<i>Need</i>
<i>Got</i>	<i>Need</i>			

These quick check-ins will help you get a sense of how your students are doing, provide timely supports, and ensure that simple struggles do not grow into demoralizing frustrations. It's important to use these check-ins continually, even when students have successfully completed a challenge. Successful completion of one challenge doesn't necessarily mean students will feel confident taking on subsequent challenges, even ones at similar levels of complexity. Sometimes even students who have all the tools to succeed need some extra emotional and motivational support (Bandura, 1997; Rosiek & Beghetto, 2009). The only way to know how students are experiencing learning tasks and challenges is to take the time to ascertain their perceptions. Doing so will ensure that you are providing the support necessary for them to take on—rather than feel overwhelmed by—increasingly complex challenges.



The following principles will put you on the path of infusing more “good uncertainty” into your curriculum—and help students acclimate to it.

Use your classroom as an invitation to uncertainty.

What: Although simple challenges can help students develop their skills and their ability to put new learning to use, it is also important to invite students to engage with uncertainty. It is the uncertainty of complex challenges that unleashes student problem solving (Beghetto, 2017b).

How: Provide students with multiple opportunities to engage with classroom and beyond-classroom challenges. Subsequent chapters in this book provide specific examples of the different kinds of challenges you can present. You can design many of these challenges by making slight changes to your existing activities and assignments (see Chapter 5). By providing students with a full range of challenges, you will develop a classroom ethos that expects all students to continually challenge themselves regardless of whether they are starting at the ground level or are ready to push their learning beyond the walls of the classroom.

Explain what makes challenges simple versus complex.

What: It is important to help students understand that some challenges are more complex than others and that the more uncertainty they face in a challenge, the more complex the challenge is. The degree of certainty is the key difference between a routine task and a nonroutine problem (Getzels, 1964; Pólya, 1966; Pretz, Naples, & Sternberg, 2003; Schoenfeld, 1983).

How: First, remind students that all challenges share the same core features: problem, process, product, and criteria. Then encourage students to think about differences among various challenges *before* they start working on a challenge. You can give them a simple prompt, such as “Before working on this challenge, take a moment to consider how it is similar to or different from other challenges you have worked on. What aspects of this challenge do you need to figure out? What aspects have been provided for you?”

You can also provide students with some brief reflective questions *after* they have completed a challenge. High school teacher Christine Bland, for instance, has her students answer questions like *What am I still curious about? How can I extend my learning?* and *What possible challenge(s) can I explore to make a contribution beyond the walls of the classroom?* (Bland, personal communication, 2017).

Promote a productive struggle.

What: When used in the context of a supportive and structured learning environment, complex challenges can promote a *productive struggle*, meaning students experience a level of cognitive demand sufficient to be able to engage productively with intellectual challenges (Schoenfeld, 2015). This productive struggle falls somewhere between “spoon feeding content in bite-sized pieces and having the challenges so large that students are lost at sea” (Schoenfeld, 2015, p. 163). Indeed, research (Jang, Reeve, & Deci, 2010) has highlighted the importance of striking a “just right” balance between providing the necessary supportive structure and giving students opportunities to challenge themselves and take charge of their learning. Achieving this balance supports student engagement, persistence, and productive outcomes.

How: Recall that in “Goldilocks and the Three Bears,” Goldilocks is able to find the “just right” bowl of porridge by sampling three different bowls. To promote a productive struggle in your classroom, try applying this “Goldilocks principle” to at least two specific areas: *task design* and *feedback*.

With respect to how you design learning tasks, it is important to blend clear, supportive guidelines and criteria with sufficient opportunities for students to grapple with uncertainty. Think of a learning *task* as a kind of learning *contract*: researchers (Chou, Halevy, Galinsky, & Murnighan, 2017) have found that contracts that strike a balance between sufficient structure *and* sufficient autonomy resulted in higher levels of task persistence, creative performance, problem solving, and cooperation. Such findings indicate that learning tasks that do not provide enough structure (at the cost of necessary guidance) or that provide too much specificity (at the cost of student autonomy) undermine students’ motivation and performance.

The Goldilocks principle can be extended to the type of feedback you provide (Beghetto & Kaufman, 2007). When giving students feedback about their performance, it is important to strike a balance between honest appraisal (offering structured guidance on areas in need of improvement) and supportive encouragement (acknowledging what students have done well and encouraging them to take on additional challenges).

Although you may be able to anticipate the level and kinds of supportive structure your students need for tackling the uncertainty of a complex challenge, it is your students who will ultimately determine whether they are getting that “just right” blend. Consequently, it is important to frequently check in with your students (using simple methods like those outlined in Figure 1.5 and in Chapter 6) to monitor how they are experiencing the challenges you deliver. Using the Goldilocks principle in conjunction with frequent check-ins can help you ensure that you are supporting students while encouraging them to engage in a productive struggle.



Summing Up

In this chapter, we looked at the structure of a challenge, how a challenge’s degree of uncertainty determines its level of complexity, and the important distinction between good uncertainty and bad uncertainty. By becoming aware of the basic building blocks of a challenge, you will be in a better position to develop and introduce more complex challenges within the context of a structured and supportive learning environment. The following chapter will introduce you to a full continuum of challenges—from simple to complex—and help you identify the types of challenges you already use and start designing and incorporating more complex challenges for your students to tackle both inside and outside the classroom.

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