

## **Chopsticks and Pandas: A Matter of Scarcity**

*Joseph Parrett*

### **Introduction**

The giant panda has become synonymous with the conservation movement. Giant pandas are a threatened species. These adorable mammals are cherished not only by kindergarten students (like those in my class) but also by people from around the globe. These animals have captured imaginations across the globe: imaginations belonging to people of all ages, genders, and cultures. Something that can grab attention like that is something that should definitely be channeled into student engagement.

I do my channeling at Kathleen Wilbur Elementary School in New Castle, Delaware. Wilbur is a large school of almost 1,200 students. Our 1,200 come from diverse backgrounds. They come from mansions, motels, and everywhere in between. I teach in one of the nine kindergarten classes found at the school. In each of these nine rooms you will find students of varying skill levels. Some will have grown as they attended years of pre-school. Some will have learned much from Sesame Street, an older sibling, or an inspired parent. Other students may never have held a book before. Throughout last year my class ranged between 20 and 22 students. As the year closed I had 22 students on my roll. I had an even split between male and female students (though this is actually atypical.) My class was predominantly (55%) of African-American descent. The rest (45%) of my class was pretty evenly split between Caucasian, Hispanic, and Asian backgrounds. Seven of my students were pulled out during the day to receive English Language support. Throughout the school year three of my students were regularly pulled from class to receive additional academic support. I also had one student who would go out weekly to receive behavioral intervention support, as well as a student who had an Individualized Education Plan put in place in his pre-school setting. These numbers are pretty common among kindergarten classes at Wilbur and I anticipate a similar class makeup in future years.

### **Content Objectives**

#### Scarcity

In kindergarten social studies we introduce economics. This introduction is presented in a very broad and simplistic way. We examine concepts such as: wants and needs, bartering, and scarcity. We introduce scarcity in a very localized manner. For example, we may talk about scarcity of classroom supplies. Students begin to gain an understanding of this concept when we discuss whether we have enough iPads for every student to use a device at the same time (we don't). We link the concept of scarcity to the highly desirable acts of

sharing and taking turns. My students understand the concept of scarcity, only as it relates to themselves. They recognize that they cannot always get what they want because there may not be enough of a certain thing, like iPads, markers, or swings on the playground. They can also extend this understanding to the home. They can come to understand that their parents cannot buy them everything due to a scarcity of money, or due to a scarcity of the item that they wish to have. These are all very egocentric views of scarcity (and totally appropriate and typical for the age group).

In kindergarten we do not usually view scarcity beyond the impact to our own lives. However, if properly engaged, students can see scarcity on a global scale. By considering animals that may have a highly specialized diet, students can gain an understanding that scarcity affects other living things; even cute, black and white mammals from half a world away. Establishing that scarcity affects more than just ourselves, my students will be better prepared in later years when the economic focus shifts from the personal to the global. Everything can be viewed through the lens of scarcity, including the favored food of the giant panda.

## **Bamboo**

Understory plants are the vegetation that grows between a forest floor and the leafy canopy high above. Bamboo is an understory plant that grows in many places including the habitats in China that host giant pandas. Bamboo is a type of grass. It is also an exceptionally fast growing plant. Some species of the plant can grow up to 36 inches in a 24-hour period.<sup>1</sup> Let that sink in, up to three feet in a day. Bamboo dedicates a lot of energy to growth. Reproduction also requires a large expenditure of energy. “It takes a lot of energy for bamboo to flower and make seeds; it takes so much energy that bamboo plants usually die after flowering.”<sup>2</sup> “In 1983 the arrow bamboo, the panda’s principal food, mass flowered, and by the following year all the plants had died off.”<sup>3</sup> Even though bamboo is an amazing grower, entire populations of the plant can be lost within a season.

Coupled with this vulnerability, bamboo is in much greater demand in China in recent years. In 2016, China put in place a ban on logging in their natural forests (as opposed to plantations developed for the purpose of harvesting). As wood became more expensive and challenging to attain, a side effect of this legislation saw bamboo replace wood in many instances. “People rely on bamboo to make houses, pipes, furniture, musical instruments, fences, cloth, and paper.”<sup>4</sup> Bamboo is even used in the manufacturing of disposable chopsticks. In 2013 it was reported that, “100 acres of trees need to be felled every 24 hours”<sup>5</sup> for the manufacture of the yearly 45 billion pairs of disposable chopsticks. By 2018 (2 years after the logging ban went into effect) the number of disposable chopsticks produced yearly had reached 80 billion.<sup>6</sup> Many of those utensils are made of bamboo. Another factor related to the scarcity of bamboo is climate change. The increase in average global temperature could lead to a decline in the number of varied

species of bamboo.<sup>7</sup> This lack of diversity could adversely impact the availability of food for the giant panda.

## **The Giant Panda**

“This creature aroused emotions, sympathy, and curiosity in the broadest.”<sup>8</sup> Due to the investment that humanity seems to have in this animal, it is little wonder that the image of a panda has represented the World Wildlife Fund since 1961. In nature these animals are only found in the highlands of China. They live amidst forests in the mountains with a large supply of bamboo in the understory. These forests are cool and damp places that often are clouded or covered in fog. Historically, these areas were not the preferred home of pandas. Pandas once roamed the bamboo forests of the lowland regions. As human populations deforested these spots and cleared away their food sources, the pandas were forced into the mountains.

Giant pandas are bears about the size of an American black bear. Males can reach about 250 pounds in weight and the females, while lighter, can still weigh in at around 200 pounds. They have very distinctive black and white markings that scientists think could either aid in sending social cues or as a form of camouflage (however, with no natural predators, camouflage seems unlikely). It is theorized that pandas diverged from the rest of the bear family millions of years ago.

Most bear species are omnivorous (they are both carnivorous and herbivorous). Pandas are different, however. Their digestive system is designed like that of a carnivore but their teeth are not designed for meat. The teeth are built for crushing bamboo. “They have evolved in ways that tie them to bamboo.”<sup>9</sup> Bamboo is the only component of the giant panda’s diet. Having a digestive system built for meat and eating only bamboo tends to make gaining nutrients a fairly ineffective process. In fact, “a giant panda spends fourteen or so hours a day searching for, selecting, and eating up to 22 to 40 pounds of bamboo it must have each day to survive.”<sup>10</sup>

In 1984 the giant panda was added to the list of endangered animal species. Pandas are primarily endangered due to habitat loss. As humans encroached into typical panda lands the animals were confined to smaller and smaller livable spaces. With this loss of habitat came a reduction in available food sources. The pandas retreated into the isolated highland areas. This unfortunately also divided the breeding populations of the animals. China has taken steps to protect these mammals, and it appears to be helping the situation. In 2016 the panda was removed from the endangered species list and was downgraded to a vulnerable species. There are currently an estimated ~1,850 pandas remaining in the world.<sup>11</sup> While these animals continue to receive protection from Beijing they also do remain vulnerable to habitat loss and climate change. If global warming reeks havoc on the supply of bamboo, so too will it reek havoc on the remaining population of giant pandas.

## **Sustainability**

In nature, sustainability is the ability to maintain the status quo. Left to its own devices, nature is pretty sustainable. The animals and plants find a balance so that the ecosystem continues as is. Trees fall and new seedlings grow. Animals die and new life replaces the old. Mustafa, Simba's dad in *The Lion King* had a pretty good handle on the concept when he talked about the circle of life. Left alone, nature seems to be mostly sustainable. Then humanity enters the picture.

Humans have a different idea about sustainability; it seems to require growth. We want a higher level of education, a higher level of healthcare, a higher level of economic growth, a higher level of technology, more food, more comfort, more opportunity, and more ease; all the while there are more and more and more of us to satisfy. To sustain our growth, we generally need more resources, produce more garbage, and flood our habitat with more pollution. The human way seems intrinsically unsustainable. To go back to my elementary roots, people are a bunch of Once-lers, harvesting the truffula trees in an effort to go on “biggering and BIGGERING and BIGGERING and BIGGERING”, “which everyone, EVERYONE, EVERYONE needs!”<sup>12</sup>

A responsible view of sustainability in the modern world needs to balance the desires of today, against the consequences to the natural world and humanity's future. Through the lens of pandas and chopsticks: “harvesting bamboo for fences and other tools appears to be another arena of local competition between pandas and people.”<sup>13</sup> While I agree that there is competition between the human and the natural worlds, I believe the playing field is skewed very much in the favor of people. As we continue to irresponsibly harvest natural resources and change the land and waters to suit our purposes, we impact the plants and animals of the planet. “Human-caused environmental change, if left unchecked, will lead to the panda's extinction.”<sup>14</sup> The future looks grim for bamboo, pandas, animals that swim in the sea, fly through the air, or walk the earth; and for the future generations of humanity that will inherit this tired planet. But hope is not lost.

## **Conservation**

“Conservation is essentially a struggle against the exploitation of nature.”<sup>15</sup> In this unit, I will focus our definition of conservation and the protection of the natural world. When a huge portion of the arrowroot bamboo died off in 1983, China feared the worst for their pandas. In response to the event, Beijing established panda rescue centers. These preserves were put into place to protect their national animal. But the centers do more than just give pandas a place of their own. “By saving this creature, we also protect the thousands of other plant and animal species that share its forests.”<sup>16</sup> Animals such as the Asiatic black bear, the red panda, and the leopard cat share a habitat with the Giant Panda. Although these are not specifically protected species, they do benefit from their

proximity to the giant panda. In fact, the giant panda is identified as an umbrella species because its protections also shield its neighboring plants and animals.

A challenge to the giant panda species is that the individuals are divided into little clusters found on disconnected mountains. Some of these clusters consist of as few as twelve animals. This type of situation does not lend itself to animal breeding. Plans are in the works in China to establish an enormous National Park that will connect several smaller panda rescue centers. The Giant Panda National Park is planned to be three times larger than Yellowstone National Park in the United States.<sup>17</sup> This new park will provide more space for these disparate communities of pandas to reconnect. Of course, this park will also provide shelter for the other numerous threatened species that call the area their home.

Saving the pandas may not just be a matter of national pride for the Chinese. Giant pandas could equal revenue. Ecotourism is a relatively new thing in China. With an increase in the interest of nature, companies are now offering opportunities to travel to natural locations. Many of the panda preserves have seen an increase in visitors eager to see the habitat of the giant panda, and possibly a glimpse of the iconic animal as well. It is a positive sign that so many people are interested in keeping the giant panda off the endangered species list. After all, “Unless someone like you cares a whole awful lot, nothing is going to get better. It’s not.”<sup>18</sup>

## **Teaching Strategies**

### **KWL Chart**

A KWL chart is a way to organize information about a particular subject. The ‘K’ stands for know, as in ‘what do we already know’. My class will be completing a chart about the giant panda. Students will share the ideas that they already have in place about these animals. Upon the completion of the ‘K’ we will dive into the “W” portion of this graphic organizer. ‘W’ stands for ‘what do we wonder, or want to know, about the topic. This portion of our chart will be filled with questions the students may have about these magnificent animals. These two parts of the chart are completed prior to any class readings or discussions about the topic. This is a useful way to begin the lesson as it provides me with an idea of my students’ exposure to the topic. The KWL chart also allows any misconceptions about the topic rise to the surface. This is certainly useful as it affords me the opportunity to address wrong ideas prior to them impeding the learning of my students. The final portion of the chart, ‘L’ is all about ‘what did we learn’. Completed after the readings and discussions, it is a nice way to summarize our learning and to highlight any information that I feel is especially important. This completed chart will be posted in the room for the duration of the unit. It will be a useful touchstone for where we started and where we currently are in our learning.

## **Non-Fiction Text**

There is a push in education to have students interacting with more non-fiction text. As my students move from kindergarten into the high-stakes testing grades they will encounter more and more informational writing on a variety of subjects. I feel that I am performing an important service for the third grade and up teachers in my school by giving my students a wealth of experience with non-fiction texts. Reading non-fiction requires different skills than enjoying a story. Students will be utilizing skills like finding a main idea and supporting details. Identifying the author's point of view and purpose, and using graphics like charts and maps to gather information. A fictional bit of writing about a panda is fun and can certainly inspire positive feelings toward the animal in my students' hearts. A non-fiction text teaches facts and is a great way to activate a student's brain in high-level thinking.

## **Introducing Vocabulary**

Vocabulary is a massively important piece of comprehension. At the kindergarten level I have found it most effective to use images in the presentation of new vocabulary words. For this unit as I introduce new terms I will find pictures that highlight the concept. I then have my students turn and talk and discuss what all of my pictures have that is the same. Through these commonalities we will derive a working definition for our new word. By teaching vocabulary in this manner, my students develop a mental image of the word. They then supplement this mental image with our 'homegrown' definition. This combination of the visual with the linguistic is more likely to be remembered than a dictionary definition that was delivered to the students.

## **Picture Sort**

A favored strategy that I employ with my students is the use of pictures. Visuals bring ideas and concepts to life. I will be engaging my students in a very simple 'blind sort'. When running a 'blind sort', I distribute pictures to my students without any explanation. With the simple directive of find a group of people whose picture goes with yours, I sent the sort into motion. The students will move about the room visiting peers, comparing pictures, determining if they have a commonality, and moving to find other partners. Once the sort is done I invite groups to explain why they feel they belong together. This explanation of the connection between the images is often the entire point of the exercise. For this unit, the kids will be sorting pictures of bamboo. One group of pictures will involve pandas with bamboo. The second group will highlight man-made objects constructed from bamboo (including of course disposable chopsticks). Comparing the two groups will bring us to the discovery that both pandas and people use bamboo.

## **Cooperative Learning**

In kindergarten especially, cooperative learning is exceedingly important to practice in class. My students need many opportunities to practice critical skills that are a prerequisite of teamwork. Being a good listener takes practice and repetition. Simple skills like facing the speaker, making eye contact, and being quiet when listening, are not a given in kindergarten. Many activities such as playing a game, also require students to take turns and share materials. Again, it cannot be taken for granted that these skills are locked in with five- or six-year-old students. Some students also have difficulties at the conclusion of a game. Some students struggle with losing a game. Others become insufferable if they are on the winning side of a game. Playing a game, even a game pitting a chopstick manufacturer against a giant panda, is an exercise in teamwork and cooperation, both of which are critical for my students. To successfully complete our game, my students will need to demonstrate some level of proficiency in these varied skills. At the end of the experience they should have gleaned new ideas about bamboo usage and the consequences to either businesses or wildlife.

### **Modeling**

Through a game, my students will be creating a model of an ecosystem. I'm not advocating using that level of vocabulary with the kids but it is what they will be doing. As they take turns they will be seeing how pandas and bamboo can maintain a balance that is sustainable. I will then introduce the human factor into the gameplay. They will be able to experience what happens to an ecosystem when resources are not used sustainably. By modeling this system through the game, my students will understand how the human world impacts nature. Conversely, my students will also be able to examine how the natural world impacts the human. How does using bamboo aid people? How do pandas impact the bamboo availability for use by human society? Ultimately, modeling brings a concrete sense to very abstract concepts in a way that allows my students a greater depth of understanding of those concepts.

### **Opinion and Justification**

My students are very opinionated about certain topics. They can all tell me which superhero is the greatest. They can all rank flavors of ice cream and toppings on pizza. When it comes to supporting an opinion with reasons, the road becomes much more challenging. This is particularly true when it comes to a topic that is less familiar than the skills of Batman versus the powers of Spider-Man. My students will be determining whether bamboo is better used to meet the desires of man, or to meet the dietary needs of giant pandas. The students will be expressing an opinion on this subject. Further, they will have to support or justify their choice with facts and ideas gained through our readings, discussions, and gameplay.

### **Critical Thinking**

Typically, if kindergarten students are asked to consider a panda, their thoughts hover around the idea of “cuteness”. After reading a non-fiction text about a panda, they can recall facts about where the animal lives or about what it eats. They can surely relate that it is a black and white animal. Exercising critical thinking is necessary but it is not often a requirement of kindergarten lessons. Every opportunity not taken advantage to make kids think, represents a missed opportunity. My students will be challenged to come up with a solution to the problem of bamboo scarcity. What can we do to help assure that pandas will continue to have enough food? Or, what can we do to assure that people will always have a supply of chopsticks? I anticipate that my students will have some interesting, well thought out ideas on the subject. Exercising critical thinking will raise my students from regurgitating information to independent thought.

### **Draw and Tell**

Draw and tell is an app that my students use on our class iPads. This app is very aptly named. My students can either draw a picture on the device or they can create their art on paper and import a photo of their work into the program. Once the art is complete, the students can add text or special effects to their image. The students can now tell their ideas to the iPad recording their voices to accompany their artwork. In the Common Core State Standards (CCSS), kindergarten writing is defined as a combination of actual writing, dictation, and drawing. A voice recording of a story is a form of writing as defined by the CCSS. This is beneficial to me on a few levels. The first benefit of this strategy is that it allows the students to record their ideas. Since the writing skills are fairly rudimentary, the students are more comfortable and willing to express themselves orally. Secondly, voice recordings like this make it easier on the teacher. I can review the students’ effort on the iPads whenever I have time available, instead of sitting with each child during instructional time to aid them in the dictation of their ideas.

### **Activities**

#### **Activity One: Building Background**

The unit will kick off with the creation of a KWL chart focused on the giant panda. The students will be given an opportunity to share their knowledge about these animals. After sufficient time, students will share out their ideas regarding pandas. I will record these thoughts in the ‘What I Know’ portion of the chart. I will then extend an invitation to share any questions that the students may have about the animal. These wonderings will be recorded in the ‘What I Want to Know’ part of the chart. Completing the first two parts of the KWL will activate the students brains and lead us to a non-fiction reading selection. I will be reading *Pandas* by Anne Schreiber, though any age appropriate informational book on the topic will do. This particular book is put out by National Geographic Kids and features fabulous pictures that will engage the class. The book also features many interesting facts about the animals and will afford me the opportunity to



introduce vocabulary terms such as, scarcity, habitat, and extinct. Following the read aloud, we will revisit the ‘What I Want to Know’ questions generated by the students. We can discuss any answers the we may have learned, At the close of the activity we will add any new discoveries to the ‘What I Learned’ column of our KWL. The graphic organizer, now complete, will be posted in an easily visible part of the classroom for easy reference as we proceed through the unit.

#### Activity Two: Bamboo; Human vs Panda

The second activity starts with a blind picture sort. Prior to this activity, I will prepare a set (enough for each student to have one) of pictures which feature bamboo. Half the pictures will show pandas eating the plant. The other pictures will show products made of bamboo for human use. This pictures will be provided to the students with the specific instruction of do not share the picture with other students until I say “go”. I then give the following directions; stand and walk about the room, share your picture with classmates, if you think your images go together, link arms and continue searching for other teammates. By the end we should be sorted into two large teams. Go!

As the students follow the directions, I will circulate about the room and provide guidance or encouragement if needed. I anticipate that some students will require nudging to get them interacting with peers and finding their team. Once the teams are made we will gather on the carpet and discuss why the pictures of each group go together. I expect one team to focus on the presence of pandas. The other team could come up with many reasons for why they are a good fit. If necessary, I will guide the class to determine that those pictures show ‘people stuff’.

After collecting the pictures, I will read the non-fiction text *Bringing Up Bamboo: Life Cycles* by Julie Lundgren. This book is an excellent source of information on bamboo and will without doubt provide the students with a solid background on the plant. At the conclusion of the text, I will initiate a discussion on the concept of scarcity as it relates to bamboo. Bamboo is also a natural resource and affords me the opportunity to introduce that term as well.

To close the activity, I will bring up a point for consideration; “Bamboo is scarce. People like to use it for making ‘stuff’ and giant pandas only eat bamboo. Could the scarcity of bamboo cause a problem for either the pandas or people?”

#### Activity Three: The Bamboo Game

To prepare for *The Bamboo Game*, I will assign students to teams of four. Pairs of students will play against each other. One pair will play as pandas, the other pair will play as bamboo harvesters for human use. Each team will receive the following materials for

the game, a bowl of 80-100 pom-poms (puff balls), a bowl of about 20-25 plastic counting bears, a cup of about 100 play money pennies, and a paper plate.

The pom-poms will represent bamboo plants. All of the bamboo plants will be placed in the center of the play area. The panda team will start with two plastic bears (the rest will remain in the bowl). The harvester team will start with no pennies (they all will also remain in the cup). At the beginning of a round, each panda in play will eat a bamboo plant (those pom-poms will be moved to the pom-pom bowl). If every panda gets to eat, an extra panda will be moved from that bowl into the area of play. The human team can pick as many bamboo plants as they would like (including all of them) and move them to the pom-pom bowl). For each bamboo plant picked during the round, the harvesters may collect a penny from that cup. Rounds of play continue; the numbers of pandas grow, the harvesters collect more and more money, and the number of available bamboo falls. Eventually, not all of the pandas will be able to eat. If a panda is not able to eat it dies (that plastic bear gets moved from the play area back to the panda bowl). If all the pandas die, the panda team loses. If the harvester team is unable to collect new pennies, they lose.

Ultimately, this game demonstrates an unsustainable use of natural resources. This game is also not a true reflection of bamboo in nature. Bamboo actually reproduces very quickly and is pretty sustainable. But, for my purposes, having the students experience unsustainability is the goal of the game. All teams lose in an unsustainable system.

I would then invite the students to play the game again. This time with an added wrinkle. Much of the game continues as before, however, at the end of each round the harvester team will have the ability to spend pennies (return them to the cup). For each penny spent, they will plant two new bamboo plants (move two pom-poms back into the field of play). This new planting function will add length to the game and make our bamboo system much more sustainable. With this addition, it would be possible for both the panda and harvester teams to not lose. Sustainability can be experienced as a winning formula. Another important idea to expose the students to, is that the animals can't really change their way, people have to do the changing. Pandas will always eat bamboo if it is available. Pandas will reproduce when food and the panda population is plentiful. People have the ability to make a choice. We can choose to use up all of our resources or we can choose to put things in place to lessen our impact on the world. Choice equals power. People (even kindergarteners) have the power to make a system more sustainable, to help preserve the natural world, and possibly to help preserve a place in our world for future pandas and humans.

Activity Four: Which Do You Choose; Chopsticks vs Pandas?

I will start the activity by revealing to the class a pair of disposable bamboo chopsticks. I will invite students to tell me what they are and how they are used. I anticipate that some

students will recognize the utensils and be able to explain their connection to Chinese food. If not, I will demonstrate and explain their use. I will also comment on the ease and convenience that chopsticks provide for busy people. I will then explain that they are made of bamboo and that they are usually thrown in the garbage after one use. I will then explain (in a way that young students will understand) that people make so many of these that we cut down forests worth of bamboo every day in the production of disposable, bamboo chopsticks. I will ask them if this trading of forests for chopsticks seems sustainable.

The students will then be faced with a choice. Pandas require bamboo as their food source. People like the convenience of using bamboo chopsticks. Which would you rather have, pandas or chopsticks? I will require students to choose a side. Further, they will be expected to explain the reason behind their choice. I will remind my students that there is no correct answer. The answer to this question is an opinion and as long as they can justify (or explain) their thinking in a reasonable way, they cannot be wrong.

#### Activity Five: My Solution

To close the unit, I will be asking my students to collaborate and discuss the problem brought about by unsustainable use of the natural resource, bamboo. I will challenge them to develop a plan that will protect the giant panda while still allowing people to have chopsticks. After the challenge is established I will put students into teams of three or four students and give them time to brainstorm possible solutions. I would not be surprised if they came up with some good ideas like; plant bamboo when we cut it down, or make chopsticks out of something else. Due to their young age and naivete, I would also anticipate answers like; put a fence around the bamboo or teach pandas to eat something else.

Kindergarten students do not often have the ability to share their thoughts well through writing. They can however explain their thinking orally. This process can be problematic as it requires one on one time and dictation for each student response. I will be eliminating these challenges by utilizing an app and our classroom iPads.

*Draw and Tell* is that app. The app allows students to import a picture and then record their voice underlaying that picture. The effect is a child displaying their work and sharing their thoughts. I like this method because I can forward to videos to my computer and review them at my leisure instead of spending instructional time to dictate responses.

Following a collaboration and discussion, each student will be required to draw a picture depicting their solution to the bamboo scarcity issue. They will then use an i-Pad to photograph and upload their artwork. Finally, they will offer a solution that would both protect the pandas while also allowing us to have our chopsticks.

## Resources

Antony, Steve. *Ill Wait, Mr Panda*. Hodder Childrens Books, 2018.

Fictional story about a panda which will provide a good ELA connection for our content while engaging the students and adding excitement to the activities.

Berners-Lee, Mike. *There Is No Planet B: A Handbook for the Make or Break Years*. Cambridge: Cambridge University Press, 2019.

A good source to give the reader an overview of sustainability and a basic understanding of the state of the Earth.

Coggins, Chris. *The Tiger and the Pangolin: Nature, Culture and Conservation in China*. Honolulu: University of Hawaii Press, 2004.

“Endangered Species Conservation.” WWF. World Wildlife Fund, n.d.  
<https://www.worldwildlife.org/>.

Good information on conservation, giant pandas, and other endangered animals.

“Giant Panda.” WWF. World Wildlife Fund, n.d.  
<https://www.worldwildlife.org/species/giant-panda>.

Facts about the Giant Panda. Also includes many good images to share with students.

Li, Renqiang, Ming Xu, Michelle Hang Gi Wong, Shuai Qiu, Qingkai Sheng, Xinhai Li, and Zengming Song. “Climate Change-Induced Decline in Bamboo Habitats and Species Diversity: Implications for Giant Panda Conservation.” *Diversity and Distributions* 21, no. 4 (2014): 379–91. <https://doi.org/10.1111/ddi.12284>.

This source highlights the challenges that could face the giant panda as a result of global warming on bamboo.

Lindburg, Donald G., Karen Baragona, and George B. Schaller. *Giant Pandas: Biology and Conservation*. Berkeley: University of California Press, 2004.

Lumpkin, Susan, and John Seidensticker. *Smithsonian Book of Giant Pandas*. Smithsonian Institution Press, 2002.

A good source for information on pandas as a species and the conservation efforts that relate to them.

Lundgren, Julie K. *Bringing up Bamboo: Life Cycles*. Rourke Pub., 2010.

A great book to introduce students to bamboo. It has good information and many pictures.

Reading, Richard P., and Brian Miller. *Endangered Animals: A Reference Guide to Conflicting Issues*. Westport, CT: Greenwood Press, 2000.

Richard, Michael Graham. "China's 45 Billion Disposable Chopsticks Require 100 Acres of Forests Every 24 Hours." TreeHugger. Treehugger, October 11, 2018. <https://www.treehugger.com/sustainable-product-design/chinas-45-billion-disposable-chopsticks-require-100-acres-of-forests-every-24-hours.html>.

Facts about the amount of natural resource that are used in the production of disposable chopsticks.

Schreiber, Anne. *Pandas*. Scholastic Inc., 2013.

Great book for building student knowledge of pandas. Full of engaging pictures and easy to understand text.

Seuss. *The Lorax*. HarperCollins Childrens Books, 2018.

This is a fantastic book to read to the students to illustrate sustainability.

Tropa, Sabine. "The Happy Bamboo -." The Happy Bamboo, May 30, 2019. <https://thehappybamboo.com/how-fast-bamboo-grow/>.

Information about the growth rates of bamboo.

Tuanmu, Mao-Ning, Andrés Viña, Julie A. Winkler, Yu Li, Weihua Xu, Zhiyun Ouyang, and Jianguo Liu. "Climate-Change Impacts on Understorey Bamboo Species and Giant Pandas in China's Qinling Mountains." Nature News. Nature Publishing Group, November 11, 2012. <https://www.nature.com/articles/nclimate1727>.

Article that explores how climate change could impact both bamboo and the giant panda.

Vitale, Ami. "China's New Panda Park Will Be Three Times Bigger than Yellowstone." National Geographic, May 15, 2019.  
<https://www.nationalgeographic.com/animals/2019/05/giant-pandas-national-park-china/#close>.

China taking big steps to preserve the giant panda in the future through a massive new panda reserve.

Zhi Lü, and George B. Schaller. *Giant Pandas in the Wild: Saving an Endangered Species*. New York: Aperture, 2002.

郭蓉 . "Saving Trees One Chopstick (Level) at a Time." Saving trees one chopstick (level) at a time - World - Chinadaily.com.cn. Accessed October 7, 2019.  
[http://www.chinadaily.com.cn/world/2017-06/21/content\\_29827428.htm](http://www.chinadaily.com.cn/world/2017-06/21/content_29827428.htm).  
Recent data on natural resources used in the manufacture of disposable chopsticks.

## **Appendix**

### Common Core State Standards

RI.K.1: with prompting and support, ask and answer questions about key details in a text.

My students will address this standard as we read non-fiction text about the panda and bamboo.

RI.K.3: with prompting and support, describe the connection between two individuals, events, ideas, or pieces of information in a text.

We will be exploring the connection between bamboo and pandas through our informational readings. We will also be connecting both of those ideas to scarcity and sustainability as we explore human uses of bamboo.

RI.K.4: with prompting and support, ask and answer questions about unknown words in a text.

This standard is addressed as we work on new vocabulary words during the unit.

### Delaware State Social Studies Standards

Economics Anchor Standard One: Students will analyze the potential costs and benefits of personal economic choices in a market economy

We will be discussing costs and benefits as we talk about the use of bamboo for human desires versus the need for bamboo of the giant pandas.

K-3a: Students will identify human wants and the various resources and strategies which have been used to satisfy them over time.

This standard relates to the sustainability of using bamboo to meet human needs ranging from housing, to fencing, to disposable chopsticks.

## Notes

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<sup>1</sup> TheHappyBamboo.com <https://thehappybamboo.com/how-fast-bamboo-grow/>  
(Accessed 10/7/19)

<sup>2</sup> Lundgren, Julie K, *Life Cycles: Bamboo*, 18.

<sup>3</sup> Zhi, Li and George Schaller, *Giant Pandas in the Wild: Saving an Endangered Species*, 13.

<sup>4</sup> Lundgren, *Life Cycles: Bamboo*, 7.

<sup>5</sup> Richard, Michael Graham, Treehugger.com <https://www.treehugger.com/sustainable-product-design/chinas-45-billion-disposable-chopsticks-require-100-acres-of-forests-every-24-hours.html> (Accessed 10/7/19)

<sup>6</sup> 郭蓉 . “Saving Trees One Chopstick (Level) at a Time.” Chinadaily.com  
[http://www.chinadaily.com.cn/world/2017-06/21/content\\_29827428.htm](http://www.chinadaily.com.cn/world/2017-06/21/content_29827428.htm) (Accessed 10/7/19)

<sup>7</sup> Li, Renqiang, *Climate Change-induced Decline in Bamboo Habitats and Species Diversity: Implications for Giant Panda Conservation*, Diversity and Distributions , 370.

<sup>8</sup> Zhi, Li and George Schaller, *Giant Pandas in the Wild: Saving an Endangered Species*, 11.

<sup>9</sup> Lumpkin, Susan and John Seidensticker, *Smithsonian Book of Giant Pandas*, 41.

<sup>10</sup> *ibid* 69.

<sup>11</sup> World Wildlife Fund <https://www.worldwildlife.org/species/giant-panda> (Accessed 10/03/19)

<sup>12</sup> Suess, Dr., *The Lorax*

<sup>13</sup> Lumpkin, Susan and John Seidensticker, *Smithsonian*, 153.

<sup>14</sup> *ibid* 7

<sup>15</sup> Zhi, Li and George Schaller, *Giant Pandas in the Wild: Saving an Endangered Species*, 93

<sup>16</sup> Zhi, Li and George Schaller, *Giant Pandas in the Wild*, 119.

<sup>17</sup> Vitale, Ami, *China's New Panda Park Will Be Three Times Bigger Than Yellowstone*, National Geographic, 15

<sup>18</sup> Suess, Dr., “The Lorax”