Transforming Teaching and Learning through New Digital Technologies

A side event at the Second Asia-Pacific Regional Education Ministers' Conference (APREMC II)

REPORT

Education 2030

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Introduction

On 6 June 2022, the UNESCO Bangkok office organized a panel discussion 'Transforming Teaching and Learning through New Digital Technologies' as a side event of the Second Asia-Pacific Regional Education Ministers' Conference (APREMC-II).

This panel session aimed to share findings and insights gained from case studies conducted from late 2021 to early 2022 in primary and secondary schools on the uses of new digital technologies in teaching and learning. The case studies were carried out in twenty-two schools in six countries – Bangladesh, China, India, Kazakhstan, Philippines and Thailand – under the project 'Situational analysis on the use of frontier technologies in teaching and learning in primary and secondary education', implemented by the UNESCO Bangkok office with the financial support of the Ministry of Education, Culture, Sports, Science and Technology (MEXT) of Japan. Employing semi-structured interviews conducted with teachers, students and school leaders, researchers collected data and information on teaching and learning practices that use new digital technologies in regional schools by asking two fundamental questions: (1) How are new digital technologies used and making impacts in teaching and learning in the school?; and (2) What helped, enabled or supported the school to generate such impacts through this technology?

> **Key questions**
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> - Technology Uses and Impacts: How are new digital technologies used and making impacts in teaching and learning in the school?
>
> - Factors and Conditions for Success: What helped the school to generate such impacts through this technology?

The session featured three among the twenty-two interviewed schools: an urban primary school in China, a rural primary school in Thailand, and a federal government school in India. Examples of innovation in teaching and learning practices arising from the use of new digital technologies in these schools were shared; in addition, the factors and conditions that foster such practices were considered by the panelists.

Opening remarks

Naoko Okamura, Assistant Minister/Director-General for International Affairs, Ministry of Education, Culture, Sports, Science and Technology (MEXT), Japan

On behalf of the Government of Japan, I wish to sincerely thank the UNESCO Bangkok office for holding this side event today. Since 2016, the Japanese government has been supporting the SDG4 project implemented by UNESCO Bangkok. With the aim of promoting SDG4 in the Asia-Pacific region, this project was conducted to strengthen the capabilities and coordination functions of the Member States in the region, and to contribute to strengthen partnerships. We are very pleased that this session is being held at this Asia-Pacific Education Ministers' meeting to share the result of the anlaysis of the use of advance technologies in primary and secondary education, which is one of the components of the SDG4 project.

In order to ensure the optimization of learning for children in Japan, MEXT has been making great efforts towards the digitalization of education. Sparked by the COVID pandemic, the digitalization of education has rapidly advanced. In March 2021, we completed a project to provide a computer device for each student and put in place a high-speed communication

network in nearly all public elementary and junior high schools in our country. We are aiming to make the most out of the potential of digital technologies to provide optimal learning opportunities tailored to the needs of each student, as well as opportunities for students to interact with each other and with people outside their schools. At the same time, new issues emerged, such as the need to support teachers who did not have sufficient knowledge to use ICT tools in classrooms. Currently, in addition to MEXT, the National Institute for School Teachers and Staff Development, local governments and private companies are providing training for teachers. I have heard that the countries participating in this project are also going through similar experiences regarding training support for teachers. The result of this project will be interesting and relevant to many countries.

The COVID pandemic reminds us of the importance of schools once again. We have all pursued various initiatives to ensure learning for all children. I expect that the result of this event will be beneficial for many countries and serve to strengthen cooperation for post-COVID educational reform. Japan will continue to extend its support through UNESCO's activities to provide higher quality education opportunities in the Asia-Pacific region.

Panel presentations

Introduction to the case studies
Ushio Miura, UNESCO Bangkok

Link to the presentation file:
https://bangkok.unesco.org/sites/default/files/assets/article/Education/files/Futures/Introduction%20to%20case%20studies.pdf

Before we hear the three stories from China, Thailand and India, allow me to give you a brief introduction.

We conducted these case studies because we wanted to obtain a picture of the ways in which new technology practices are emerging and making impacts in teaching and learning. We had two main research questions. The first question was: How are new digital technologies used and making impacts in teaching and learning in the school?

When we say 'new technology', we understand it as 'a technology that is new in the context of the school'. We decided to understand it this way because the results of the online survey we conducted before the case studies showed that technology situations in schools vary significantly, not only from country to country but also from school to school within the same country. In our case studies, in some schools, the new technology was internet or Google and Microsoft applications, and in other schools, it was robotics, the Internet of Things (IoT), 3-D printing, augmented reality (AR), etc.

The second question was: What helped the school to generate such impacts through using this new technology? We wanted to find out what factors and conditions enabled the innovation in the school.

Case studies were carried out in three to four schools in each country; including primary and secondary, public and private, urban and rural, and well-funded and under-resourced schools. Researchers carried out semi-structured interviews with teachers, students, technology coordinators and school leaders using a common data collection framework. In some cases where it was possible for researchers to visit schools, they observed classes in person.

Researchers wrote a report for each school providing detailed data on teaching and learning practices, technology environment, and school environment. Then we analysed and categorized the data on practices, utilizing this SAMR framework developed by Puentedura.

Practices that we categorized under 'Substitution' use a technology to do what has been done without it. An example is the livestreaming of a teacher lecturing in front of a blackboard. As you know, this was seen in many places when COVID school closures started. Schools were trying to replicate what was done in a face-to-face classroom.

Practices that we categorized under 'Augmentation' also use technologies to do what has been done without them but with improved impacts. In our case studies for example, in several schools, it was reported that teachers use online quiz tools like Kahoot or chatbots, to stimulate students' interests and engage them in class. In other cases, teachers report that AR and various visual technologies are helpful in explaining concepts that are difficult for students to understand only with words and static images.

Practices that we categorized under 'Modification' have an impact to significantly redesign conventional methods and approaches. For example, during COVID school closures, lessons were recorded and made available online, which made it possible for students to access lessons anytime they wanted and repeatedly. Another example that can be found in several reports is a shift from conventional 'chalk and talk' teaching to student-led, active learning facilitated by new technologies. The practice of students undertaking research on a topic using internet and consolidating their findings using various applications is seen in a number of schools we studied.

Practices that we categorized under 'Redefinition' create a new process previously inconceivable without the technology. In the case studies of some of our schools, we see students creating new apps and new products through programming and using 3-D printing to address community issues in collaboration with other students, teachers and community people. In these cases, we see emerging indications that student-teacher-community relationships are beginning to be reconfigured and schools' role in society redefined.

According to Puentedura, those practices with Modification and Redefinition impacts are pertinent to the transformation of education and learning, and it is in this context that we would like to share the stories of the three schools in China, Thailand and India today.

A case of an urban primary school in China

Xiaodong Zeng, Baoping Li and Yifan Lu, UNESCO International Research and Training Centre for Rural Education (INRULED)

Link to the presentation file:
https://bangkok.unesco.org/sites/default/files/assets/article/Education/files/Futures/Urban%20primary%20school%20in%20China.pdf

As we all know, our world is changing and developing faster than ever. Facing this uncertain future, students need to acquire self-directed learning skills in order to navigate such uncertainties. Advanced digital technologies continue to transform what learning is valued, the ways in which learning occurs, and how education systems are organized. In the post-COVID-19 era, all the countries in the world, including China, are exploring ways to utilize digital technologies as transformative forces for inclusive education. I believe we benefit from sharing practices and exchanging thoughts on ongoing transformations.

The school we studied is in Beijing. The vision of the school is to create confident, mindful, responsible, and happy individuals who contribute to society. Let's have a look at how it is pursued.

This school takes a digital story-telling approach utilizing the art of telling stories. Students tell their learning stories by using a variety of media including graphics, audio, video and web-publishing. This is an innovative teaching and learning model, which is a collective and systematic initiative undertaken in this school. The school also receives very strong technical support from Beijing Normal University and some tech companies.

We would like to share a video of a project. The project is designed to have students calculate an area in an authentic circumstance, like designing a parking space, totally by

themselves. Teachers act as advisors instead of teaching the formulas directly. Digital pens and tablets are used in this project. The handwriting of students written with a digital pen on paper can be printed with dot-matrix on an electronic board. The whole learning process is recorded into the students' own digital stories that can be shared with others.

Here is a short video to show you what a digital story may look like. Students are empowered to make important decisions about their learning experiences and how they discover and apply the new knowledge. To work out the final answer, they need to search for learning resources, discuss with peers, consult with teachers and adjust their workplan. In the final stage, students use their digital stories to share their group work and teach the knowledge they gained to the rest of the students. A digital story also serves as a meaningful and positive assessment tool. Students demonstrate critical thinking, construct knowledge and contribute to the learning of others in this process.

What enables the school to create such impacts? First of all, we think the national education policy, which focuses on integrating ICT into education, is a critical driver. Secondly, the school formally encourages teachers to use new technologies in their classrooms. Teachers hold workshops to share their technology experiences and observe each others' lessons. Thirdly, the school is exploring a model of school-university-enterprise cooperation. Pedagogical guidance from Beijing Normal University and technical support from tech companies are the basis of innovation in teaching and learning practices in the school.

A case of a rural primary and lower secondary school in Thailand

Wanwisa Suebnusorn Klaijumlang, Kasetsart University

Link to the presentation:
https://bangkok.unesco.org/sites/default/files/assets/article/Education/files/Futures/Rural%20school%20in%20Thailand.pdf

The school that I will talk about today is a public school under the Ministry of Education. It provides education from kindergarten to lower secondary level. The school is located in a rural area in Khon Kaen Province in the northeastern part of Thailand. In the context of Thailand, we consider it a small school with only 16 teachers, 2 non-teaching staff and 172 students. The students often come from underprivileged backgrounds. Their parents are mostly farmers, shopkeepers and factory workers. According to the data of the Ministry of Interior, the subdistrict where the school is located faces four major problems: career promotion, community risk management, poverty reduction and community management. However, the subdistrict is also considered a model for using technology for better living.

The vision of the school is not particularly different from those of other schools in Thailand, but the school has established its uniqueness as being a leader in robotics in Khon Kaen Province. According to our research, in terms of technology uses and impacts, we found that this school can be considered a model practice. The school has won many competitions at national and international levels in spite of its limited resources. The robotics kit that they use costs only about US$20, but they can still win many competitions. The school maximizes its existing resources. It uses Coding.org, which is a platform created in the United States then translated into Thai by the Ministry of Science and the Ministry of Education to make it available free for schools.

All 16 teachers in the school know coding and robotics. Even though they teach Thai, social studies, English, etc., they can support students in robotics and teach robotics to teachers in other schools. The students graduate from the school being able to apply robotics in their real life. While many of them come from disadvantaged backgrounds and some of them may not be able to pursue higher learning and instead may join their families to do farming, they can use their knowledge of robotics to develop and engage in smart farming. Students present their robotics products to their communities, thus people of the nearby communities appreciate the value of robotics as well.

Teaching robotics in the school has redefined the process of teaching and learning. Students create whatever they want to create, such as a smart trash can or an alcohol gel despenser, and present them to the nearby communities. The school offers a robotics club for students, alumni and anyone interested, and it is becoming a robotics hub of Khon Kaen Province. The achievements of the school drew the attention of CP All, one of the biggest companies in Thailand, resulting in the company establishing an AI laboratory in the school and providing robotics kits, 3-D printing machines, computers and other equipment to help students make their imagination come true.

We found that the strong leadership of the principal is one of the key factors for the school's success. He demonstrates technical skills, human skills and conceptual skills. Especially in terms of technical skills, he was the first in the school to learn robotics, then shared the knowledge with the students and teachers of the school. Another factor is the support of CP All. The support came through the CONNEXT ED programme, which promotes collaboration between schools, the government and the private sector to improve the quality of education in rural Thailand. It should be noted however that the school's success came before the company's support.

A case of a central government funded school in India

Pranati Panda, National Institute of Educational Planning and Administration

Link to the presentation:
https://bangkok.unesco.org/sites/default/files/assets/article/Education/files/Futures/Central%20Government%20Funded%20School%20in%20India.pdf

India has a national policy on ICT along with a new education policy. Almost all schools have had some kind of intervention to use ICT to a greater extent during the COVID situation. The case I am sharing with you is a school managed by the central government. The school is neither a highly resourced school, nor an under-resourced school. It is a moderately resourced school with a good strength of students, teachers and non-teaching staff sharing the school's vision to promote experimentation and innovation. The school is located in the renowned Indian Institute of Science in Bangalore.

This case study highlights how the use of technologies is facilitating the teaching and learning processes for the teachers and the students and bringing change in the ecosystem of the school. The school uses multiple technologies ranging from Google Classroom to artificial intelligence (AI), robotics, etc. Students are learning various subjects like physics and mathematics with these multiple technologies.

The use of these technologies is enabling students to ideate and create feasible solutions for community problems. The students have created waste management and health fitness

apps and app-based robots. They have won national-level innovation awards from the Indian STEM Foundation.

School leadership plays a critical role in bringing Atal Tinkering Lab, an important Indian project supported by the central government, to the school. The school head took the lead in applying for this project, building the lab within the school with adequate facilities and seeking support for teachers from other agencies such as NITI Aayog, which provided support for capacity-building.

The school has honed a community of highly motivated and passionate teachers. Efforts that started with a few good teachers had rippling effects on a good number of teachers in the school. A mathematics teacher is using robotics to teach difficult concepts. These teachers are supported by DIKSHA and NISHTHA for their capacity-building in using these technologies. There are other agencies and foundations that are also extending school-based support to enhance the capabilities of teachers.

Institutionalizing new technologies and integrating them in teaching and learning processes require strong partnerships and collaboration not only within the school but also with agencies operating outside the school. The Indian STEM Foundation is offering support to the school for integrating technologies, and partnerships are creating momentum in the school.

Synthesis: factors and conditions that help foster innovative practices

Tianchong Wang, the Education University of Hong Kong

Link to the presentation:
https://bangkok.unesco.org/sites/default/files/assets/article/Education/files/Futures/Synthesis.pdf

I am going to discuss briefly some of the key factors and conditions that can help foster innovative practices that contribute to the transformation of education and learning. Through the analysis of case studies, we identified four factors and conditions that seemed to help. They are: (1) Strong leadership supported by national policies; (2) Passionate and willing teachers who take initiative; (3) Co-learning and development among teachers; and (4) Partnership.

First, we see proactive school leaders enabled the schools to foster practices that make transformative impacts. Proactive leaders communicate a sense of determination and urgency for change. They mobilize resources to make technologies available for teachers and create an environment conducive for teachers to innovate. For example, the principal of the school in India that we just heard about mobilized and led the school community to bring computer labs from a private company. The director of the school in Thailand initiated coding and robotics education, disseminated the knowledge he acquired to teachers, students and the local community, and mobilized support from the private sector, local universities and the government. It is also important to highlight that these school leaders could be proactive because the national government was on their side, through various policy advocacies.

Second, we see passionate and willing teachers enabled the schools to foster practices that make transformative impacts. Passionate teachers are keen to try new practices, and they are committed to innovating with technology. For example, the teachers in the school in India take their own initiatives to explore new practices in their own teaching, and disseminate their newly gained knowledge to their colleagues. Teachers of the school in China actively attend technology-related teaching and research activities. Through proactive engagements, teachers gain new ideas that ultimately lead to transformative practices.

Third, we note that co-learning and development among teachers enabled the schools to foster practices that make transformative impacts. In the stories of the schools that we just heard, teachers share and co-construct knowledge around technology practices. In the school in China, the teachers hold their own workshops to share their technology experiences with each other and to observe and comment on each other's lessons. Similarly, in the school in India, group discussions and collaborative development activities regularly take place – teachers who are experienced in using a new technology share their knowledge and motivate others to try it too. Through such collaborative learning and development, teachers co-construct innovative practices that move away from conventional methods.

Fourth, it is clear that diverse partnerships enable the schools to foster practices that make transformative impacts. In the case studies, schools leverage partnerships to bring financial, material and knowledge resources to schools. For example, the school in China partnered with a tech company, and the company made available ready-to-use technology solutions, offered training activities, co-developed digital content with teachers, and provided technology maintenance services. Another example would be the school in Thailand that partnered with a local university, the local community, a private sector company and the government. The university provided training support, the local community contributed to the students' learning, a private sector company, and the government offered financial and

material support. The diverse and broad partnerships helped the school to create a holistic technology ecosystem that nurtures innovation.

The twenty-two school case studies provided us with valuable insights into what helps foster innovative practices that can contribute to the transformation of education and learning. Based on this analysis, we would like to put forward four recommendations for the ministries of education in the region to consider and act on.

1) Strengthening school capacities to sustain strong leadership,
2) Supporting and honouring teachers' passion and willingness to take initiative,
3) Creating conditions for teachers' co-learning and development, and
4) Stepping up government support in partnership building.

By incorporating these recommendations, countries can create more conducive environments for schools to make greater impacts with technologies and transform education towards 2030 and beyond.

Discussion

Cher Ping Lim, Chair Professor of Learning Technologies and Innovation, Education University of Hong Kong

I am sharing some of my observations and insights I got from the presentations of today. I will start from a more micro level and move to more macro-level ideas.

When we look at new digital technologies in the education sector, it is quite clear from the presentations that we are always interested in students' learning outcomes – so we are

interested in the quality of education, and at the same time, whether the quality is inclusive, and whether it is done in a cost-effective way. Thus, the first point is to consider the impacts of digital technologies on education quality, equity and efficiency.

The second one is with respect to technology choices. A promising practice is always adopted within a particular context and within a particular ecosystem. This means we must always match our technology choices with students' learning needs and the expected learning outcomes in the context of the teaching and learning ecosystem. We do not look at just the learning environment but the ecosystem, including the school system and the education system. This leads me to the third point that we must build the capacity of the education workforce – the capacities of leaders and the support staff, not only teachers, must be built in order to drive and support the use of digital technology for the enhancement of education of quality, equity and efficiency. Fourth, for the capacity-building of the education workforce, an improvement cycle for technology practices and policies of acting, evaluating and improving needs to be adopted, and that improvement cycle must be data-driven and informed by evidence.

The last point is about partnerships within the education sector and across sectors. I think the pandemic has highlighted the need to work across sectors to sustain and scale up innovative digital practices. As our colleagues from China, Thailand and India have highlighted, partnerships with industries, with the local government and with the community are important to enhance education quality, equity and efficiency.

Ethel Agnes P Valenzuela, Director, Southeast Asian Ministers of Education Organization (SEAMEO) Secretariat

The three case studies presented can attest to the preparation and changes made towards technological transformation, and the situations are different in each country. I am truly impressed by the innovative practices and frontier technologies used in the three schools.

Despite the different settings and conditions in each school, I see at least two common factors. First, we need a strong co-learning culture among teachers as well as students. Second, the support obtained from strategic partnerships and collaborations with government agencies, private sector, civil society, etc. are very important. These key factors have enabled customization and localization of responses and interventions for integrating new technologies into teaching and learning.

I would like to share my reflections on the incorporation of digital technology in education in Southeast Asia, where SEAMEO has 11 member countries. To keep up with the advancement across various countries and regions in the world, even before the pandemic, SEAMEO has promoted smart education and invested in adapting high-tech teaching methods and devices, developing open educational resources, sensitizing the awareness of policy-makers, and providing opportunities for teacher education.

In SEAMEO's experience, we also needed to consider that not all teachers can be trained on the same platform due to lack of access to devices or infrastructure. In addition, language is an important factor in order to localize and contextualize teaching and learning in each country. For SEAMEO's training, we provided physical copies of the modules and face-to-face sessions for those who cannot access the online training platform. We also invested in translating the materials into eight local languages.

The three case studies have shown us that language, support and partnership, policy and policy-makers are all very important in pushing for technology transformation in this new era. We need to sensitize the awareness of policy-makers to provide infrastructure and strengthen partnerships with universities, innovators and non-state actors. Language is also an important consideration as contextualization is needed to achieve our common goal in transforming teaching and learning through new digital technologies. If we consider all these factors, only then can we have sustainability and resilience of education in the new normal.

Q & A

Question: We are wishing to move to digital education in Pakistan, but there are diverse situations in the country. We are still lacking basic infrastructure and have connectivity issues in some areas. In such an economic crisis as the one our country is in, how can we initiate from no technology to low technology? During COVID, we have had some experience with an easy digital platform that we use in urban areas only. In rural areas, we are facing difficulties. I would like to ask if experts in this forum could share some experiences of moving from no technology to low technology.

Answer: Thank you for raising the very important question. Because our case studies focused on examining technology practices, we selected schools that were already using digital technologies, and there was no case of a school that was not using technology at all.

However, when we conducted an online teachers survey prior to the case studies, asking teachers what was the most advanced technology used in their schools, there were many responses from different countries that said, 'There is no technology in our school.' Therefore, we are definitely aware of the diversity of technology situations in every country and that technology situations vary greatly from a school to a school within the same country. Therefore, the question you raise is an important one, and something we need to examine in the future. In these case studies, we wanted to understand success factors for technology integration, thus the schools selected for the case studies were those that were considered successful. Definitely, the schools are not representative cases in these countries.

Annex: Summaries of the three case studies

Urban public primary school in China

Established in 1957 and located in downtown Beijing, this public primary school has close to 2,000 students with an average class size of 37. The area that the school serves is economically disadvantaged compared to some other districts with high-tech industries and is currently undergoing large-scale reconstruction. The vision of the school is to create confident, mindful, responsible, and happy individuals who contribute to society.

The school widely uses tools developed by Honghe, a Chinese tech company that produces various education and learning technology products. For example, the school employs a digital storytelling approach that combines a storytelling method with multimedia tools. In a mathematics class, students work in groups to discover and apply the formula for calculating the area of a polygon, and present and explain how they worked out the formula with the help of Honghe tools such as whiteboards, pads, and dot matrix digital pens.

Students also undertake group research projects to investigate real-life issues of their choice such as water conservation. After conducting research in books and on the Internet, they organize their data and present their analysis using Honghe tools. They are encouraged to create short videos based on their understanding of a topic using multimedia applications. Students enjoy learning with these tools and gain a sense of accomplishment when they successfully present their group work to their classmates.

The school has been promoting 'smart education' to respond to the national ICT policies such as the 'Action Plan 2.0 for ICT in Education' issued in April 2018. Using funding provided by the municipal and district governments, the school is equipped with a high-speed Wi-Fi connection, and every classroom has a Honghe electronic whiteboard, Honghe pads, and dot-matrix digital pens. In order to ensure that all students had no difficulties in using these tools, teachers spend extra time training students who are not yet familiar with the Honghe products, and invite IT teachers to their classes to explain their use. In addition, the Honghe staff provides technical support to maintain the smart classrooms. The company also comes to the school to conduct training for teachers.

The teachers of the school hold their own vibrant workshops to share their technology experiences and to observe and comment on each other's lessons. The school also works with the Faculty of Education of a public university in Beijing to develop a learning diagnosis system. Additionally, the teachers have abundant opportunities to attend teaching and research activities organized by the school, the grade group, and the municipal government.

The school formally encourages teachers to learn and share new technology knowledge and skills. The teachers who participate in training and demonstrate their skills and abilities to incorporate technology in teaching are recognized by the evaluation department of the school. The school has also established an online platform for teachers to upload and share instructional materials and lesson plans, and provides cash bonuses for those who develop and share quality resources.

Rural primary and lower-secondary school in Thailand

This rural primary and lower-secondary school is located in Khon Kaen province in the northeastern region of Thailand. The Pra Lab subdistrict where the school is situated faces economic hardship as is common in this part of the country. The school is small, with only 16 teachers and fewer than 200 students.

Despite the limited resources available for public schools in rural Thailand, this school is remarkable in its integration of coding and robotics into the curriculum for all students from Grade 1 to 9. All teachers in the school are familiar with coding and robotics, regardless of whether they teach Thai, social studies or English. While the school lacks the funds for more expensive robot kits from established companies like Lego, it was able to procure robotics toolkits that cost only 600 Thai baht, which is less than 20 USD.

From as early as first grade, students are already grasping a basic understanding of coding and robotics with the help of educational games and online platforms, while the older students in Grade 7-9 engage in collaborative project-based learning to create innovative products using robotics, coding and the Internet of Things (IoT). Some students' creations include an automatic floor sweeper, a smart trashcan, a smart clothes hanger, and an electronic leakage detector.

The students' robotics-related knowledge and skills can be well translated into their lives beyond school. For example, one student who was interested in smart farming created a robot that could control the lighting and temperature in his garden. As an alumnus, he still often visits the school to consult the teachers and School Director about IoT for his smart farming endeavour.

In addition, the school organizes events for students to present their work to their families and the surrounding community. The community is then able to gain a greater understanding on the value of teaching robotics, and some community members even participate in the school's Robotics Club, which is open to all.

The school benefits from the passion of its Director, who initiated the instruction of coding and robotics. The majority of the in-house training courses are provided by the School Director and other competent teachers in the school. A culture of peer-learning amongst the teachers has been fostered as the older generation of teachers learn about the use of new technologies from the younger ones. The school's teachers are often invited to share their success stories with those in other schools in Khon Kaen province.

The teachers also take part in external training programmes. For example, some teachers attended a training course at a local university in Khon Khaen province, after which experts from the university came to the school to provide further coaching and mentoring. The Director himself also attends external training in order to provide further in-house training. He recently joined a local university's workshop on AI, which he intends to adapt for training at the school. Additionally, he is a member of a network of robotics teachers in Northeastern Thailand for knowledge exchange and resource sharing among schools.

The ambition and success of the school's robotics programme has drawn the interest of CP All, the largest food retailer and convenience store operator in the country. The company provides a yearly grant to support the school's Artificial Intelligence Laboratory and has donated computers and other devices, including robot kits, a laser cutting machine and a 3D printer. In addition, the school has also established partnerships with various government agencies, such as Thailand's Equitable Education Fund and the Pra Lab Municipal Office. The Office of the Basic Education Commission (OBEC) has also equipped the school with additional laptops.

Central government funded school in India

This public secondary school is located in Bangalore, a large and populous city that is widely considered the 'Silicon Valley of India'. Bangalore is the country's leading IT exporter with many tech companies headquartered in the city. The school is part of a system of central government schools governed by an autonomous body under the Ministry of Education. These schools were established to provide a common education programme for the children of central government employees such as military personnel working in different parts of the country. The school in Bangalore has over 1,700 students and 43 teachers.

Teachers at the school use robotics, artificial intelligence (AI) and 3-D printing in their teaching under the Atal Tinkering Lab (ATL) scheme. ATL is an innovative workspace equipped with technological kits and equipment installed by the Indian government in numerous schools across the country. The scheme is part of Atal Innovation Mission (AIM), the government's flagship initiative to promote a culture of innovation and entrepreneurship in India.

In collaboration with the Indian Institute of Science, the teachers organize design workshops for students using the technologies available in the ATL lab. Grade 6-8 students work together in groups to identify community issues they have seen or experienced and develop possible solutions to the problems with the help of technology. For example, one group of students wanted to tackle water wastage which was caused by unfixed leaks in the local plumbing system. They developed a system to detect the location of the leaks based on the pressure difference in a leaking pipe. They then produced a prototype with components available in the ATL lab such as sensors, microcontrollers and 3-D printing.

Various technologies are used by the teachers in math classes, including augmented reality (AR), 3-D printing and GeoGebra, an interactive software and online platform for teaching mathematics. For example, one teacher uses AR to teach the differences between two- and three-dimensional figures to Class V students. Another teacher uses GeoGebra to help Class X students visualize coordinate geometry concepts with 3-D graphics.

The central government school head office typically provides orientation and in-service training to teaching staff across the country, which includes technology-related trainings such as multimedia workshops. Within the school itself, teachers organize peer-to-peer training on technologies they use to enhance their teaching and learning practices. The

teachers regularly also participate in additional training on technology integration under various initiatives of the Ministry of Education such as Digital Infrastructure for Knowledge Sharing (DIKSHA), an online learning platform that features interactive teaching materials and resources produced by Indian teachers and content creators.

The school also receives support from the National Institution for Transforming India (NITI Aayog), the Government of India's public policy think tank, which included funding for establishing the ATL lab. The organization provides training and mentorship to selected teachers from the school, who then in turn train their colleagues after the successful completion of the training. In addition, NITI Aayog collaborates with major tech companies such as IBM and Intel to deliver training for teachers at the school.

A strong co-learning culture has been fostered at the school, as teachers share with each other new technologies or features that they use in their classes. They organize both formal meetings and informal group discussions to share their successes and challenges and motivate others to use new technology in their teaching practices. For example, one teacher who utilizes AR in her instruction held an in-house training session for the other teachers to learn how to create their own AR videos. The teacher who was experienced in using GeoGebra to teach geometric constructions also shared his knowledge and experience with other math teachers in the school.

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From
the People of Japan

Stay in touch

UNESCO Bangkok Office

Section for Educational Innovation
and Skills Development (EISD)

920 Sukhumvit Road, Prakanong,
Klongtoei, Bangkok 10110, Thailand

✉ **eisd.bgk@unesco.org**

🐦 **@unescobangkok**

f **@unescobangkok**

🌐 **https://bangkok.unesco.org**