Scenarios

The following section provides examples of what the 2016 ISTE Standards for Students look like in the classroom. Nine scenarios describe, by age band, authentic activities that reflect not only the ISTE Standards for Students, but also relevant curriculum standards, underscoring an ISTE core belief that technology use should not occur in isolation but as an integral part of learning across all skills and subject areas. The scenarios – informed by conversations with instructional technology experts and educators from around the world – depict real examples and promising practices from around the globe.

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Scenarios for Ages 4–7

Scenario 1

Programming with Robots

Four- and 5-year-old students hone math and problem-solving skills using programmable devices.

Age Level: 4- and 5-year-olds
Content Area: Mathematics

Learning Environment: One robot and one, 3′ x 3′ mat (6-inch grid) per classroom, free-choice learning center
Technology: Programmable toy robots

Students ages 4 and 5 learn basics that lay the foundation for skills they will use throughout their lifetimes in academics, critical thinking and problem-solving. These skills include sequencing, estimation, counting, one-to-one correspondence, spatial relationships, cause and effect and more.

Teachers in the program described here have explored and implemented the appropriate use of technology in their classrooms for several years. They have learned that, with thoughtful planning, various mobile devices can be used to enhance learning—even with 4- to 5-year-olds. Recently, the legislature in the state where these teachers work passed a comprehensive law requiring that all public and charter high schools offer coding classes. It wasn't long before the teachers started hearing about coding experiences for younger children that involved the use of programmable devices. The curriculum incorporates opportunities for children to learn through play, and there are times when they are given free choice of activities. Building in use of simple robots appealed to teachers as a logical way to allow children to hone important skills in an exploratory environment.

Typically, toy robots move forward or backward (6 inches at a time), and rotate 90 degrees left or right. They are programmed by pressing buttons on top of the robot. So, to move the robot forward 12 inches and then turn around and go back to where it started, a child would press the forward button two times, press either the right or left turn button two times, and then press the forward button two times—a sequence of six directions. Toy robots can accept a predetermined number of commands, and some offer accessories such as floor mats of various sizes with 6-inch grids. Students use these mats to complete programming tasks like moving the robot from one location on the grid to another using a series of commands. The teachers began by providing challenges for students to complete.

Once they are comfortable using the mat as an aid to estimating distances, the children program the robots to navigate paths and mazes they've constructed using building blocks, resulting in a mix of teacher-created and student-designed activities. The children's ideas are typically spontaneous, arising out of their play. Given a flexible working environment and freedom to develop their own challenges, use of programmable toy robots is very powerful. Recently, two of the children and their teachers attended a conference where the students demonstrated their programming skills to educators from around their state.

What is the connection to the ISTE Standards for Students?

Empowered Learner–Students in these preschool classrooms are making choices about which learning goals they want to explore and how they want to proceed. Their use of programmable toy robots is based on free choice during center time, and they can choose between using teacher-created programming challenges or creating their own.

Knowledge Constructor–As these young students move from teacher-created activities to devising programming experiments of their own, they are developing ideas and theories about how to complete a challenge and then pursuing answers and solutions by trying various programming strategies.

Innovative Designer–One attribute of innovative designers is perseverance, a willingness to stick with a problem until a solution is found. The preschoolers demonstrate perseverance as they work to complete each challenge.

Computational Thinker–In the process of identifying a sequence of steps that will complete a challenge, students are collecting and analyzing data as they explore possible solutions.

Scenarios for Ages 4-7

Scenario 2

Biomes and Habitats

In this scenario, 7-year-old students prepare team projects they will use to teach classmates about biomes and habitats.

Age Level: 7-year-olds
Content Area: Science, language arts, geography

Learning Environment: Four laptops and four tablets per classroom
Technology: Computers and tablets

Students often get their first introduction to biomes and habitats at age 7. Children are typically fascinated with science at this age, but the vocabulary and breadth of the content can be overwhelming. Rather than expect each child to conduct an in-depth study of every biome included in the unit, a pair of primary teachers decided to approach this science unit in a different way.

They began by providing a brief overview of biomes to the entire class. This included an explanation of what biomes are and an introduction to the seven biomes they would be studying. Then their approach took a new turn. Understanding that even children this young prefer activities where they are creating something as opposed to memorizing basic information, the teachers asked their young charges to: work in trios to conduct online research about one of the seven biomes; select a project idea from a list of suggestions; design and create their chosen project; and use that project to teach the rest of the class about their assigned biome.

Primary students typically need more instructional support than older elementary and secondary students. This entails more teacher planning time, but the children's need for additional scaffolding does not preclude their abilities to take initiative, work collaboratively, think critically and demonstrate their learning through technology-supported learning activities. What does planning and implementation look like?

First, students needed a workspace for accessing links to digital research materials easy enough for them to use. The teachers opted to use an online curation tool they'd used with students previously to create an interactive Biomes & Habitats lesson. Students in each classroom had access to four tablets and four laptops. These devices were used to create or document the final student projects. Teachers also created a class workspace so students could easily turn in digital assignments. Since students were already familiar with these tools, no time was required to teach basic technology skills.

The online lesson included four questions each student team answered related to its biome. The questions ranged from basic comprehension to analyzing information that was presented in the online lesson. Students took notes digitally or using paper and pencil, making note of sources they'd used so they could cite these when they created their projects. Once they responded to the questions, student teams chose a project idea from a list provided at the end of the online activity. They were also permitted to pitch an original project idea to their teacher. Project suggestions included tasks like recording a podcast, writing an ebook and making diagrams or models. Technology tools were available, but not necessarily required.

As each team completed its project, one member turned in either the project itself or detailed photos of the project. On the final day of this unit, each team taught the rest of the class about the biome they studied, using their project as an instructional aid. Finally, student projects were posted online for ongoing reference.

What is the connection to the ISTE Standards for Students?

Empowered Learner–The 7-year-olds are asked to either choose from a list of ideas for their projects or pitch an original idea to their teacher. This approach enables them to take responsibility for their learning and demonstrate that learning in a variety of ways.

Digital Citizen–By noting and citing sources, students are learning to abide with copyright and fair use laws.

Knowledge Constructor–With support from their teachers, these youngsters are learning to locate and evaluate information related to learning topics. The project requirement ensures students create one or more artifacts related to their learning.

Creative Communicator–In the course of teaching peers about a biome, students are afforded opportunities to present knowledge based on information they have customized for a specific audience.

Global Collaborator–As they complete their team projects, students are working collaboratively and contributing constructively to produce products they can share with classmates and learners from other backgrounds.

Scenarios for Ages 8-11

Scenario 1

Newton's Laws of Motion

Nine- and 10-year-old students increase writing and speaking skills as they demonstrate their understanding of Newton's Laws of Motion.

Age Level: 9- to 10-year-olds
Content Area: Physical science, language arts, video production

Learning Environment: 1:1 laptops, tablets
Technology: Any device that can record video (digital camera, tablet, smartphone, etc.), laptops

It's one thing to rattle off one of Newton's Laws of Motion such as, "An object in motion stays in motion and an object at rest stays at rest unless they are acted upon by an outside force." It's quite another thing to really understand what the laws mean, explain one and be able to cite original real-world examples–particularly if you are 8 or 9 years old. But that's exactly what a group of elementary students have done.

The students were provided instruction and engaged in hands-on explorations in an instructional unit that covered forces and motion. As they worked through each part of the unit, students were provided ample time to grasp the content. The culminating activity for the unit was for students to work in three-person teams to make a 3- to 5-minute video explaining their choice of one of the three laws of motion. Each video was required to include an explanation of the concept, an experiment to illustrate the law and a demonstration of a real-world example of the law.

Teachers in this school are committed to regularly offering students opportunities to use various technologies for creating original products to demonstrate their understanding of complex concepts presented in class. In the process of doing this, skills from additional content areas are incorporated into activities, as appropriate. In this example, skills in language arts and video production were used to help students demonstrate their learning of concepts in physical science. As a result, between seven and eight hours of additional class time was devoted to recording and producing the videos. Skills covered included writing a script, creating a detailed online storyboard, and shooting and editing the video. Students were also responsible for completing pre-production tasks such as gathering props and materials for experiments, finding a suitable location for shooting, and scheduling and conducting rehearsals. All students had laptop computers which they used to research their topics, work collaboratively on scripts and create their storyboards. Each team had access to tablet devices to shoot and edit their videos.

The initial audience for their work is the teachers who use the videos to assess students' understanding of the content. However, once assessed for accuracy, videos that met the required criteria were posted online in a project blog for use by other teachers and students as tools for learning, and for viewing by family members and friends.

What is the connection to the ISTE Standards for Students?

Empowered Learner–Although teachers select the type of technology that is used for this activity, students are making the videos to create artifacts that demonstrate their learning.

Knowledge Constructor–Students use multiple sources for the research conducted prior to developing a script, including online materials, which helps them expand their understanding of the material they will present in the video.

Creative Communicator–The project requirements for sharing experiments and including demonstrations as content is developed to document their understanding of concepts presented during the instructional unit helps students become more creative communicators.

Scenarios for Ages 8-11

Scenario 2

Solving Real-World Community Problems

Ten and 11-year old students design tools to help community members cope during heavy winter storms.

Age Level: 10- to 11-year-olds
Content Area: Science, social studies
Learning Environment: Makerspace classroom
Technology: Laptops, tablets, digital cameras, electronic building blocks

When a recent winter storm dumped 2 feet of snow overnight, fifth grade students at one middle school used the storm to provide context for their upcoming design project on weather. Students personalized the five-day activity by focusing on identifying ways they could make their neighbors' lives easier or better during the next large storm event.

Students began by self-selecting two- and three-person teams, then brainstorming ways they could help or protect people and animals in the next storm. They also took a look at ways to enjoy themselves during a snowstorm. This led to lists of things students could create that could be helpful or just plain fun. Ideas included items such as modified snow shovels, a collapsible tarp for temporary covered parking, thermal boots, a hot cocoa cozy, a flying sled and a snowball launcher. A popular idea was a rock salt blower designed to make it easy for senior citizens to salt their sidewalks. While creative ideas abounded, the class instructor reports it would have been helpful to take additional time to delve even more deeply into the process of identifying real needs and possible solutions.

With just five days for the entire project, teams took their ideas and started working on prototypes. The learning environment was a makerspace classroom, so there were many tools and materials to choose from ranging from high-tech to no-tech. Aside from a need for better tools for cutting things like Styrofoam, the teams were able to fabricate their prototypes using items available in the classroom. Once prototypes were constructed, a video was made of each team as they explained the need they identified and how their product provided a solution.

In reflecting on the experience, the instructor identified three modifications he will make in the future. First, he will provide less direct instruction to give students more time to build and create. Second, he will have even more supplies and additional tools on hand. And finally, teams will be responsible for creating a design brief using an online presentation program.

What is the connection to the ISTE Standards for Students?

Empowered Learner–While the challenge is designed by the teacher, student teams have a great deal of autonomy when it comes to determining how they will solve the problem posed. They are also able to continue the project into the next school year.

Digital Citizen–Design challenges are an appropriate venue for teaching students about intellectual property in terms of their own designs and when looking for ideas in designs created by others.

Knowledge Constructor–Research is a critical piece in design challenges in conducting needs analyses and in product development.

Innovative Designer–The entire project is based on students using a design process to identify and solve problems by creating new, useful or imaginative solutions.

Creative Communicator–The project requirements for teams to explain their prototypes and how these meet a specific need help them become more creative communicators.

Global Collaborator–In the course of developing a more empathetic approach to problem-solving, students learn to view a challenge from a perspective other than their own. For example, students think about problems related to major winter storms from the point of view of a senior citizen or a parent with young children.

Scenarios for Ages 8-11

Scenario 3

We're All Immigrants

During a study of immigration, two classes of 10 and 11-year old students located on different continents collaborate to gather and share data about their families' histories, helping them gain a better understanding of this timely topic.

Age Level: 10- and 11-year-olds
Content Area: Social studies
Technology: Laptops
Learning Environment: 1:1 laptops

The United States is often referred to as a "melting pot." That was true at one time, but today, the percentages of immigrants living in 67 other countries is far higher than in the U.S., where just 14.3 percent of the population is made up of immigrants. Why do people leave one country to live in another? What factors impact their choices about where to go? How do beliefs and behaviors of their cultures of origin influence their transitions into new lives?

Students in American education programs typically study immigration during the Colonial period when they are 10 to 11 years old. They learn about why people came to the New World between 1660 and 1775. This is a perfect opportunity for them to engage in an on-going project in which they learn about where their families came from originally, when and why. It also provides an opportunity to partner with students in one of the countries that has a much higher immigrant population than the U.S. in order to draw comparisons between the immigrant populations in each country. This is a timely topic for students to explore as nations around the world grapple with the impact of immigration.

In this example, students in an American school joined forces with students at a school in Singapore (where the immigrant population is nearly 43 percent) on a semester-long collaborative project. They began by developing an online survey each class member used to interview and capture responses from adult family members. They needed to gather data that could be dropped into a spreadsheet and then analyzed to compare immigration patterns between the families of the two classes. This required developing questions, testing them to be sure the results could be easily analyzed and rewriting questions as needed.

Once the survey was approved by teachers, each student interviewed an adult family member and entered responses into the survey that were then automatically added to a spreadsheet. Students then used an online tool to create a database of information about their families' origins–where they originally came from, when they moved, why they immigrated to a new country and if/how their cultures of origin still impact their lives. Students developed questions they wanted to ask about the data, then learned how to sort and filter their results. They next learned how to create charts and graphs to illustrate the answers to their questions. Their final results were published online and will be used as the foundation for continuation of the project next year.

In addition to offering opportunities for students to connect with counterparts in another country to conduct a timely study of the impact of immigration, teachers report that this project is an occasion for students to engage in iterative learning. Based on the premise that learning is an evolving process, iterative learning activities take place over time and are designed to encourage students to try out something, learn from mistakes and then try again. In this project, students develop, test and revise surveys and, once the data are collected, explore strategies for analyzing and reporting their results.

What is the connection to the ISTE Standards for Students?

Knowledge Constructor–In the course of completing their study of immigration patterns, students build knowledge by actively exploring real-world issues and problems, developing ideas and theories, and pursuing answers and solutions.

Computational Thinker–As they work through this project, students collect data or identify relevant data sets, use digital tools to analyze them and represent data in various ways to facilitate problem-solving and decision-making.

Global Collaborator–This project offers opportunities for students to explore local and global issues using collaborative technologies to work with others to investigate solutions.

Scenarios for Ages 11-14

Scenario 1

Learning through Design Thinking

Eleven- to 14-year-old students use design thinking to work collaboratively to solve problems in their local community.

Age Level: 11- to 14-year-olds
Content Area: Science, social studies, mathematics
Learning Environment: Digital shop

Technology: Laptops, tablets, digital cameras, 3D design tools and printers, programmable robots and drones, open-source electronics platforms, an assortment of low- or no-tech materials including writeable desktops and hot glue guns.

Remember middle school shop class where students built birdhouses or fabricated their own hammers and chisels? Shop classes are not as common as they once were, for a variety of reasons. But the principal and teaching staff of one suburban middle school have committed to replacing traditional shop classes with digital shop classes.

You've undoubtedly heard references to transforming classroom learning by introducing design thinking into classrooms along with activities that help students develop empathy. These ideas are an important part of the foundation of digital shop, a program in which all students participate on a rotating basis (one week on, five weeks off) throughout the school year. What differentiates this class from similar STEM or STEAM programs is that every learning activity is tied directly to needs within the school's community. Design thinking provides a structure for giving students the skills they need to work collaboratively to solve problems. Focusing on needs within their own community helps students develop empathy as they strive to help people they know deal with real-world concerns.

What does this look like? First, students do not receive grades. This is to help students move beyond what the need to "pass" the class and shift their focus to what they need to do to find solutions to real problems that will benefit people they actually know. Next, students are able to work individually and/or in small groups. They may not come up with a good solution the first time around, but the idea is to allow them to learn from unsuccessful attempts–failure is an opportunity to learn, not an insurmountable obstacle. In addition to class time, students have access to online activities they may access at will, as part of after-school clubs, and some even come into the digital shop during their lunch time.

There are defined themes and special projects that tie back to students' learning in social studies, mathematics and science courses, but students have a lot of latitude when it comes to completing the activities. A sixth grade project focused on assistive technologies for a member of the school community with multiple sclerosis who had a double knee replacement. Mobility is a real issue for this person and the sixth graders explored design solutions to help her. A recent seventh grade project was a joint effort between students and a local medical center. The seventh graders helped medical staff identify and execute ways hospital stays can be made less scary for young children. Finally, eighth grade students are printing 3D prosthetics for a project that makes these devices available to children who need them.

What is the connection to the ISTE Standards for Students?

Empowered Learner–An unexpected outcome of this program is the opportunity to help students learn to take more responsibility for their own learning. This is something many students need to learn how to do, and the projects are a good vehicle for this.

Digital Citizen–Because they are frequently working online and designing products, students have ample opportunities to practice positive, legal and ethical online behaviors. For example, they learn to protect their own privacy in the course of conducting research as well as the importance of adhering to copyright protections and respecting intellectual property as they create their designs.

Knowledge Constructor–In the course of conducting research related to design projects, students are afforded chances to find, analyze, curate and apply resources they discover, both online and offline.

Innovative Designer–Innovative design is the cornerstone of this approach to learning. Students have ample opportunities to employ design processes to identify and solve problems by creating new, useful or imaginative solutions.

Computational Thinker–Depending on the design challenge, students are encouraged to develop and employ strategies for understanding and solving problems in ways that leverage the power of technological methods to develop and test solutions.

Creative Communicator–Each project requires that individuals or teams be able to describe their design(s) and why this is an appropriate solution for the challenge.

Global Collaborator–Each design challenge is an opportunity for individuals or teams of students to enrich their learning by collaborating with others and working effectively in teams locally and globally.

Scenarios for Ages 11-14

Scenario 2

Making Algebra Accessible

Twelve- to 14-year-old students use an online tool to facilitate their mastery of complex algebraic concepts.

Age Level: 12- to 14-year-olds
Content Area: Mathematics (algebra)
Learning Environment: 1:1 classroom
Technology: Laptops, class set of 30 tablets

At the start of the 2015–16 school year, this small K–8 school launched pilot STEAM academies for students ages 12–14. Each age level focuses on a specific theme that offers a challenging, focused curriculum. Students from around the district were invited to enroll in the program, and all applicants were accepted. This is noteworthy because it means that students are there because it's where they want to be, not because they were included based on their academic skills. As a result, students are motivated, but represent a range of abilities.

Mathematics skills are foundational for many of the activities in the STEAM academies. The students study algebra to support the work they do in design and engineering classes. They regularly use a free online graphing calculator tool for functions, algebra, geometry, statistics, calculus and 3D math. This tool works online and is available in an app version for tablets and smartphones.

Their teacher reports that prior to having access to this tool, students labored over tasks like graphing linear equations or graphing on a coordinate plane. She reports that students were so focused on the mechanics of getting the data represented on paper, they missed the ultimate point of what they were doing and why. Now, thanks to the online tool, students are able to shift their attention from drawing a graph to what the graph represents. They are able to make predictions about ways changes in the data will impact the graph and then quickly test their guesses.

Students still learn how to create graphs by hand, but once they understand the basics for doing this, their use of technology removes barriers to learning. Students engage in more sophisticated activities because it's easier to get preliminary work out of the way. And even the less-skilled students are making enough progress in class to be able to apply their learning in engineering and design classes.

What is the connection to the ISTE Standards for Students?

Computational Thinker–Use of the online graphing calculator enables students to use digital tools to analyze and represent data in various ways to facilitate problem-solving.

Scenarios for Ages 14-18

Scenario 1

Becoming Global Citizen Leaders

As part of their social studies and science coursework, high school students engage in long-term social action projects that address local and global issues. The culminating activity for these projects is a 3- to 5-minute video about each project.

Age Level: 14- to 18-year-olds
Content Areas: Language arts, social studies, science

Learning Environment: Classroom, computer lab, library/media center
Technology: Any device that can record video (digital camera, tablet, smartphone, etc.), laptops

Service learning that is grounded in either the social studies or science curriculum is a time-honored way for students to explore real-world issues and develop empathy and leadership skills by reaching out to help others. Over time, this idea has morphed from very short-term goals, such as a club-sponsored clothing drive, to projects that last one or two semesters. There are even programs where students are participating in multi-year social action projects. Students attending the high school featured here are transitioning from single to multi-year program commitments focused on local examples of global issues. The purpose of these activities is to encourage students to develop skills they need to become global citizen leaders. Broad project topics include: human rights, ethical issues, respect for law, the environment, the underprivileged, various disabilities, psychosocial issues, culture and heritage.

A critical piece of these projects is the underlying digital and communication skills students must acquire to be successful in implementing and sharing projects that have a global focus. Accurate research requires digital literacy. Communication with participants not readily available on campus necessitates online collaboration of one form or another. Project management must be facilitated through effective use of productivity tools. And the sharing of stories entails using various forms of social media to spread the word. For example, in the course of creating their 3- to 5-minute videos, in addition to learning how to point a camera to shoot video, students are learning how to develop ideas and organize their stories. They explore ways that scripting, acting and editing are used to communicate ideas and shape viewers' opinions.

For students who want to participate, the high school hosts an annual film festival that spotlights the best of the videos submitted. Only those videos related to the social actions projects are accepted. The festival is a community effort with active participation from: faculty who advise students as they develop and implement their social action projects and assist with making the videos; parents who support their children during the process of creating their videos and then attend the festival event; and the students themselves who spend countless hours working on their entries. Past topics for videos have included: the Syrian refugee crisis; special needs that impact students, including autism and Down syndrome; eating disorders; animal rights; nature preservation; and bullying.

What is the connection to the ISTE Standards for Students?

Empowered Learner–Each student or team of students selects and pitches a topic for a social action project that will be the basis for a 3- to 5-minute video. Students are offered a great deal of autonomy in this learning process and also are encouraged to experience learning in formal and informal environments.

Digital Citizen–The study of media literacy throughout this activity provides a platform for students to learn responsible use of language, acting and editing when presenting a case for something or making a point.

Knowledge Constructor–Throughout this project, students explore real-world issues, pursuing answers or solutions. They are encouraged to plan and conduct effective research and evaluate the resources they find, both print and digital. They use the information they gather to build connections and draw conclusions.

Creative Communicator–Throughout this activity, students are creating an original work with the purpose of clearly communicating complex ideas. The final video presents content about their social projects in a manner designed to get their point across to parents, educators and fellow students.

Global Collaborator–Learning skills that will enable students to function as global citizens is one of the foundations of this project. This is embodied in the collaborative nature of the projects and opportunities to examine issues from multiple points of view as students explore local and global issues.

Scenarios for Ages 14-18

Scenario 2

Business and Ethics

High school students enrolled in a business management course as part of the International Baccalaureate Diploma Program (IBDP) apply what they are learning to complete a project about marketing.

Age Level: 16- to 18-year-olds
Content Areas: Business management, marketing
Learning Environment: 1:1 classroom
Technology: Laptops, tablets for checkout, students' personal devices

It is true that the IBDP program is rigorous, but within its framework, students are encouraged to thrive not just academically, but emotionally, ethically and physically. Civic responsibility is an important element in the IBDP program. Students are afforded many opportunities to develop skills in project management, ethics and empathy designed to ensure that they become responsible global citizens.

Given the current climate in many businesses around the world today, students enrolled in the business management course at one high school are encouraged to pay special attention to thoughtful, ethical business practices. One unit in the course focuses on marketing. As students learn about topics like marketing planning, sales forecasting, marketing research and e-commerce, they work in teams to apply their learning to development of a product or service that is designed to address a local or global issue. Ideas range from developing products to help deal with the global water crisis, to setting up micro-financing programs to help low-income people establish a small business, to organizing disaster relief for victims of natural disasters.

Once teams identify an idea for a product or service, they create a specific plan around marketing it. Related tasks include data collection and analysis for marketing research (proof of need for the product, target audience, price points), website design, and creation of a basic social media plan for product or service promotion. Teams collaborate online and offline to complete their work. Finally, they develop a report on their marketing plan that is delivered to the class and posted online.

What is the connection to the ISTE Standards for Students?

Digital Citizen–Students consider ethical behavior as they use technology to complete the marketing project.

Knowledge Constructor–Students explore real-world issues, pursuing answers or solutions. They use the information they gather to build connections, draw conclusions and identify a product or service in response to an important global issue.

Innovative Designer–The point of this project is to use a process to identify and solve problems by creating new, useful or imaginative solutions in the form of a product or service. Use of technology is an integral part of the project.

Computational Thinker–As they develop a marketing plan, students collect data or identify relevant data sets, use digital tools to analyze them, and then represent data in various ways to facilitate problem-solving and decision-making.

Global Collaborator–In the course of completing this project, students explore local and global issues and use collaborative technologies to work with others to investigate solutions.