Opportunity Education

Quest Forward Learning Research Brief

Be Curious

One of Six Essential Habits of Quest Forward Learning

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Why Be Curious?

At Opportunity Education, we believe that curiosity is one of the most important habits students need to thrive in school and in life. This is why Be Curious is one of the six Essential Habits of Quest Forward Learning. This brief summarizes research on curiosity, its relationship to learning and development, and how to best cultivate curiosity. It also describes some of the ways Quest Forward Learning encourages and supports students in being curious and highlights decisions we have made to intentionally foster students' curiosity. Some of these include a habits program and curriculum, quest-based curricula, projects and electives, the design of Quest Forward schools, and more.

Overview

As humans, we are all born curious. Our very nature compels us to make sense of our experiences and environments (Piaget, 1964; Kagan, 2002). This is obvious when you watch young children. They are intensely focused and curious as they discover new toys, flip through books, or try to figure out how the faucet or remote control works. A person's curiosity and the intensity of their curiosity are derived from several sources, including: genetic traits; attachment as a toddler; environmental factors and opportunities to express curiosity; and, most importantly, influences from the people around us—parents, families, friends, teachers (Engel, 2015). When curiosity is not encouraged or modeled, especially early in life, it can diminish. Curiosity, like any skill or mindset, is one that needs to be practiced.

As humans, we are all born curious.

Each of us can benefit from cultivating curiosity throughout our lives. Curiosity supports, and is essential to, learning and critical thinking. Curiosity and the resulting exploratory behavior have been linked to social, emotional, spiritual, and physical development (Berlyne, 1960; Kashdan & Roberts, 2004) and well-being, including life satisfaction and a greater sense of purpose (Jovanović & Brdaric, 2012; Sheldon, Jose, Kashdan, & Aaron, 2015).

Curiosity is considered a form of intrinsic motivation, which is also linked to well-being and academic achievement (Ryan & Deci, 2000a). Being curious can help individuals adapt to different environments, including developing tolerance to anxiety and uncertainty, thinking unconventionally, expressing positive emotions—including humor and playfulness—and having non-defensive, critical attitudes (Kashdan, Sherman, Yarbro, & Funder, 2013). These are some of the reasons why it is valuable to include curiosity as one of the six Essential Habits in Quest Forward Learning, and to design learning experiences that stimulate and sustain curiosity.

What is Curiosity?

Curiosity is a form of intrinsic motivation, which is a primary driver in early stages of development and also an important condition for independent, lifelong learning (Oudeyer, Gottlieb, & Lopes, 2016; Ryan & Deci, 2000a). Choosing to visit a museum, play a video game, search the web based on a question you have, or read a book purely for enjoyment, is a result of intrinsic motivation and curiosity. There is not an extrinsic reward for doing these tasks; we do them because we want to.

Curiosity is associated with interest in activities, wonder, events that are surprising, new, or moderately complex, and the desire to reduce gaps in knowledge (Engel, 2015; Lindholm, 2018; Barto, Mirolli, & Baldassarre, 2013; Oudeyer & Kaplan, 2007; Schmidhuber, 1991). It is a drive, which we satisfy by seeking information and resolving uncertainties (Berlyne, 1960). Curiosity is so important that some believe it is "essential to the survival not only of the individual but of the species" (Bruner, 1966: p. 115).

As a psychological phenomenon and developmental function, curiosity has been researched for over a century, but the topic continues to be a contentious one without an agreed-upon definition. What is challenging about understanding the research on curiosity is that the work rarely centers around curiosity. Rather, curiosity is linked to phenomena such as play, exploration, motivation, interest, and emotion.

At Opportunity Education, we see curiosity as a combination of wonder and interest. Throughout this document, interest is used synonymously with curiosity, which is also how many researchers think about curiosity (e.g., Silvia, 2017; Izard, 1997). Some researchers describe it is an innate trait we are born with. Some think of it as a motivator. Others view it as a state—something that varies by situation.

Curiosity is an Innate Trait

Some researchers think of curiosity as a trait we are born with, to varying degrees and intensities. Some people "experience curiosity more often (frequency)," "more strongly when they feel it (intensity)," or "they need less input for curiosity to be sparked (sensitivity)" (Silvia, 2017: p103). Individuals differ in their predispositions to become curious and how they respond to uncertainties (Litman, 2005; Litman & Jimerson, 2004). Some respond to uncertainties in order to reduce negative feelings (Berlyne, 1950). Others see uncertainty as a challenge and interest is then sparked (Berlyne, 1967). Individuals may both try to avoid negative feelings due to uncertainty or seek out interests in order to learn something new (Litman & Jimmerson, 2004).

Curiosity Is a Motivator

"Curiosity motivates people to explore the world and challenge themselves, and it is relevant to obtaining life fulfillments" (Kashdan & Silvia, 2009: p. 370). Some researchers see curiosity as a motivational counterweight to anxiety, helping us to get over fears or new experiences (Silvia, 2017; Izard, 1997). While people may be happy or enjoy a specific experience, it is not uncommon for them to have the desire to try something new to pique their interests even more. This is best described as a tension between sticking with what one likes and seeking something better. Two metaphors are useful for understanding how curiosity can motivate (Ainley, 2012). The first is a hook. Activities and information can trigger interest and engagement. The second metaphor is a switch, connecting a person's interests with current activities and topics and providing an opportunity to express those interests.

Curiosity Varies By Situation

Other researchers tend to stress how curiosity is highly dependent on specific situations—the people around us, resources available, and experiences we have (Naylor, 1981). Understanding the ways in which curiosity can be triggered in different situations, such as in school, is more important for our work with Quest Forward Learning than understanding individual differences or traits related to curiosity.

Key Findings from Research

Interest

Related to these perspectives on curiosity are two types of interest: individual interest and situational interest (Krapp, Hidi, & Renninger, 1992; Renninger, Hidi, & Krapp, 1992; Hidi & Renninger, 2006). Interest can be triggered because of a person's disposition (individual interest) or it can be sparked by the environment (situational interest). Situational interest is most often associated with curiosity. The two metaphors mentioned above speak to these two types of interest. A hook can trigger situational interest, while a switch fosters individual interest. Hidi and Renninger's (2006) four-phase model of interest describes the stages a person goes through in developing deep and stable interests (Järvelä & Renninger, 2014). Take the following example of a teenager learning about bicycles and bike maintenance:

1. **Phase 1: Triggered situational interest.** Interest is piqued, but may fade quickly. A teenager takes her bike out of the garage for the first ride of the season. She notices a tire is flat and the chain looks a little loose and rusty. She wonders what to do. To address the issue she searches online for support and, with her parent's permission, orders new parts. She fixes the bike and then never thinks about bike maintenance again until she has another flat tire.
2. **Phase 2: Maintained situational interest.** Interest is piqued for a sustained period of time. After fixing her bike, the teenager talks to her dad about his bike and works with him to get his bike in good shape even though there is not anything obviously wrong with it. She enjoys the time and conversation with her dad and he also expresses interest.
3. **Phase 3: Emerging individual interest.** Because the teenager had a positive experience fixing her dad's and her own bikes, and she sees value in maintaining them, she remains interested in bikes and bike maintenance. She starts to ask questions like: How often should chains be replaced? How do the gears on the bike work? What should I do to regularly maintain my bike? She is on her way to developing a personal interest in the topic.
4. **Phase 4: Well-developed individual interest.** The teenager does her own research to learn about bikes and how to properly maintain them. She participates in online forums discussing the best products and methods for maintaining bikes and attends a bike convention in her local city. Bike maintenance has become something she is really knowledgeable about and the questions she is curious about become more complex.

To move from situational interest to individual interest, students need enough knowledge to know what kinds of questions they should be asking. Students also need ongoing, optimally challenging activities that spark new questions. "This continuing interplay between knowledge, questioning, and challenge then leads to a deepening of interest over time" (Clark, 2017: p. 26; Renninger, 2000).

Curiosity's Connection to Learning and Engagement

"We cannot learn new things without trying new things." (Silvia 2017, p. 99)

Curiosity and intrinsic motivation are fundamental for learning (Freeman et al., 2014). They encourage active learning, exploration, and inquiry (Oudeyer, Gottlieb, & Lopes, 2016). When people are curious, their brains are more receptive to learning and they retain more information (Gruber, Gelman, & Ranganath, 2014; Engel, 2015; Freeman, et al., 2014). Along with intelligence and effort, a mind that is curious about learning and intellectual pursuits is considered a key predictor of academic achievement (Von Strumm, Hell, & Chamorro-Premuzic, 2011). The following outcomes have also been shown to be linked to curiosity and interest:

When people are curious, their brains are more receptive to learning and they retain more information.

- Curiosity has shown to be predictive of academic achievement in math and reading comprehension (Shah, Weeks, Richards, & Kaciroti, 2018; Gurning & Siregar, 2017).
- Individual and situational interests predict academic achievement (Krapp, Hidi, & Renninger, 1992; Rotgans & Schmidt, 2011).
- Curiosity is linked to a student's emotional, cognitive, and behavioral engagement (Fredricks, Blumenfeld, & Paris, 2004; Skinner, Furrer, Marchand, & Kindermann, 2008).

- When a school is more challenging, more curious students performed better on achievement tests than their less curious peers (Kashdan & Yuen, 2007).
- Through the use of functional magnetic resonance imaging (fMRI), Kang et al. (2009) concluded that adults show greater long-term memory retention when they had expressed high curiosity rather than low curiosity.
- The brain is more active when people are curious. Both monkeys and humans experience enhanced brain activity when receiving new information as compared to information they expected or knew (Bromberg-Martin & Hikosaka, 2009).

WHY CURIOSITY WANES OVER TIME IN SCHOOL

Children in a preschool classroom are curious about everything—toys, books, kids, and other learning materials. They manipulate objects to see how things work and ask a lot of questions. Only in the most fortunate of circumstances do you observe this kind of curiosity in a middle school or high school class. What's the difference? Why does curiosity appear to dwindle as students move into middle and high school? There may be a natural decline in interest as the world becomes more familiar to us, but there are at least two other factors as well, including developmental differences in curiosity and competing priorities in classrooms that can decrease or inhibit a student's curiosity.

Development Differences

First, from a developmental perspective, curiosity looks different in preschool than it does in middle school or high school (Lindholm, 2018). In the early years, children wonder about everything as they are continually exposed to new environments, objects, and ideas. Children ask "what?" questions that are triggered by their perceptions and senses ("What is rain?" "What is a centipede?"). They also wonder about how the existence of certain events is possible ("Why is it raining?" "Why is the centipede crawling under the rock?"). Occasionally, most often with the guidance of teachers or parents, students begin to think about causal relationships (Lim 2004; Milne, 2010).

But focusing too much on causal relationships for young learners may impede a sense of wonder and exploration of all their perceptions of the world. Developmentally appropriate preschool curricula encourage students to express wonder and curiosity about what things are and why they exist, which explains why many preschool classrooms are full of tangible resources.

As children approach puberty, they experience a rapid growth in executive functions, which allows them to coordinate and better control their cognitive activity and behavior. They learn many facts about the world around them and find joy in physical activities like athletics and games, and they engage in understanding more and more about the world around them. It is during this time that science education, for example, typically focuses on facts and gaining a deep knowledge base in preparation for doing science. Students are capable of thinking more about causal relationships, which are the foundation for science and science courses at this time. By the time students reach puberty, their brains are ready for inquiry and abstract and critical thinking. Wonder and curiosity become more intellectual in nature, rather than driven by perceptions and senses. Curiosity, specifically techniques like questioning, also need to be modeled and taught at this time (Baehr, 2015; Clark, 2017). As we age, expressing curiosity becomes a more intentional decision.

Competing Priorities

Second, as students move out of elementary school, classrooms become more focused on structured learning, getting through the curriculum, and covering all the required standards. In such circumstances, teachers may feel they do not have time for "unstructured curiosity" and the time it would take to follow students' interests. It is worth noting that our current education system, a system overly focused on testing, makes this extremely challenging for teachers. Students tend to ask fewer questions and avoid tinkering or experimenting, because these activities are often seen as distractions—things that get in the way of learning what is required in school and for getting through the curriculum. There is evidence that when teachers feel pressured to cover topics, standards, and curricula, cultivating and sustaining curiosity can become

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a lower classroom priority. In fact, teachers may feel it is up to more mature learners to "make themselves interested" in whatever topic appears in the curriculum. Engel (2011, 2013) found that when teachers were prompted to focus on learning, teachers reacted to students who were off task differently than teachers who were cued to focus on students completing an assignment. Those prompted to focus on learning were more likely to support students in getting off task to explore ideas they were curious about. Those cued to focus on completing the assignment were more likely to discourage students from experimenting beyond what was written in the instructions. This suggests that when emphasis is placed on completing tasks and requirements (as it is in many schools), teachers are less likely to encourage curious behaviors and thinking. It is worth noting that our current education system, a system overly focused on testing, makes this extremely challenging for teachers. This conclusion leads to another really important finding about curiosity: the importance of the role adults and other people play in cultivating curiosity.

SOCIAL INFLUENCES

"Curiosity is contagious not only between peers, but between adults and children." (Gysi, 2017)

Adults influence a child's curiosity, by asking questions and responding favorably when a child expresses curiosity by smiling, commenting, and providing feedback (Engel, 2013). Children also pick up on curiosity when it is modeled for them, as when parents and teachers express their own curiosities. Here are a few examples of studies that emphasize how other people influence curiosity:

- Engel (2013) found that when an experimenter made encouraging faces or comments, children were more likely to explore an interesting object. This same researcher found that children show much more interest when an adult expresses their own curiosity and interest. Adults can help a child's curiosity flourish or they can stifle it by not being encouraging.
- Students learn from one another through observation and by teaching one another. Whiten and Flynn (2010) taught one child in a preschool class how to manipulate levers on a tool to release a small toy. Students readily shared this knowledge with one another.
- In the "Curious George in the classroom study," researchers investigated whether curiosity is contagious (Engel, 2015). Results showed that children affect one another's curiosity. Social engagement and expression of curiosity through asking questions, encouraging one another to tinker or test something, triggers curiosity, even in those students who tend to exhibit less curiosity. "The lower a child's individual level of curiosity, the more likely it is to be lifted by interacting with other children" (p. 127).
- A study by Fredricks et al. (2002) found that that one of the reasons children say they pursue an extracurricular activity is so that they can see their friends. Friend and peer influences can help students feel a sense of belonging and also expose them to new activities, both of which can motivate students to explore and pursue interests further (Bergin, 2016).
- Sha, Schunn, Bathgate, and Ben-Eliyahu (2015) found that family support for learning was significantly linked with a student's choices for and engagement in science learning and can influence a student's interest and curiosity in a domain or topic. Other studies have also found that parents' influence children's interests (e.g., Crowley, Barron, Knutson, & Martin, 2015).

Designing Experiences to Trigger Curiosity

Existing interventions, curricula, and pedagogies have been intentionally designed with the goal of triggering student interest and curiosity in order to support engagement and learning. In what follows are just a few examples of interventions or designs that were created, in part, to trigger curiosity and support student achievement.

PROJECT-BASED LEARNING

Project-based learning starts with a driving question or problem to be solved. Students explore the problem and participate in inquiry to learn more about the problem and explore and evaluate possible solutions. Students collaborate with peers, teachers, and community members to find solutions. As part of this process, students create tangible products or artifacts that reflect their thinking about the driving question (Krajcik & Blumenfeld, 2005). Interest and value, which affect motivation, are enhanced when the projects involve varied tasks, novel elements, an authentic problem, appropriate challenge, choices about what is done and how, opportunities to work with others, and when a possible solution to the problem is defined (Malone & Lepper, 1987). Studies focusing on the use of PBL curricula have found that it is associated with motivation (Blumenfeld, Soloway, Marx, Krajcik, Guzdial, and Palinscar, 1991), academic achievement (Geier, et al., 2008) and

interest in pursuing a career in STEM (LaForce, Noble, & Blackwell, 2017).

ACTIVE LEARNING

Rotgans & Schmidt (2011) examined how an active learning classroom at a higher education institution supports student interest. During a one-day active learning activity, they measured situational interest to see how it develops and fluctuates and then relates to achievement. The day began with students being introduced to a problem and then discussing the problem in small groups. They had a self-study period and the day concluded with students presenting their findings. Results showed that interest was piqued after the problem was presented and during the presentation time. Likely this was because of the hook of the problem and its novelty, and also because of the active and social learning that occurred during the discussions and presentations. Interest gradually decreased during the self-study. Situational interest was highly predictive of achievement.

QUESTIONING

The Question Formulation Technique (QFT) was developed by the Right Question Institute to teach students how to ask their own questions (Rothstein & Santana, 2011). The step-by-step process starts with the teacher providing a prompt—a question, image, statement, or object. Next, students come up with as many questions as they can that relate to the prompt. Students then discuss the questions, modify them, and prioritize 3 they would like to focus on. Students and teachers plan how they want to use their questions (for a project, for example). This technique has a positive effect on student curiosity and engagement, as well as achievement, deeper learning and thinking, ownership of learning, and greater confidence (Rothstein & Santana, 2011). Clark (2017) also found that higher teacher fidelity with QFT contributed to increased student curiosity.

INQUIRY

Potvin, Hasni, and Sy (2017) provided science teachers with a 5-day training workshop to learn about inquiry-based pedagogical interventions. During the workshop, inquiry was presented as situated problems, requiring students to tackle challenges with reasonable difficulty by following the scientific method procedures. Teachers were also provided examples of inquiry-based teaching methods. Teachers then worked with their school counselors and university science professors to identify areas of their practice that could be improved by leveraging more inquiry-based methods. Each teacher designed and implemented inquiry interventions that lasted between 5 and 10 75-minute class periods. Research shows that the intervention had a significantly positive impact on students' interest in science and technology, compared to a control group that learned the same content but did not participate in inquiry.

GAMES

Games have the power to spark student interest in new domains. They can encourage students to ask and answer questions while playing (Squire, 2011). Triggering curiosity and engagement are key goals for many game designers. This is often done by providing activities that offer optimal and increasing amounts of challenge, novelty or fantasy, uncertainty, choice, collaboration with others, and more.

Design Principles for Cultivating Curiosity

Many of the strategies used to spark curiosity, some of which were just highlighted, are also used to create engaging learning experiences more broadly. In what follows are design principles for cultivating interest and curiosity (Blumenfeld, Kempler, & Krajcik, 2006; Ryan & Deci, 2000a; Ryan & Deci, 2000b; Urdan & Turner, 2005; Dickey, 2005; Pluck & Johnson, 2011; Green-Demers et al., 1998; Sansone and Thoman, 2005; Clark, 2017).

1. **Novelty and variation**
   New and varied experiences spark curiosity, as well as humor and fantasy. Students are more likely to remain interested and curious when there is variation in the tasks they are completing.
2. **Mastery and skills**
   Focusing on mastery and skill development and the process of learning, instead of completing work or getting a good grade, can fuel curiosity and engagement.
3. **Clear goals with uncertain outcomes**
   Supporting students in having clear goals can promote curiosity, especially when the outcomes are uncertain. People are intrinsically driven to accomplish goals (as long as they are attainable and realistic), and this is true even when the end result is not clear. Students are more likely to be curious and interested if they are trying to meet a goal and students are more likely to internalize a goal if they understand the goal, value it, and have the skills and knowledge they need to achieve it.
4. **Appropriate challenge**
   Curiosity can be piqued when there is just the right amount of challenge and when activities become more complex over time. Students feel curious when there are knowledge gaps they want to close. Students feel more curious the closer they feel to closing the gap and people feel satisfied when they close the gaps (Pluck & Johnson, 2011). This motivates them to continue learning. If a knowledge gap is too big, students will lose motivation and curiosity. This is why it is important to have differentiated curriculum, scaffolding, and ways of modifying curriculum to be more or less challenging for individual students.
5. **Feedback and assessment**
   Formative feedback focused on development is key. Students may not be aware of their knowledge or skill gaps or how to close these gaps. Teachers can promote curiosity by regularly assessing students and providing feedback to help them make connections and close knowledge gaps. Feedback directed at improving stimulates curiosity. In addition, if curiosity is a goal for students, it should be measured and students should receive regular feedback on their willingness to express curiosity.
6. **Autonomy**
   Perceived autonomy can lead to more engagement and curiosity. One way to help students feel autonomy is to offer them choices. Two examples are encouraging students to choose the questions they ask and try to answer, and to choose the ways they demonstrate skills and learning.
7. **Supportive and collaborative relationships**
   Relationships to peers and mentors affect student learning and curiosity. Helping students feel safe and connected means they will be more likely to take risks and be open to expressing curiosity. Relationships also provide opportunities for students to observe curiosity when it is modeled by people they trust and work closely with. Social relationships and experiences with others influence one's willingness to be curious and pursue learning as a result of curiosities. Challenging group projects can spark curiosity, as well.
8. **Relevance**
   When something feels relevant and has a perceived value, people are more curious (Rossing & Long, 1981). Helping students find personal meaning and encouraging them to draw on their own interests can pique curiosity and enhance overall engagement.
9. **Inquiry and project- and problem-based learning**
   The way information is presented influences curiosity. Inquiry and problem-based learning motivate students by requiring them to develop their own questions and carry out their own research to close knowledge gaps. Typically, problems are authentic, and may have multiple solutions or no clear solution. Students also work with others during these learning activities, which promotes curiosity.
10. **Questioning**
    A classroom goal should involve students asking more questions and ideally higher-order questions. Both teachers and curriculum designers can support this by asking students what they want to know and then by supporting them in seeking answers. This can also be supported by providing flexibility to get off task in order to explore and discuss questions that arise.

Curiosity in Quest Forward Learning

Opportunity Education has made many design decisions specifically with the goal of stimulating and supporting curiosity. In what follows we describe some of these opportunities created for students and mentors, including a habits program, quest-based curriculum, projects and electives, design of schools, and more. Our design decisions are described and connected to at least one of the principles presented in the last section.

Be Curious Benchmarks

What is this?

We developed a set of benchmarks that define the Be Curious essential habit and its four building blocks, which include:

1. recognize you don't have all the answers
2. ask questions
3. be resourceful
4. try new things

The benchmarks include thoughts and behaviors students should demonstrate, and are organized around 6 stages. A goal is to enable students to progress into more advanced stages over time, expressing more complex thoughts and behaviors.

How does this cultivate curiosity?

The benchmarks provide **clear goals with uncertain outcomes**. The benchmarks are a framework for designing effective experiences that foster curiosity. They provide goals that guide the creation of our Essential Habits curriculum, including a Be Curious card game, and related reflection and feedback tools. They also provide clear goals for student outcomes, but do not specify how students need to demonstrate each benchmark. For example, one benchmark or goal is that the student "asks complex, open questions." The way students reach this goal could take many forms (e.g., an artifact or capstone project, or an internship) and can focus on a topic or question the student chooses.

BUILDING BLOCKS	STAGE 1	STAGE 2	STAGE 3	STAGE 4	STAGE 5	STAGE 6
Recognize You Don't Have All The Answers.	Recognizes when they don't know something. (thought)	Admits to others when they don't know something.	Listens to and is eager to learn from others when prompted to do so.	Listens to and is eager to learn from others.		Understands the world is full of complex problems that no one has the answers to. (thought)
Ask Questions.		Expresses wonder about how and why things work the way they do.	Asks questions based on interest and curiosity.		Asks questions effectively, and at the right moments.	
				Questions their own and others' assumptions.	Expresses skepticism.	
	Asks simple, closed questions. (e.g. Is 'cat' a noun?)	Asks simple, open questions. (e.g. What kind of tree is this?)		Asks complex, closed questions (e.g. Is there a water pollution problem in my community?)		Asks complex, open questions. (e.g. What are ways we could solve this energy crisis?)
Be Resourceful.	Seeks out new information when prompted to do so.	Seeks out new information with assistance from others.	Voluntarily seeks out new information.		Asks people they know to help them gather information and answer questions.	Connects with new people and experts to help them ask and answer questions.
Try New Things.		Understands "comfort zone" and where theirs ends.	Willingly tries new things when prompted to do so.	Responds positively to challenges and uncertainties.	Regularly and voluntarily steps out of their comfort zone.	Actively seeks out experiences that they find challenging.
	Identifies interests and things they are curious about.		Makes choices based on interests, not only how easy or fast something is to complete.			
	Identifies new activities, clubs, or extracurriculuar activities they would like to participate in.		Participates in a new club, competition, or other extracurriculuar activity.		Participates in multiple hobbies and activities outside of school.	

Benchmarks for the Be Curious habit.

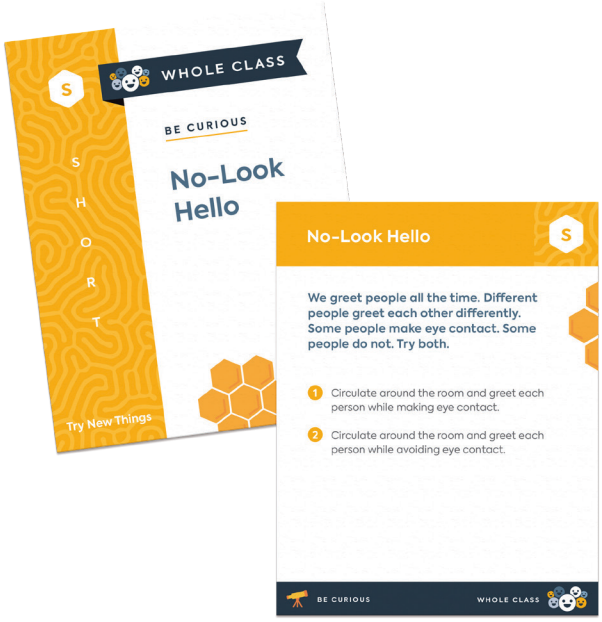
Be Curious Card Game: The Extraordinary Ordinary

What is this?

We are designing a card game specifically for practicing the Be Curious habit. The game is called "The Extraordinary Ordinary." The game's activities invite students to perform everyday, or "ordinary," actions and tasks. The game, however, puts a twist on these actions so that the students, through repeated loops of extraordinary actions and subsequent reflection, come to see the amazingness of ordinary practices and the ordinary world around them. They will regain an appreciation for the practices they take for granted and recover a fresh sense of wonder and curiosity.

How does this cultivate curiosity?

The game asks students to practice being curious through **novelty and variation**. The game consists of 22 cards, each with a different activity to promote curiosity. Students step out of their comfort zone, try unusual activities, and explore topics and questions that pique their interest. The practices allow for a variety of group sizes (independent, small, and large) and durations (several minutes to several weeks). The practices are designed to be engaging and align with the Be Curious benchmarks.



The front and back of one of the Extraordinary Ordinary game cards. This activity is best done with a group of students (it's more fun!) and only takes a few minutes. To maximize impact, mentors facilitate a discussion about curiosity after students complete the activity.

Examples of 3 individual practices ranging from short, medium, and long time commitments. Each practice is written on a single card in the deck.

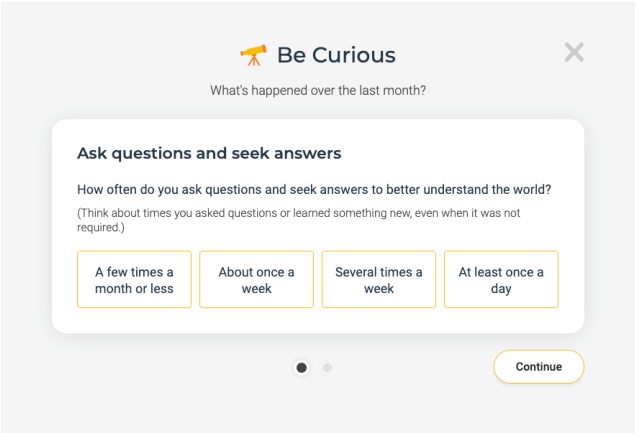
Habit Review

What is this?

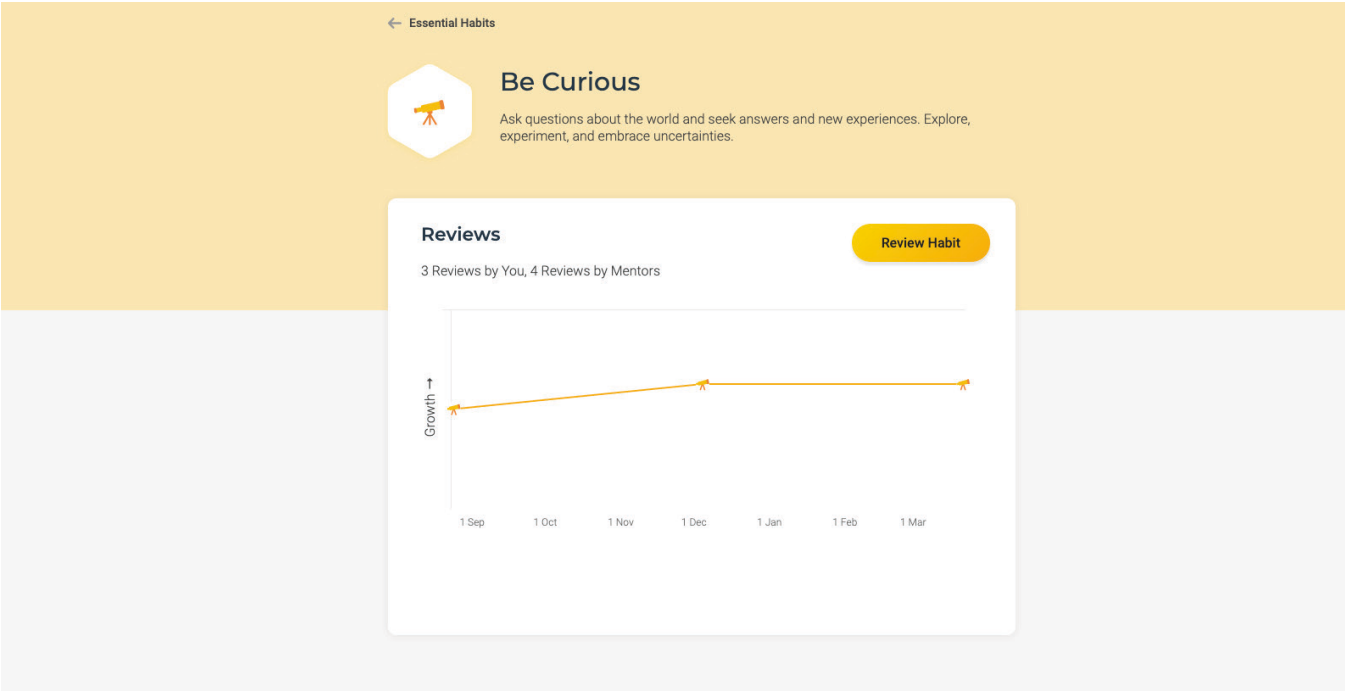
The Habit Review is a reflection and self-assessment tool. Students answer a series of questions about how frequently they express certain habits and related behaviors. When reviewing Be Curious, students reflect on how often they try new things and ask questions about the world. There are open-ended spaces for students to reflect on their responses and ways they have practiced being curious. Mentors review student responses and use information to guide discussions with students and to help students set and achieve goals for making personal improvements.

How does this cultivate curiosity?

The Habit Review supports reflection, **feedback, and formative assessment** on students' development of each habit. The goal is for habit reviews to be completed multiple times throughout a term as students work on a habit and for their responses to drive improvement, which is a process that stimulates curiosity. Because curiosity is a goal for students, we felt it was important for students to reflect and self-assess on this habit.



With the Habit Review, students answer questions, reflecting on how frequently they express certain habits and related behaviors.



Students see can view their responses and see trends over time for each of the 6 Essential Habits.

Quest-Based Curriculum

The quest-based curriculum includes courses, made up of journeys and quests, for all core subjects in secondary school both in the US and Tanzania. The Quest Forward courses and quests stimulate curiosity through a variety of strategies, including **inquiry** and experimentation, **project-based learning, clear goals and uncertain outcomes, novelty, autonomy, mastery of skills, appropriate challenge,** and more.

COURSES AND JOURNEYS

What is this?

Journeys are a collection of quests, organized by levels and centering around a project or narrative. Each year- or semester-long course is made up of several journeys.

How does this cultivate curiosity?

Courses and journeys are designed to support **autonomy** and provide **appropriate challenge**. For example, three pathways through each course and journey are defined. Each pathway is defined based on student ability, in order to offer appropriate challenge. A scope and sequence is provided for each pathway.

QUESTS

What is this?

Quests are made up of a series of activities that support students in exploring topics, practicing skills, creating artifacts or projects, and reflecting on their learning. Quests start with a driving question that guides students, without generally offering one "right" answer to the question.

How does this cultivate curiosity?

To the right are two quests that each cultivate curiosity in a variety of ways.

North Pole Explorers: A Race to the Top

US SOCIAL SCIENCE

Think about how you could prove you did something to people who were not there. What would you use? Would that be enough to convince people? Most people have heard that Admiral Robert Peary was the first explorer to reach the North Pole. Or was he? At least one other explorer, Dr. Frederick Cook, claimed that he was there first. Let's take a look at some reports of both their expeditions and then explore what they used to prove their claims. Along the way, you may also discover that there is actually more than one North Pole.

This quest starts off with an intriguing introduction, bringing in novelty and sparking student interest from the start. While completing the quest students ask questions, investigate, and come to their own conclusions about the discovery of the North Pole. In the final activity, there is a clear goal for students, but the outcome is uncertain. Students are asked to take a position based on which evidence they found most convincing. Students make choices in order to respond to an authentic question.

A Symphony of Sounds

US MATH/SCIENCE

From the beautiful, high-pitched song of a violin to the deep bass of a tuba, instruments are identifiable by the sounds that they make. In fact, if the violin and tuba were people, they would make the ultimate odd couple! But when the violin and tuba play together in a symphony, each contributes a unique sound that plays an important part in the music. In this quest, explore why each musical instrument has a different sound, and make your own music by creating a household orchestra!

In this quest, students are engaged with investigating the production of sound by comparing and contrasting different instruments and the myriad variety of sounds they make. For the artifact for this quest, students transform their natural curiosity into inquiry and have an authentic and engaged experience while making and recording music using common household items, like pots and pans.

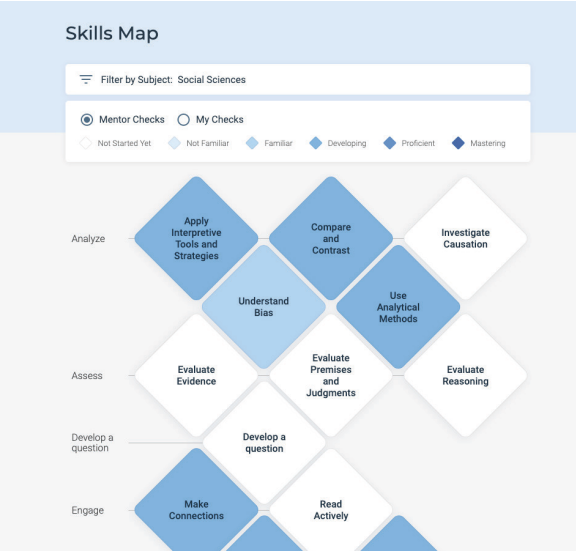
SKILLS

What is this?

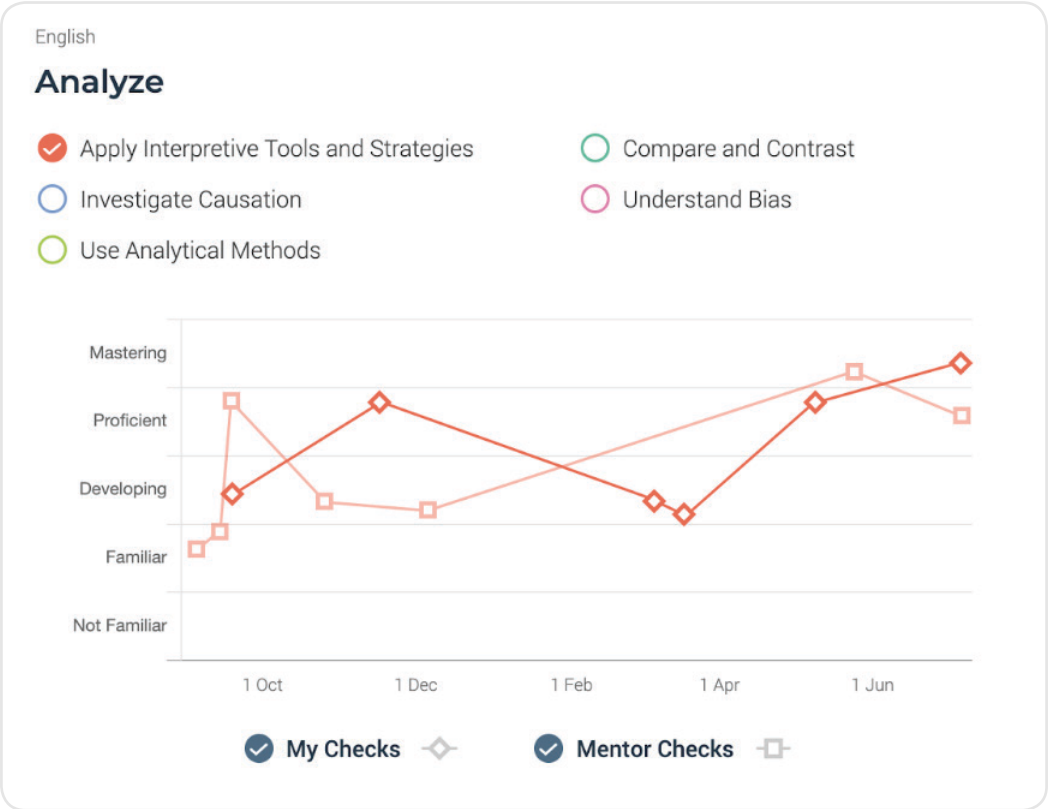
Each course is built using a skills framework as a foundation. Courses and quests are designed to support students in mastering skills and students reflect and are assessed on their development of skills through skills checks.

How does this cultivate curiosity?

Focusing on **mastery of skills** and improvement, rather than completing work or assignments and getting good grades, can encourage curiosity. Students do not receive grades for their artifacts or work they do in quests. Instead they get feedback on their skill development, with the goal of mastering a specific set of skills in each subject area.



The Skills Map screen in the Quest! app, showing development of skills in the skills framework by subject.



This graph shows student and mentor responses to skills checks—a tool for reflecting and assessing student progress on the skills they are focused on developing.

Quest Forward Academy Omaha students working on robotics.

Projects, Intersessions, and Electives

What is this?

Students at Quest Forward schools explore topics and ideas that interest them, outside of the core subject areas. They can do this through capstone projects, intersessions, and electives. In Tanzania, students can choose from elective courses such as Needlework, Music, Carpentry, Electricity, Food and Nutrition, and Computers. In the US, schools have 2–3 week intersessions between terms. For example, in the spring of 2019, eight students at Quest Forward Academy Omaha took a robotics and coding class over two intersessions. During the first intersession, students learned the basics of coding and wiring. They created circuits that could turn on a series of LEDs to indicate temperature. They ended this intersession by creating a robot that could navigate a maze using ultrasonic sensors to sense the walls. When the class reconvened in the spring for two weeks, students were given free rein to design a project of their own choice. One pair of students designed a robotic hand that would mimic the user's movements.

How does this cultivate curiosity?

Intersessions, electives, and capstone projects allow students to explore their interests and practice being curious. Students make choices based on personal interests and have **autonomy**. Students propose, plan for, and carry out their own projects.

City as Campus

What is this?

Schools treat their cities and communities as part of their campuses. Tanzanian students visit places like coffee, tea, and sugar plantations and national parks, like Mount Kilimanjaro. They go to museums and factories, such as the Coca-Cola plant. US Academies provide opportunities for students to explore their city through field trips, guest speakers, and collaborations with local organizations. For example, students at the Quest Forward Academy Santa Rosa all volunteered as election officials. They visited museums, an organic farm, and even an ice cream shop.

How does this cultivate curiosity?

Visiting places in the community and working with people in the community helps students to find relevance and make connections between the work being done in school and events and happenings in the community. Each visit, both in the US and in Tanzania, is closely connected to the work students are doing in their quest-based courses.

Quest Forward Academy Santa Rosa students took a trip to the Healdsburg Memorial Bridge to complement what they learned in their Bridges quests.

Global Learning Program

What is this?

As part of the Global Learning Program, US schools are matched with Tanzania schools. Students meet via video to learn more about each other, their schools, and what life is like in their communities. During the 2018-19 school year, students at the Quest Forward Academy Omaha connected with students at Mtakuja Secondary School. Through video calls and recordings students were able to share and discuss projects and artifacts they created. They each provided tours of their school and they asked each other questions about their culture and experiences in school.

How does this cultivate curiosity?

The Global Learning Program activates curiosity by connecting students and building **supportive and collaborative relationships**. They work with others and develop a sense of belonging in the broader Quest Forward network.

Design of Learning Spaces

What is this?

Rather than desks in a row, students at Quest Forward schools have modular tables and chairs that can accommodate group work, discussions, as well as individual work and mentoring. In Tanzania, tables were customized so they could accommodate group work, but also meet national guidelines that require students to be separated during exams. Experiments that students are running are left out to spark curiosity in their peers. For example, each year the US 9th grade curriculum wraps up with an "ecosystem in the jar" experiment. Instead of disposing of them over the summer, the science mentor at the Quest Forward Academy Omaha leaves them out at the start of the next school year so that incoming freshmen can preview the experiment and ask questions.

How does this cultivate curiosity?

Quest Forward schools are designed to establish **supportive and collaborative relationships, and inquiry- and project-based learning**.

Mentoring

What is this?

Quest Forward class sizes are smaller than typical classes (approx. 15 in the US, approx. 25-40 in Tanzania), which means mentors can devote a lot of time to each student and their needs. Part of their responsibilities is to create a community where students feel safe expressing curiosities, taking risks, and learning from one another.

How does this cultivate curiosity?

Mentors model curiosity by actively sharing their interests with students. They also help students find relevance and encourage students to **ask questions**. For example, a science mentor from Quest Forward Academy Omaha found space in her classroom for her rock and geode collection. Mentors cultivate curiosity in students in the words and phrases they use every day in the classroom. For instance, if a student asks a question about a topic that is not necessarily relevant to a current quest, mentors encourage exploring the answer rather than tabling the question for another time. Rather than detract from the day's lesson, these conversations can help students see the connections between the different academic disciplines.

A classroom space at Quest Forward Academy Omaha, with small group tables with dry-erase tops.

Summary

	Benchmarks	Card Game	Habit Review	Curriculum	Projects	City as Campus	Global Learning Program	Space	Mentors
Novelty and Variation		✓		✓	✓	✓	✓		
Mastery and Skills	✓	✓	✓	✓	✓		✓		✓
Clear Goals, Uncertain Outcomes	✓	✓	✓	✓	✓	✓	✓		✓
Appropriate Challenge	✓	✓		✓	✓		✓		✓
Feedback and Assessment	✓	✓	✓	✓	✓			✓	✓
Autonomy		✓	✓	✓	✓	✓	✓	✓	✓
Supportive and Collaborative Relationships		✓			✓	✓	✓	✓	✓
Relevance		✓		✓	✓	✓	✓		✓
Inquiry, Project- and Problem-Based Learning				✓	✓	✓	✓	✓	✓
Questioning	✓	✓		✓	✓	✓	✓		✓

Cultural Considerations

As Opportunity Education continues to design and implement supports that promote students' curiosity, we need to be sure to pay attention to the ways that curiosity and its role in learning can vary across contexts and cultures. It is important for us to understand further how curiosity is perceived in different countries and the social and cultural implications this habit may have for different populations. For example, in Tanzania, asking questions or taking risks to explore a curiosity may clash with cultural norms about how young people should behave. Curiosity may not always be viewed as a positive habit. Moving forward, we need to continue to learn from and co-design with the Tanzanian team in order to ensure Quest Forward Learning is culturally responsive.

Conclusion

Curiosity is one of the most important habits students need to be agents in their own learning, to think critically, and to continue to ask questions about the world around them. While research points us in a lot of useful directions when it comes to stimulating situational curiosity and fostering individual interests, one idea stands out above all others: The best way educators can promote curiosity is to be curious themselves, to model curiosity, and to give students the freedom and multiple opportunities to express and pursue their own curiosities.

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