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Creativity Will Be Essential for Children in the Age of AI

In today's increasingly uncertain world, creativity is an essential element in flexibly adapting to the circumstances of the moment. In this issue of *My Vision*, we consider how to foster an ability to think creatively that is able to adapt to future circumstances.

About This Issue

Creativity Will Be Essential for Children in the Age of AI
- Generative AI Should Be Used as an Educational Resource, Not as an Educator

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In today's world of dramatic change and increasing uncertainty, creativity is considered to be an essential element in flexibly adapting to the circumstances of the moment. In order to foster creativity, we must build an educational system that allows unique talents to flourish. Can the use of digital technology play a role in this process? This question must be considered from a broad perspective. What is the essential nature of the ability to think creatively? How should digital technology be used to foster creative thinking skills? For this issue of *My Vision*, we sought the opinions of a number of researchers, an educator, and an educational writer.

Keywords…Use of generative AI in education, Professor Resnick's 4Ps, curiosity as a driving force, need for society as a whole to think

Expert Opinions

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What is the nature of the ability to think creatively?
How should digital technology be used to foster creative thinking skills?

Projects, Passion, Peers, and Play: The Key to Nurturing Creative Thinking

Mitchel Resnick

LEGO Papert Professor, Learning Research,
MIT Media Lab

Keywords…Four P's of Creative Learning, creative learning spiral, educational ecosystem

Prioritize Creativity and Transform Learning with Technology

Nanako Ishido

Professor, Graduate School of Media Design,
Keio University

Keywords…Diversification of evaluation axes, creation of a new society, generative AI

Establish Hands-on Educational "Labs" Throughout Japan to Allow Children and Parents to Experience Digital Technology

Izumi Aikawa

Education Writer / Editor

Keywords…"1 to 10" creativity, standardization of educational data, improvement of digital literacy

What Is the Essential Role of the Teacher in Fostering Creative Thinking Skills?

Hitoshi Nakagawa

Director, Next Generation Education Research and Development Center, The Open University of Japan

Keywords…Be aware of the "weft," create a world related to the problem, don't interfere

Change Awareness Among Teachers and Parents and Foster Creative Confidence in Students

Nobuaki Sawa

Principal, Kashiwa Municipal Otsugaoka Daiichi Elementary School, Chiba Prefecture

Keywords…Questions with more than a single correct answer, ability to design lessons, creators of a sustainable society

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Interviewer: Atsushi Inoue (Associate Senior Fellow, NIRA), Mari Kawamoto (Associate Senior Fellow, NIRA), Jonathan Webb (Research Coordinator & Research Fellow, NIRA), Chiharu Hagi (Commissioned Research Fellow Abroad, NIRA)

Creativity Will Be Essential for Children in the Age of AI
- Generative AI Should Be Used as an Educational Resource, Not as an Educator

Shigeki Uno

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Science, The University of Tokyo

How should generative AI be used in education? What are the abilities required of children in the age of AI? While ChatGPT has been the main focus of discussion, revision of Japan's curriculum guidelines has made a "period for integrated studies" compulsory in elementary and junior high schools, and a "period for integrated inquiry" compulsory in senior high school. As schools around the country experiment with a variety of practices, the subject in question is nothing less than children's creativity.

Creative Thinking Skills Needed in Unpredictable Times

Professor Mitchel Resnick of MIT Media Lab, who developed Scratch, an educational programming language for children, tells us that creative thinking is "the ability to generate ideas that are meaningful to oneself and others." In an era of rapid change, "the ability to think creatively and develop innovative solutions" is increasingly necessary in responding to situations that are difficult to predict. Professor Resnick's four principles of creative learning are "Projects," "Passion," "Peers," and "Play." It is important to find projects in daily life, to have a desire to do them, to share them with others (in the case of the discussion here, computer programming), and above all, to have a spirit of play. As Professor Resnick points out, "Digital technology can serve as a powerful enabler of creative thinking when it provides children with opportunities to explore, experiment, and express themselves, rather than delivering instruction to them."

Transformation of Education and Standardization of Data Are Both Necessary

Professor Nanako Ishido of Keio University's Graduate School of Media Design points out that up to the present, Japan has been an "underdeveloped country" in terms of the development of digital environments in the nation's process of informatization in the field of education. The pandemic, however, spurred the rapid development of a digital environment and the provision of equipment; the "one device per student" policy was realized ahead of schedule, making Japan an "advanced country" in this area. Nevertheless, the use of digital technology in the specific educational domain of "creating," in order to expand students' creativity, remains insufficient. How we change learning in schools in the future will be the key here. The use of AI today allows super-individualized learning across subjects, and because a student's total learning history can be stored in a blockchain, there will be no need for exams, Professor Ishido tells us. Having experienced two major social experiments in the pandemic and the introduction of generative AI, now is the time for the transformation of Japanese education, which has remained unchanged for 150 years.

The challenge is to link educational data between the elementary, junior high, senior high school, and university levels, according to Izumi Aikawa, an education writer and editor. Currently, a

student's history is reset each time they proceed to a higher level, and learning outcomes are not cumulative. But if educational data could be standardized to a greater degree, it would encourage students to continue learning. By utilizing digital tools, students become able to challenge themselves to try again and again, even if they fail. It will be desirable to actualize the sentiment stated in the movie Back to the Future Part III: "Your future is whatever you make it. So make it a good one!"

The Changing Role of Teachers amid the Transformation of Learning

What is important here is of course the role of the teacher. According to Professor Hitoshi Nakagawa, Director of the Next Generation Education Research and Development Center of the Open University of Japan, who has provided guidance and advice in the area of research on practice in elementary and junior high schools, in addition to being attentive to children's thoughts, ideas, and behavior, it is important for teachers to encourage, praise, and be there for their students. In addition, it is also important for teachers to be aware not only of the systematic aims of a subject (the "warp"), but also of the ability of students to think outside the box of the subject, across other subjects or domains (the "weft"). This weft is nothing other than creative thinking. Following the realization of Steps 1 and 2 of the GIGA School program*, promotion of the use of digital devices and exploration of unique ways to use ICT respectively, there is a need for a transition to inquiry-based learning, which allows children themselves to determine the best use of the technology, and the exploration of new styles of learning.

Nobuaki Sawa, principal of Kashiwa Municipal Otsugaoka Daiichi Elementary School in Kashiwa City, Chiba Prefecture, also points out that the role of teachers in the classroom setting is changing from "teaching" as such to serving as "coordinators," encouraging and supporting students' learning. Given that children are now able to learn on their own, teachers no longer need to teach them everything. Rather, what is required is the ability to design lessons that provide opportunities for children to learn and explore on their own, leaving the work to the children themselves. It will also be necessary to engage in dialogue with parents and the local community about the ideal form of education. In this process, the question will be how to increase children's confidence in their creativity (creative confidence) and help them grow into "creators of a sustainable society."

Generative AI is by no means a panacea. If used incorrectly, there is a risk that certain educational approaches could be set in stone, and even that children's independence might be restricted. It will be important to use children's own curiosity as the driving force, enabling them to hone their ability to think creatively via specific projects, with the support of their teachers and through cooperation with other students. Rather than being an educator that gives instructions to children, AI must be used as an educational resource that encourages children to challenge themselves. Society as a whole needs to think about the ways in which children can grow and how to put in place systems and structures to support this growth.

*A Ministry of Education, Culture, Sports, Science and Technology program that is attempting to create an educational ICT environment that fosters creativity

Professor Uno is an Executive Vice President of NIRA, and a Professor in The University of Tokyo's Institute of Social Science. He holds a Ph.D. in Law from The University of Tokyo's Graduate Schools for Law and Politics, and specializes in the history of western political thought and political philosophy.

Expert Opinions

Projects, Passion, Peers, and Play: The Key to Nurturing Creative Thinking

Mitchel Resnick
LEGO Papert Professor,
Learning Research,
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Creative thinking is the ability to generate ideas that are meaningful to oneself and others. In our rapidly changing world, the ability to think creatively and develop innovative solutions in response to uncertainty is becoming increasingly important.

Creativity naturally flows from working on things that interest us, and I believe that digital technologies are a powerful tool for providing people with new opportunities to pursue their passions through projects. We have developed digital tools, such as Scratch and OctoStudio, through which children can create and share interactive stories, games, and animations. To date, over 100 million children worldwide have used these tools to create and share projects based on their passions with their peers. This distinctive emphasis on empowering children to build, experiment and collaborate with their peers is driven by our guiding principles, the "Four P's of Creative Learning" — projects, passion, peers, and play — which we've found to be the most effective method of nurturing children's creative potential.

However, despite its advantages, several challenges limit the mainstream adoption of this approach to education. First, not enough people understand the importance of creative thinking in today's world. Educators and parents need to focus not on exam scores, but on helping children develop as creative, curious, caring, and collaborative learners. Those are the key ingredients for children to thrive in the modern workplace, contribute to one's community, and live a meaningful and fulfilling life.

Another challenge is the difficulty of assessing a child's development as a creative thinker. Rather than relying on traditional quantitative measurements, we have found it more effective to document the diversity in the projects that a child creates over time. That serves as an important indicator of the development of a child's creative thinking ability.

Digital technology can serve as a powerful enabler of creative thinking when it provides children with opportunities to explore, experiment, and express themselves, rather than delivering instruction to them. Technology should assist children in experiencing a process we call the creative learning spiral - imagining, creating, playing, sharing, and reflecting. Parents and educators can play a vital role in this process. While children excel at diving into activities, they often need help stepping back to reflect. Thus, adults can facilitate creative development by asking questions, probing reasoning, and encouraging reflection.

Fostering creativity requires contributions from across the educational ecosystem, involving students, parents, educators, administrators, product designers, and policymakers. The educational value of digital technology depends on how it is designed and used. Rather than trying to minimize children's "screen time", we should seek to maximize their creativity time. Of course, there are many creative activities that don't involve new technologies: drawing pictures, creating stories, building with blocks, making up songs. But digital technologies can expand the range of what children can create, share, and learn. Used the right way, they can play an important role in children's development as creative, curious, caring, and collaborative learners.

Professor Mitchel Resnick develops new technologies and activities to engage people in creative learning experiences. He leads the Lifelong Kindergarten research group, which has developed innovative software including the Scratch programming language, and the OctoStudio mobile application. The group has collaborated with the LEGO company on the development of new educational ideas and products. Professor Resnick co-founded the Computer Clubhouse project, an international network of after-school learning centers for youth from low-income communities. Professor Resnick is author of the "Lifelong Kindergarten: Cultivating Creativity through Projects, Passion, Peers, and Play," which won the PROSE award for Education Practice in 2018.

Expert Opinions

Prioritize Creativity and Transform Learning with Technology

Nanako Ishido

Professor, Graduate School of
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Technology has the potential to revolutionize learning. Expanding the learning environment to take advantage of the elements of fun (creation), connection (sharing), and convenience (efficiency) will enable children to quickly and easily access knowledge from around the world. It will also be possible for them to develop the ability to create new values through collaboration with a wide variety of others.

Prior to the pandemic, Japan could be described as an "underdeveloped country" with regard to development of the digital environment in its process of educational informatization. With the advent of the pandemic, however, the digital environment was quickly developed and equipment provided, and the goal of "one device per student" was realized ahead of schedule, making Japan an "advanced country" in this area. However, the status of use of digital technologies in schools is 60% in the area of "learning," 40% in the area of "connecting" with others, and 30% in the area of "creating." The degree of use of digital technology for "creating," which broadens creativity, is still insufficient. Lying behind this is the low social evaluation of creativity in Japan. It will be important to foster an awareness in society that creativity and the power of expression should be granted importance in education. Evaluation of knowledge is only one axis of evaluation. Efforts will be required to diversify axes of evaluation and to increase the priority of creativity.

However, programming contests are indicating signs of hope among the younger generation. Even though social issues are not specifically made themes, many children determine points of connection between themselves and society, come up with ideas to solve problems, and implement these ideas. During the pandemic, children were required to adapt to and find enjoyment in a new life, and to display a spirit rising to challenges through trial and error. The way they are exploring solutions to problems and the creation of a new society through programming is exactly this.

How we change learning in schools will be the key to encouraging this trend. Today, the use of artificial intelligence (AI) enables super-individualized learning across subjects. In addition, blockchains can store a student's entire learning history, eliminating the need for exams. This offers us the potential to build a flexible education system that is focused on the learner, without relying on the framework of educational institutions such as schools and grade levels, or the uniform entrance examination system. The question is whether Japanese education, which has remained unchanged for 150 years, can be transformed after the experience of two major social experiments, the pandemic and generative AI.

Technology is only a tool, but it is a tool that has revolutionized education throughout history. Movable-type printing gave birth to textbooks and established group lessons. Television and radio gave birth to a new audiovisual education. In order to adapt to a new society, it will be essential to make the transition to an education that focuses on creative use of technology, rather than being bound by the conventional wisdom and successful models that have prevailed up to the present.

Professor Ishido is a leading figure in bringing programming education and digital textbooks into the mainstream. She has been involved in creating new learning environments utilizing digital technology for many years. After graduating from The University of Tokyo with a bachelor's degree in Engineering, she was a visiting scholar at the MIT Media Lab, before founding and serving as president of the NPO CANVAS, Digital Ehon Inc., and Learning of Tomorrow. Professor Ishido has served as a member of the Information and Communications Council of the Ministry of Internal Affairs and Communications and the NHK Central Broadcast Programs Council, and is the Director of the Digital Signage Consortium. She holds a Ph.D. in Media and Governance.

Establish Hands-on Educational "Labs" Throughout Japan to Allow Children and Parents to Experience Digital Technology

Izumi Aikawa
Education Writer / Editor

"Your future is whatever you make it. So make it a good one!" is a line from the movie Back to the Future Part III. Creative thinking is the ability to create one's own future and improve oneself and the world. Specifically, it is the ability to think in order to create new ideas and solutions, and its driving force is curiosity and the spirit of inquiry, which see the individual seek to have fun and learn more. In order to nurture this ability, it is necessary to practice both knowledge-based learning and creative activities that go back and forth any number of times (input and output). Here, the use of digital tools has the advantage of allowing students to try again and again, even if they fail. In addition, because of the ease of mixing elements in new ways, students are readily able to display creativity not merely from "0 to 1" but also from "1 to 10."

The problem is that there is no link between student educational data across elementary school, junior high school, senior high school, and university, and learning outcomes are therefore compartmentalized at the school level. Given that digital tools are able to store cumulative learning outcomes for each student and enable a long-term view, it is a waste to have the data reset in the process of the students' moving on to a higher level. If educational data could be standardized, it would encourage individual students to continue learning.

In addition, the lack of teachers who are able to teach using digital technology is also a major issue. While the focus tends to be on cases of successful efforts, there are actually many examples of ineffective use of digital technology. Teachers who are not confident in their teaching skills try to follow a set format instead of allowing students to work freely in exploratory activities. This makes the students feel that they are forced to do what the teacher wants them to do. On the other hand, where advanced initiatives are being conducted, teachers take time out of their private time to hold study groups and workshops, which places a heavy burden on them.

Not only teachers but also parents need to increase their digital literacy. IT-savvy parents provide their children with continuous opportunities to learn using digital tools, while those who are not so knowledgeable tend to leave it to their children because they don't understand the technology; as a result, their children tend to use digital technology only for consumption. If facilities such as the educational "labs" where children can learn and make things using digital tools were made available to all, in a similar way to libraries, parents and children would have the opportunity to expand their creative thinking skills together, broadening their experiences. It is my hope that the government will take the lead in expanding facilities like "TIB FAB" in Tokyo and "STEAM Lab" at Toda Higashi Elementary School in Saitama Prefecture throughout Japan.

Previously a member of the editorial department of the weekly PC-focused magazine "Weekly ASCII," Ms. Aikawa is currently a freelance education writer and editor, surveying the nation's schools in her reporting and writing on topics such as the use of ICT, programming education, inquiry-based learning, entrepreneurship education, and junior high school entrance exams in Japan. She also founded "Mirai-ku," an organization that holds educational events for children in Tokyo's Shibuya Ward, and conducts hands-on programming classes for local children, in addition to serving as a Shibuya Ward Digital Utilization Supporter. Ms. Aikawa has written numerous articles and article series, including "Introduction to Life Hacks for Parents and Children" for Asahi Shimbun EduA.

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Expert Opinions

What Is the Essential Role of the Teacher in Fostering Creative Thinking Skills?

Hitoshi Nakagawa
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Education Research and
Development Center,
The Open University of Japan

For many years, Japanese education has emphasized the importance of students being able to do the same things as every other student, and has demanded that they should be able to follow instructions to the letter and give correct answers. However, today, this no longer suffices. In order to nurture children able to face unpredictable changes, it is imperative that we foster creative thinking skills together with the ability to identify and solve problems, utilize information, and self-regulate.

The role of the teacher has a significant impact on the development of creative thinking skills. In addition to paying close attention to each child's thoughts, ideas, and behavior, this role involves encouraging, praising, and being there for the students. Other aspects of the teacher's role include asking questions that spur creativity and ensuring opportunities for sharing and collaboration.

In addition to teaching the school curriculum, it is also necessary to cultivate the qualities and abilities that form the basis of learning; another role of the teacher is to be aware not only of the systematic aims of a subject (the "warp"), but also the ability of students to think outside the box of the subject or domain (the "weft"). One of the threads of the weft is the ability to think creatively, which is nurtured not through the study of specific subjects, but transversally, across subjects and domains.

It is also important to enhance the environment surrounding learning tasks. When implementing learning activities related to creative thinking skills, it is essential to devise ways of attracting children's attention (that is, create a world related to the subject matter), for example by placing related displays in the classroom or borrowing related books from the library and displaying them in the hallway near the classroom, and so on.

One of the most important roles for the teacher is not to interfere unnecessarily. The more serious and dedicated a teacher is, the more he/she tends to "teach" the children with a close focus, but this may stop the children from thinking. It is important for teachers to be "unkind" in the positive sense of the word, and to be patient and allow children the opportunity to think carefully for themselves.

Digital devices are powerful tools for fostering creative thinking skills, and many schools have moved from Step 1 at the initiation of the GIGA School Program* - promotion of the use of digital devices - to Step 2, exploring unique ways to use ICT. The key point is how to make the transition to inquiry-based learning, which encompasses Step 3, allowing children themselves to determine the best use of the technology, and exploring new styles of learning. At this stage, digital devices will be used as tools to exercise creative thinking skills.

*An initiative of the Ministry of Education, Culture, Sports, Science and Technology that seeks to realize an ICT environment in education that will foster creativity.

Professor Nakagawa's areas of specialization are multimedia education and information education. He holds a Ph.D. in Informatics from Kansai University. He took his current position in 2009, following terms in positions including as an elementary school teacher at a Yokohama City municipal elementary school, an assistant professor in Kanazawa University's School of Education, and a professor at the National Institute of Multimedia Education. Professor Nakagawa's main research topics include ICT utilization, multimedia education, and information education in elementary and secondary education. He also provides guidance and advice on research regarding practice in elementary and junior high schools. He has served on numerous education-related government committees, including the Central Council for Education's Special Subcommittee on the Future of School Education toward the Integrated Enhancement of Individually Optimized Learning and Collaborative Learning.

Expert Opinions

Change Awareness Among Teachers and Parents and Foster Creative Confidence in Students

Nobuaki Sawa
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What is creativity? I see it as not only the ability to create art, but also as the ability to form one's own ideas and communicate them to others. This is an ability that everyone possesses. Up to the present, learning in the school setting has been directed toward questions with a single correct answer. In the future, children will be challenged with questions that do not have a single correct answer, allowing them to come up with their own answers, and this process will increase their confidence in their creativity (creative confidence). This kind of learning means that students will have a great many seemingly futile experiences in the process of thinking through problems, such as investigating things that prove not to be useful, but they will learn a lot by making choices regarding what to accept and what to reject.

With the introduction of digital devices, students can easily collect and analyze information based on their own interests, which also facilitates collaborative work. Using digital devices, students are able to continue learning at home after class; opportunities for learning are expanding beyond specific times and places. Taking advantage of these changes, some local governments and schools are considering making the change to classes that are only possible using digital devices. The role of teachers is changing from "teaching" as such to acting as "coordinators" who encourage and support students' learning. Now that children can learn on their own, there is no longer a need for teachers to teach them everything. The ability to design lessons that leave it up to the children and provide opportunities for them to learn and explore for themselves will be an important skill required of teachers in the future. From this perspective, I believe that experienced, veteran teachers will be better able to manage classes.

The problem is that government guidance is not connected to classroom practice in the field of education. First, it will be necessary to change awareness among principals, teachers, and parents. It is essential that they are keenly aware that for children who will live in the society of the future, , determining how to utilize and further extend the knowledge that they acquire will be more important than obtaining correct answers regarding specific subjects and areas of knowledge. In schools, it will be necessary to share the school management's vision with the teaching staff and to manage the school-wide curriculum to incorporate activities that foster creativity. In order for school administrators themselves to accept these changes, it will be vital for them to engage in dialogue with parents and the local community about the type of education that is required, and to change their awareness.

Through successful experiences in the classroom, creatively-confident children developed a significantly greater awareness of the need to change their community, society, and country by their own efforts. Viewed over the course of a lifetime, learning that fosters creativity will be more effective even in terms of academic ability than education that crams children with knowledge. I hope that these children will flourish as the creators of a sustainable society in the future.