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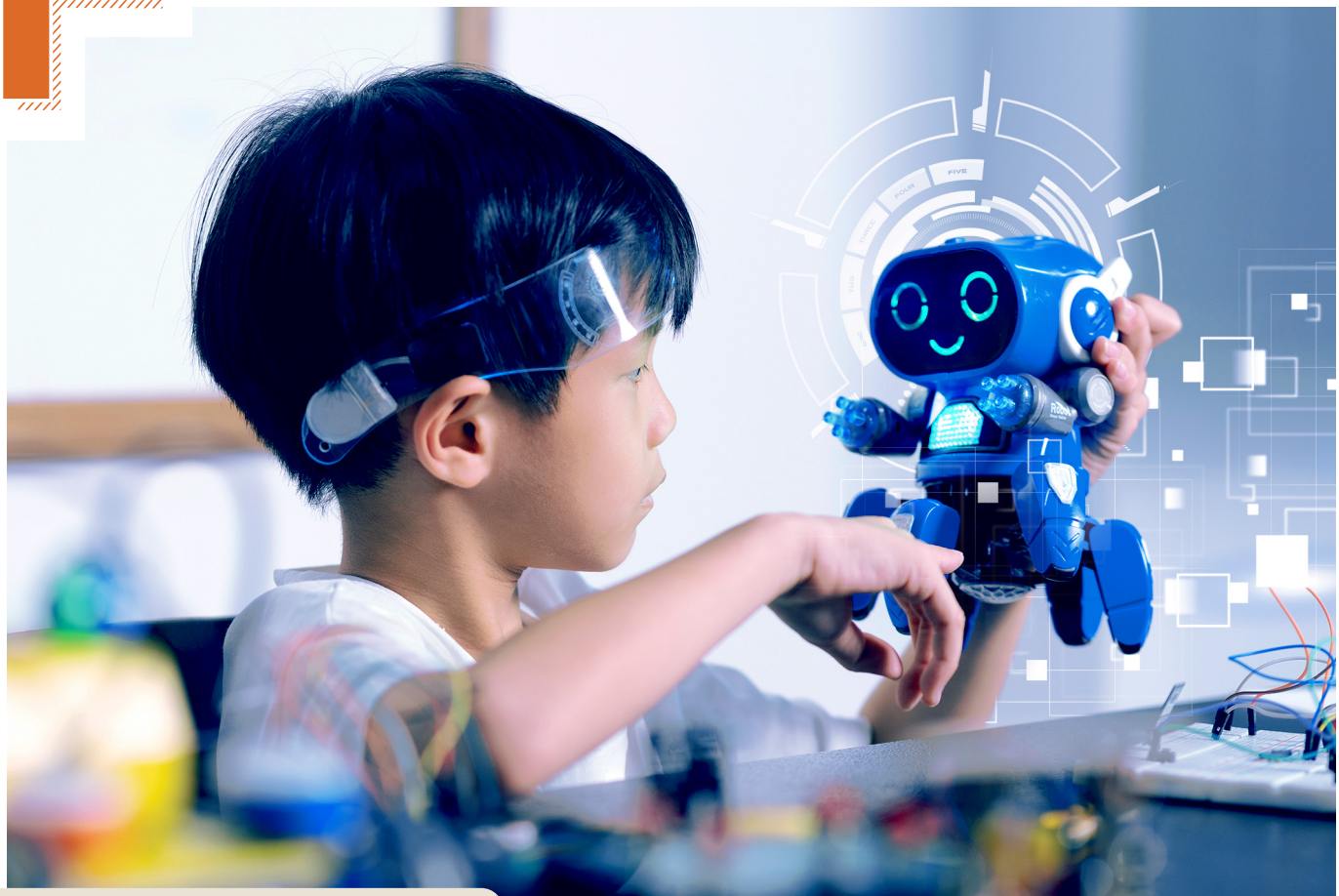



## Human-Machine Synergy

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# Contents



AI FOR EDUCATION

# What to Teach and How to Teach?

Artificial Intelligence (AI) is transforming education. Researchers and educators are concerned how to prepare future-ready learners by advocating responsible, ethical and critical use of AI for teaching and learning without the erosion of critical skills from the learners. Now is a salient opportunity for us to think: what and how to teach/learn in an era of AI? In this issue of *SingTeach*, education researchers and practitioners share their views and experiences in using AI for teaching and learning from different perspectives.

AI literacy has become a hot topic in today's educational discourses. Educators are exploring how to prepare students for a world in which AI is becoming an important part of current and future careers. It is not just about teaching students how to do coding or programming like what computing teachers do. AI literacy is a set of knowledge, skills, competencies and dispositions that students should have. These include the knowledge and understanding of the affordances, capabilities and limitations of AI, communicating and collaborating effectively with AI, and using AI in a creative, critical, ethical and responsible way.

The Big Idea article highlights the notion of human-AI synergy, which examines ways for humans and computers to work synergistically, rather than focusing on whether humans or AI have better control. Human interactions with AI go beyond feeding AI with prompts and responses. It can be seen as a "social" interaction involving conversation, negotiation, exploration and co-creation between humans and AI.

How can we leverage AI technologies to design better learning experiences and environments for students? Dr Elizabeth Koh has developed a digital formative assessment tool for teamwork, called Teamwork Intelligence for Tertiary Education (TITE). AI technologies have been used to provide meaningful analytics on students' teamwork intelligence. Associate Professor Tan Seng Chee and his team have developed some proof of concepts on using generative AI to enhance teacher education and learning.

Many educators have been actively exploring and experimenting with AI for teaching and learning. Teachers have been using AI to help plan lessons and create engaging educational content. They can innovate their teaching with "learn-with-AI" pedagogies. For example, they can design meaningful learning tasks by leveraging different roles of generative AI in students' learning journey by taking on the role of a tutor (providing information and instruction), a guide (offering real-time feedback or encouraging reflection), a collaborator (co-generating ideas, co-designing artifacts or accomplishing tasks together), or even a student (being taught by a human).

In this issue, Mr Edmund Lee and Mr Victor Chew from Rosyth School share their experiences in identifying students who need more help in particular areas of Math with the support of AI-enabled Adaptive Learning System developed by MOE. Mr Lau Chee Keen from Anglo-Chinese Junior College and Mr Chan Kuang Wen from Raffles Institution share their views on opportunities and challenges brought by AI.

The area of AI for education will continue to evolve in a landscape of technological changes and innovations. AI complements and augments human capabilities, not replace them; it is important to maintain the human roles in the essential processes of learning. No matter how advance the field of AI in education develops, we must avoid focusing on using AI to make humans less human. AI should empower humans to become better masters of AI instead of a servant to AI.

**Associate Professor Chen Wenli**
Head, Learning Sciences and Assessment Academic Group
NIE

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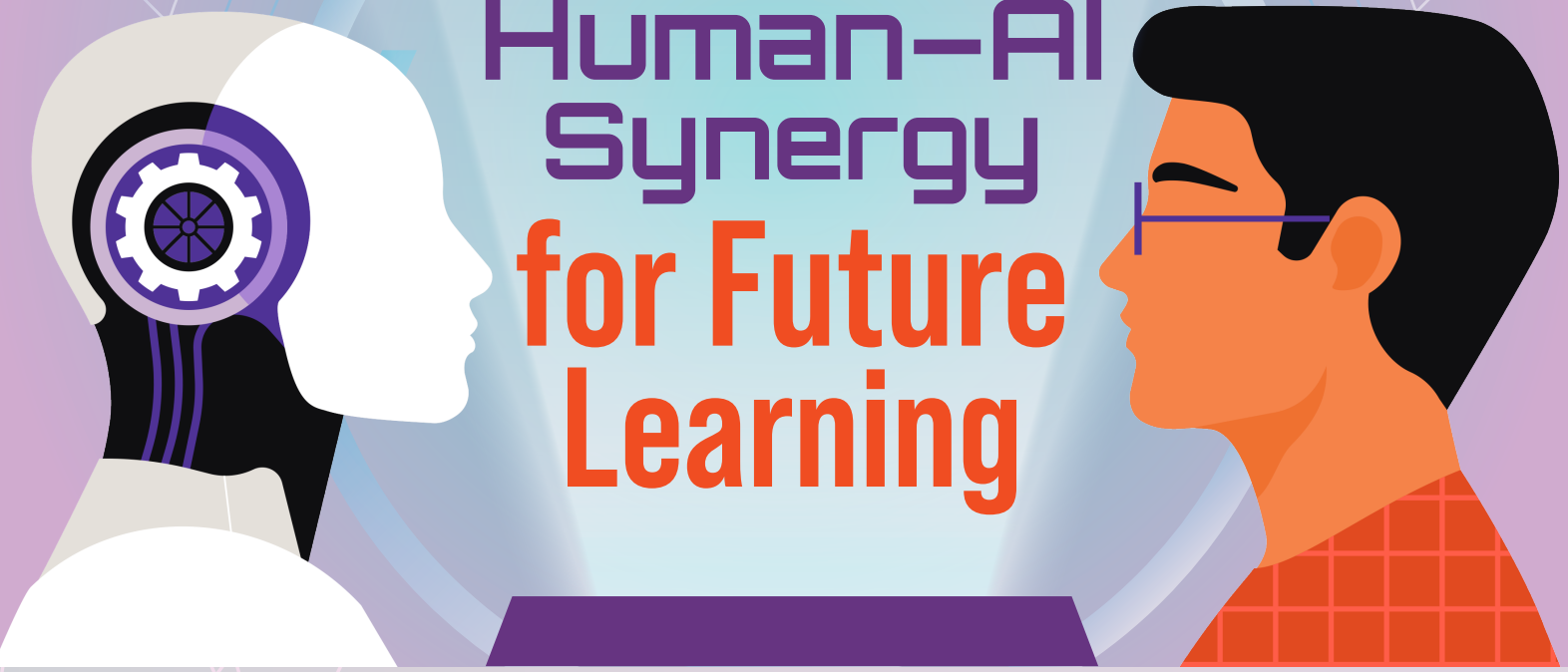
The list of research projects on the ER Connect page will be refreshed periodically. We encourage you to share about ER Connect with your fellow colleagues in your school. We hope that providing such information will serve to reduce the research-practice gap and inspire you to embark on an education research journey alongside NIE experts.

Find out more by scanning the QR code below.



# Human–AI Synergy for Future Learning

As part of NIE's efforts to integrate AI in education, the institute offers the following AI-related courses for preservice and in-service teachers, and/or graduate students:

1. Introduction to Artificial Intelligence
2. Using Generative AI in Singapore's Educational Contexts
3. AI for Self-Directed Learning and Self-Assessment
4. Design Considerations for Learning Experiences for AI
5. Leadership for AI in Education
6. Education at the Intersection of Artificial Intelligence and Neuroscience

**Search for these courses by scanning the QR code.**

**At the forefront of technological innovation lies Artificial Intelligence (AI) where it revolutionizes various facets of society including education. The recent development of AI technologies pave the way for future learning where AI is not just a tool but a seamless extension of human's capabilities. Although not novel, the idea of human-machine synergy is constantly developing. The guest editor of this issue of *SingTeach* NIE Associate Professor Chen Wenli sheds some light on the profound impact of AI on education while also addressing common challenges and concerns in AI for Education (AIED).**

## UNDERSTANDING THE HUMAN–AI SYNERGY

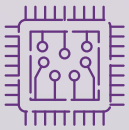
In March 2024, Education Minister Mr Chan Chun Sing mentioned in his speech at *Leading the Era of AI* that Artificial Intelligence (AI) is more than just technology and if harnessed well, it will help the nation in its economic progression (Ministry of Education [MOE], 2024).

The notion of human–AI synergy in education encapsulates the harmonious collaboration between human learners/educators and AI systems which leverage the strengths of both to better achieve educational objectives. Working together, a human–AI partnership can achieve better learning outcomes than either one working alone. Unlike traditional approaches where technology merely augments human efforts, human–AI synergy denotes a seamless integration where AI complements and enhances human capabilities, and vice versa.

"For this human–machine collaboration to be successful, one must be mindful that AI should empower the individual to become a better master of AI instead of a servant of AI," Associate Professor Chen Wenli, who is also Head of the Learning Sciences and Assessment Academic Group at NIE, explains. "The research and development on AI for education examines ways for humans and computers to work synergistically, rather than focusing on whether humans or AI have a better control on achieving complex educational goals."

In the classroom, this human–AI collaboration manifests in various forms, from personalized learning platforms that adapt to individual student needs to AI-powered teaching assistants that provide real-time feedback and support. By leveraging AI algorithms and data analytics, educators can gain deeper insights into student learning patterns, enabling targeted interventions and tailored instructions.

"To take full advantage of this collaboration, we need to understand how AI can enhance what humans do best, how humans can effectively augment machines, and how to redesign AI technology and pedagogy to support the partnership in order to bring meaningful learning experiences to the students," Wenli adds.



## ENHANCING EFFECTIVENESS OF TEACHING AND LEARNING

The meaningful integration of AI into education yields various benefits, significantly enhancing teaching and learning processes and outcomes. One notable advantage of AI in education (AIED) is on personalizing students' learning experiences by playing the role of a student's personal tutor, providing immediate feedback on learning progress, and suggesting customized learning resources to students. One example of such AI-infused technology is *ChatGPT* in which it can provide personalized and immediate feedback to students based on information provided by them or the teachers (UNESCO, 2023).

"In the human-AI collaboration, human learners' agency is important and humans are the key decision makers for various aspects of collaborative learning," Wenli explains. "It is critical to understand that humans play the essential role in the process of learning, while AI complements it by enhancing efficiency for human learners' through the provision of additional information, feedback and identifications of learning patterns."

As such, it becomes crucial that educators also focus their efforts on facilitating this meaningful human–AI collaboration in designing and implementing AI-integrated lessons. This can be done by helping students to ask good questions, evaluate the reliability and validity of info provided by generative AI (GAI), and compare their own ideas with that of GAI's as a form of reflective learning.

"The idea is to encourage our students to reflect, critic, build upon and rise above GAI's ideas," Wenli shares. However, this human–AI collaboration is not without its challenges. Navigating the intricacies of this partnership presents numerous challenges, ranging from ethical dilemmas to technical hurdles.

## COMMON CHALLENGES AND CONCERNS

Despite the transformative potential of AI, especially GAI, in education, there exists misconceptions or concerns regarding its integration into teaching practice.

"First, the capabilities of AI and learners on human–AI collaboration need to be further enhanced as there has always been concerns about whether AI systems are really able to understand human's goals and intentions," Wenli says. "Some AI algorithms may lack interpretability and transparency which results in its inability to provide reasonable explanations for their decisions. Some biased AI systems which were trained using datasets that were imbalanced with respect to demographics or cultural background may diminish rather than augment human intelligence in collaborative decision-making."

According to Wenli, this lack of interpretability and transparency may create a significant barrier to trust between human learners and the AI systems. Without transparency, humans cannot verify whether the decisions made by the AI system are fair, accurate, or

aligned with ethical principles. This lack of verification undermines trust because users cannot assess the system's biases.

In addition to that, there is also a need for human learners to improve their capability of working with AI more effectively. "This raises the issue of AI literacy, which includes the knowledge, skills, competencies and dispositions on using AI for learning. To engender effective collaboration, human leaners need to specify their intent with regards to what AI system should do in the collaborative task by communicating their intention as executable instructions," she adds.

This includes being able to provide appropriate prompts when interacting and collaborating with GAI systems like ChatGPT, and resolve the possible conflicts between human learners and AI that may occur during the collaboration.

## FUTURE POTENTIAL OF GENERATIVE AI IN EDUCATION

The advent of GAI holds immense promise for transforming teaching and learning experiences. This implies that educators' roles and responsibilities in the classroom have changed from that of traditional instructors to facilitators of learning and champions of innovation.

"Educators now need to be able to design meaningful learning and assessment tasks *supported* by technology, rather than designing tasks *surrounding* technologies," Wenli says. "AI's larger impact is in complementing and augmenting human capabilities, instead of replacing them."

GAI's potential to enhance curriculum development and instructional design processes can empower students to engage in self-directed learning, critical thinking, and creative expression, preparing them to thrive in the complex and rapidly evolving digital age.

However, it is also important to note that realizing the full potential of generative AI in education requires thoughtful integration, ethical consideration, and ongoing research and development efforts to address technical, pedagogical and societal challenges.

"While human-AI collaboration has been investigated in domains such as healthcare and business, there is limited research on human–AI collaboration in teaching and learning," Wenli claims. "More research is needed to look into the design, develop and implement human-AI collaboration to help learners use AI in creative, critical, ethical and responsible ways to learn better, deeper and faster."

Wenli envisions that with appropriate implementation, GAI can also address wider learning areas from cognitive to social emotional learning, and from content knowledge to 21st century competencies. As Singapore continues to embrace AI-driven innovation in education, the future of learning promises to be more adaptive, inclusive and empowering than ever before.

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### DID YOU KNOW?

In 2023, faculty members from NIE's Learning Sciences and Assessment Academic Group, led by Assistant Professor Farhan Ali, designed and developed a web-based chat app or chatbot for students. Named *TeacherGAIA*, the chatbot is powered by OpenAI GPT models and has numerous affordances to promote self-directed learning and self-assessment. These include a library of AI models to support different forms of learning such as inquiry-based learning, knowledge construction and self-assessment. Teachers can also tap on other affordances such as viewing of chat logs, use of group chats for collaborative learning and differentiated instruction via teacher-customizable AI models.

### ABOUT THE GUEST EDITOR

***Associate Professor Chen Wenli*** *is Head of the Learning Sciences and Assessment Academic Group at NIE. Her research interests include Computer-Supported Collaborative Learning (CSCL) and learning analytics. Her school-based research projects address the challenges of transforming and enhancing teaching and learning, and applying her research outcomes to impact school practices.*

# HARNESSING AI TO Formatively Assess Teamwork Skills

**Formative assessment focuses on providing feedback during the process of learning to help learners recognize their strengths and weaknesses, and target areas that need improvement. How can AI technology enhance the effectiveness and efficiency of this feedback process? Dr Elizabeth Koh, Senior Education Research Scientist at NIE's Office of Education Research, developed a digital formative assessment tool that is augmented by AI to provide personalized feedback for teamwork. She shares with us more about her research project and the benefits of using this tool in the classroom.**

## RETHINKING TEAMWORK ASSESSMENT

"We cannot assume that all learners assigned to work in groups are naturally adept at being good team players," Dr Elizabeth Koh says. "Teamwork may not come naturally to everyone, but it is a skill that can be learnt."

A digital formative assessment tool for teamwork, called Teamwork Intelligence for Tertiary Education (TITE), was developed to help tertiary learners grow their 21st century skill of teamwork and collaboration.

"TITE is a techno-pedagogical system underpinned by the Team and Self-Diagnostic Learning (TSDL) approach which allows learners to be more cognizant of their teamwork competencies using formative assessment and AI-embedded learning analytics," she shares.

"Learners found that TITE's personalized learning analytics dashboard was especially useful in providing them with deeper insights into their strengths and areas for improvement. The ability to track progress throughout the team project was also particularly valued by learners, as it facilitated their growth as effective team collaborators," Elizabeth remarks.

Instructors also reacted positively to TITE especially as it allows them to find out more about their learners' teamwork and contributions which is often not so visible to the instructor.

"Instructors benefit from TITE as it enhances their understanding of the learners' teamwork dynamics and enables them to identify at-risk learners who may require additional support as they navigate team collaborations," she adds.

## WHAT IS TITE?

TITE is built on Elizabeth's earlier project called My Groupwork Buddy (MGB) that was successfully trialled

in five secondary schools. Refined and adapted from MGB for tertiary learners, TITE was piloted in five local university courses.

"TITE allows learners to receive feedback on their teamwork efforts and evaluate their peers in a timely manner. It was enhanced from the earlier MGB, giving it greater flexibility and control over system functions such as self-registration," she shares.

"The concept of formative assessment, which focuses on providing ongoing feedback for improvement throughout the learning process, is incorporated into the design," she further elaborates.

Involving four iterative stages grounded on TSDL, the first stage has learners collaborating and engaging in concrete team activities aimed at completing tasks. They are also instructed to participate in team discussions via TITE's online chat.

The second stage is where learners can gain more insights into the teamwork dynamics. They are asked to rate themselves and their peers based on these four teamwork dimensions:

i. focusing on organizing team activities to complete a task within a stipulated time frame;

ii. monitoring and assessing the contributions of team members;

iii. addressing differences in interpretation between team members through discussions; and

iv. providing emotional and psychological support to fellow team members.

"An AI-based natural language processing algorithm that my team developed is used to identify indicators of teamwork language from the team's chatlog. The ratings and the chatlog analytics are then visualized as charts, for example a spider chart or a bar chart, on TITE's personalized dashboard. By viewing these visualized ratings and chatlog analytics, each learner can then proceed to work on strengthening his/her teamwork skills," she explains.

The third stage involves learners reflecting on their teamwork and setting targets to achieve. In the final stage, learners are encouraged to track their progress and evaluate whether they have met their targets.

"The cycle then loops once more as the goal is to increase the learners' awareness of their teamwork and collaborative skills upon the completion of their team project," she adds.

## THE INTERSECTION OF AI AND PEDAGOGY

While AI use is pedagogically designed and used, a strong learning culture of formative assessment is also needed among learners and institutions. Both elements, she emphasizes, are inextricably linked.

She points out how instructors or teachers need to be adept at setting up a safe and friendly classroom environment where opinions and feedback are valued. They also need to be armed with knowledge on how to motivate their learners to be fully engaged in the teamwork learning process and be prepared to address their concerns.

"While we recognize AI's exceptional efficiency and personalization, we also cannot forget the essential role human interaction plays in education," she says. "The growing synergy between AI and humans has much potential to transform and innovate education."

As AI continues to evolve, Elizabeth is also looking to advance the analytics in TITE as well as expand the use and role of TITE in different educational contexts.

Scan the QR code to find out more about **Elizabeth's other project "My Groupwork Buddy"**

## ABOUT THE INTERVIEWEE

***Elizabeth Koh*** *is Senior Education Research Scientist at NIE's Centre for Research in Pedagogy and Practice, Office of Education Research. She also serves as Deputy Director (Academic) Research Support of the Education Research Funding Programme Office at NIE. Her research interests include learning analytics, computer-supported collaborative learning, and lifelong learning skills. She has developed My Groupwork Buddy, a formative learning analytics tool for teamwork and was instrumental to the design and adoption of CoVAAPD and WiREAD+ in schools which provide learning analytics environments for learners.*


# A School's Journey in Bringing AI to the Classroom

**The emergence of Artificial Intelligence (AI) and its gradual integration into the classroom has reshaped the traditional classroom experience. Rosyth School, one of the schools known for its innovative approach in Singapore's education sector, has implemented the AI-enabled Adaptive Learning System (ALS) in its classrooms. Two teachers from the school, Mr Victor Chew and Mr Edmond Lee, provide insights on the use of the ALS as well as other AI tools in the school.**

## FOSTERING PERSONALIZED LEARNING

The implementation of AI-enabled Adaptive Learning System (ALS) at Rosyth School has seen students being able to adjust the content and learning pace based on their own needs and performance. A key characteristic of the ALS is its ability to provide personalized learning experiences to students.

"When students enter the ALS, they have the flexibility to choose their preferred amount of learning time as well as the number of concepts that they want to master within that timeframe," Mr Victor Chew, Head of EdTech Department at Rosyth School, shares. "Upon selection of the topic that they want to work on, the ALS recommends differentiated learning pathways for the student to choose."

Mr Edmond Lee, Senior Teacher, adds that students are usually recommended the "Guided Learning" mode to build their mastery of the concepts. Those who deem themselves more ready can opt for "Challenge" mode to evaluate their learning.

"Such decision-making on the pace and intensity of learning helps students to foster a sense of ownership and develop self-directed learning," he remarks.

As students engage with the ALS, the system learns from their responses to the various assessment questions embedded in the learning pathway. With these insights, the system starts surfacing appropriate learning content and questions that target the student's zone of proximal development to help them achieve concept mastery.

"Students appreciate that the content is moderated to their level of understanding to challenge them appropriately. These small successes actually spur them on to reach their final learning goal for the topic," Edmond adds.

In addition to benefiting students, the ALS serves as a valuable resource for teachers. By analysing ALS data, teachers can gain insights into student performance and identify areas of improvement. This enables them to design differentiated tasks and activities, catering to the diverse needs of their students.

"Whether used as a pre-lesson resource to identify areas to focus on or as a post-lesson tool to assess effectiveness, the ALS empowers teachers to make informed instructional decisions that enhance student learning outcomes," Victor comments.

While the ALS facilitates personalized learning experiences, he emphasizes the important and indispensable role of teachers in guiding and supporting the students' learning journey. "Teachers provide invaluable mentorship and encouragement, complementing the ALS to create a dynamic and engaging classroom environment," he adds.

## EMBRACING AI BEYOND THE ADAPTIVE LEARNING SYSTEM

At Rosyth School, teachers are embracing AI beyond the use of the ALS. Victor and Edmond note how integrating generative AI tools into teaching practices allows for the creation of diverse learning resources, from text to videos, that are tailored to students' needs. The school's Special Education Needs (SEN) team, for instance, utilizes text and video generative AI tools to develop engaging visual social stories, fostering student expression and communication.

"Teachers at our school are encouraged to leverage AI apps that can quickly generate lesson content and quizzes. For example, the Lead Teacher for the English Language was able to efficiently design and create lesson packages for her students to learn about grammar," Victor shares.

These good practices are shared with fellow colleagues through the EdTech Interest Group within the school, which then led to more teachers leveraging AI. "By harnessing

AI, the lesson preparation process can be streamlined, enabling teachers to allocate more time to connect with students and deliver impactful lessons," he points out.

## GUIDING STUDENTS ON USING AI ETHICALLY

Beyond technical skills, Rosyth School also guides students on the ethical use of AI. Both teachers point out that even though students are not able to use some AI tools directly due to age restrictions, the school takes the opportunity to start the conversation early.

"We engage students during Form Teachers' Guidance Period (FTGP) through our enriched Cyber Wellness curriculum," Victor shares. "For example, we discuss deepfake technology and stress the importance of verifying information from multiple sources to combat misinformation."

The school also gives students varying levels of exposure according to their age. In Primary 5 and 6, students delve deeper into AI concepts through Computational Thinking and Machine Learning modules. During these lessons, they acquire the necessary skills on how to research, innovate and create with technology for the benefit of society.

"They also engage in an Emerging Tech Module, where they learn about the affordances and challenges of using AI and how they can leverage it responsibly, when they are ready," Victor adds.

As the digital landscape continues to evolve, both teachers emphasize that the school remains committed to preparing students for the challenges and opportunities presented by AI and other emerging technologies.

## BRIDGING THE AI KNOWLEDGE GAP FOR TEACHERS

Integrating AI into the classroom presents educators with various challenges, ranging from technical complexities to ethical considerations. At Rosyth School, addressing these challenges is paramount to ensure the effective and ethical use of AI in education.

"It is important for teachers to not just be familiar with new technologies but also to understand the pedagogical and ethical implications associated with using them," Edmond says.

The school's EdTech Interest Group also acts as a platform where teachers come together as a community to learn and share about their experiences with using AI and other emerging technologies. Through knowledge-sharing and professional development opportunities within the group, teachers gain confidence and competence in integrating AI into their instructional practices, with the aim of enhancing student learning experiences.

"Our teachers are also free to embark on differentiated learning experiences within the interest group, based on their readiness in embracing AI," he notes.

"Support from school leaders is a crucial factor too," Victor says. "At Rosyth School, school leaders and the EdTech Committee work with teachers on flattening the learning curve and reinforce the point that we are taking a whole-school approach in learning and improving together." ∎

### ABOUT THE INTERVIEWEES

***Victor Chew*** *is Head of EdTech Department and* ***Edmond Lee*** *is Senior Teacher (Mathematics) from Rosyth School. Victor is passionate about the use of EdTech and leads the EdTech Interest Group in the school. Edmond is keen on exploring ways in which technology supports the teaching and learning of Mathematics.*

# Navigating the Future of Education: Perspectives on AI Integration

**In today's dynamic education landscape, the emergence of generative Artificial Intelligence (GAI) heralds unprecedented opportunities and challenges, reshaping pedagogical paradigms and redefining the roles of educators. As the quest for human–AI synergy accelerates, educators navigate ethical considerations, embrace technological advancements, and champion inclusive learning environments. In this article, NIE Associate Professor Tan Seng Chee from the Learning Sciences and Assessment Academic Group and who is also an active researcher in the field of educational technology for schools, sheds some light on the evolving landscape of AI integration in the Singapore education landscape.**

Scan the QR code to watch a video interview of **A/P Tan as he discusses AI in education and the various courses NIE is offering on this topic.**

## HOW DO YOU SEE ARTIFICIAL INTELLIGENCE (AI), PARTICULARLY GENERATIVE AI, SHAPING THE FUTURE OF TEACHER EDUCATION AND PROFESSIONAL DEVELOPMENT?

The development of artificial intelligence (AI) can be traced back to the 1950s, marked by phases of promise and disillusionment. However, at the turn of the millennium, advancements in big data, computational power, and sophisticated algorithms have reignited enthusiasm for the use of AI, particularly with the emergence of generative AI (GAI) in the last decade. This resurgence in interest has prompted discussions around the potential promises and pitfalls of AI, including concerns about job displacement. Yet, it's crucial to recognize that the true competition may not lie between humans and machines, but between those who can harness the power of AI effectively and those who do not.

For teachers, the threat is not so much about AI replacing teachers, but whether they can harness the power of AI to enhance their teaching and students' learning. Teachers, who are shaping the future generations, will need to embrace the reality of AI's growing presence in society and develop a realistic vision of what AI can or cannot do. They need to equip themselves with the knowledge and skills to leverage AI in transformative ways to enhance teaching and learning experiences, while at the same time, be mindful of the ethical issues and limitations of AI. Moreover, teachers play a pivotal role in preparing students for an AI-driven future. Their attitudes towards AI and ethical considerations in its use can profoundly influence how well-prepared their students are for the challenges and opportunities ahead.

In essence, embracing AI in teacher education and professional development isn't merely about dispelling the fear of job displacement, but rather, about empowering teachers to adapt and innovate in ways that enrich educational outcomes and equip students with the skills necessary for success in an AI-enhanced world.

## HOW DO YOU DEFINE THE CONCEPT OF HUMAN–AI SYNERGY AND WHAT IMPLICATIONS DOES IT HAVE FOR EDUCATORS AND LEARNERS?

Human–AI synergy, some call it human–AI collaboration or human–AI alliance, means clarifying the partnership roles of machines and humans so that this human–AI system can address complex challenges to the ultimate benefit of humans. This requires an understanding of what machines do best, for example, machine can crunch data, structured or unstructured, visible or embedded, within a short period of time, which can provide real-time feedback to the human. As well, we need to know which essential roles of human teachers and students that cannot be replaced.

NIE Associate Professor Quek Choon Lang, for example, has explored the use of a virtual reality (VR) environment to provide feedback to users about their presentation skills. The VR system can generate feedback about the rate of speech, use of filler words, gestures, or even distribution of eye-gazing patterns on the audience. It also requires an understanding of what humans do best, for example, in showing care and concern, in meta-level thinking such as reflecting on the strategies used in a particular teaching situation.

In the learning context, one critical consideration is that machines should never take away the critical aspects of learning. For instance, if the objective of a lesson is to develop the students' ability to brainstorm ideas, and to think laterally for more ideas, then even though generative AI is very good at doing this, it should not rob the students of the opportunity to develop this specific skill. Machines, however, can be used as a scaffold, by stimulating students' creativity by suggesting one or two ideas as a starting point.

In a learning context, we need to differentiate between using GAI as a tool or as a scaffold. As a tool, it can be used by the students at all times. As a scaffold, we want to remove the use of GAI at some point so that the students can develop the ability to perform a task independently.

## AS AI CONTINUES TO ADVANCE RAPIDLY, WHAT DO YOU BELIEVE ARE THE ETHICAL CONSIDERATIONS THAT EDUCATORS SHOULD KEEP IN MIND WHEN UTILIZING AI TECHNOLOGIES IN THEIR PRACTICE?

There are numerous ethical issues related to the use of AI for education. What I describe here is not exhaustive. First, data privacy and security issues. This includes practices like whether consent is sought from the students about the use of their data and whether these data are protected from unauthorized access. Second, the trustworthiness of the AI algorithm and system. The term "AI hallucination" was used to describe a phenomenon in which AI generate content that is not accurate, for example, by fabricating a citation of a research report that does not exist. Reducing such AI hallucinations is an active area of work for many researchers. Third, fairness and equity issues. Students should not be treated unfairly or discriminated against because of inherent bias in an AI system. For example, if an AI system developed in another cultural context was used to predict at-risk students, it might lead to biased predictions unless it has been finetuned and verified with the appropriate set of data.

Researchers such as Muhammad Ali Chaudry, Multu Cukurova and Rose Luckin have developed an AI Transparency Framework and related AI transparency to other ethical AI dimensions. The Institute for Ethical AI in Education has also developed the Ethical Framework for AI in Education.

## WHAT ADVICE WOULD YOU GIVE TO EDUCATORS WHO MAY FEEL APPREHENSIVE OR UNCERTAIN ABOUT INCORPORATING AI INTO THEIR TEACHING PRACTICE?

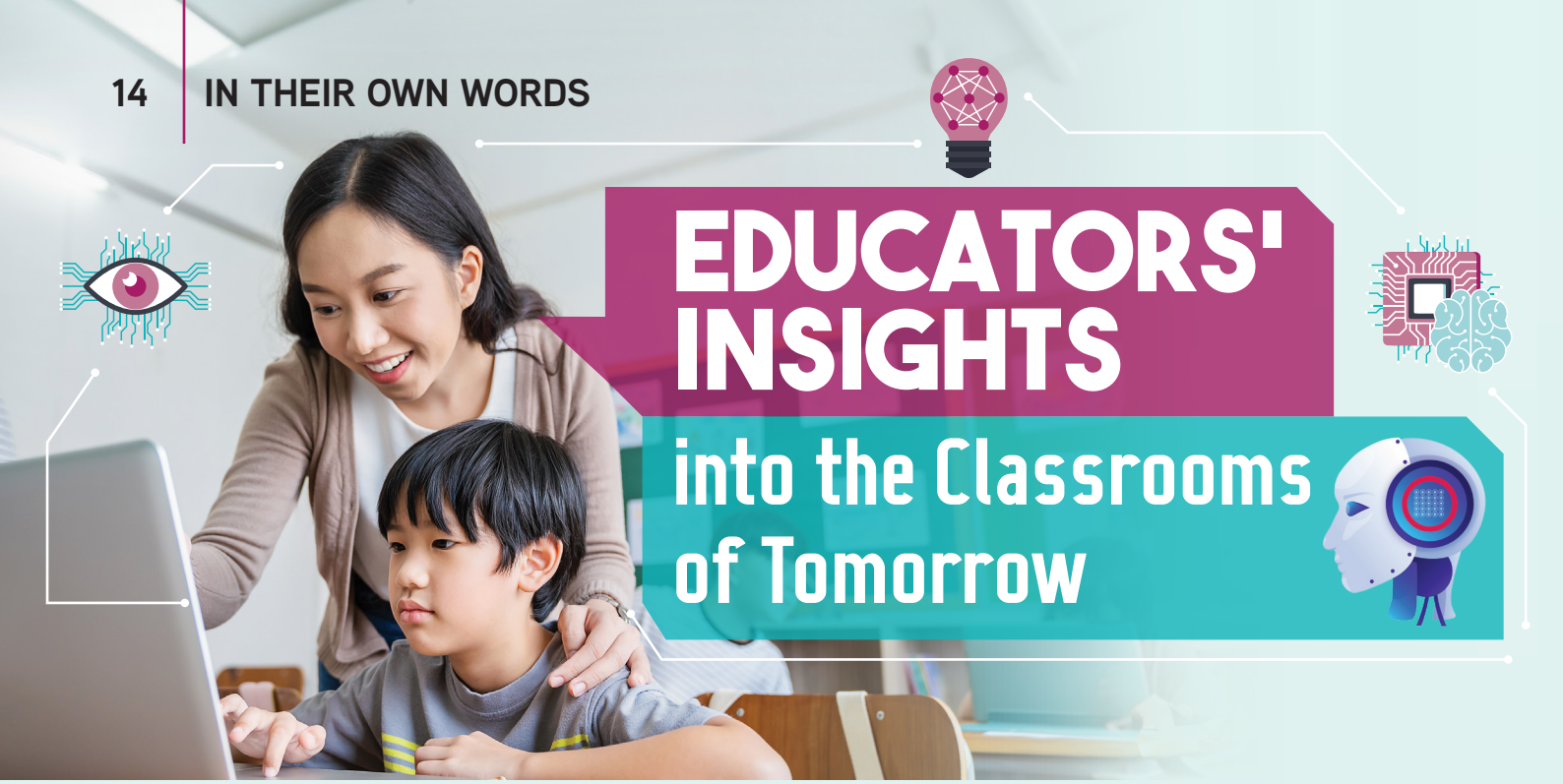
Reiterating what I said earlier, the threat is not so much about AI replacing teachers, but whether teachers can harness the power of AI to enhance their teaching and students' learning. The emergence of new technology has often caused anxiety, uncertainty, fear and frustration. My collaborator and NIE's graduate Dr Wang Xinghua has also developed an AI Readiness Scale for teachers. This scale evaluates teachers' readiness in the use of AI for education by assessing their perception on their knowledge, skills, and visions and whether they feel threatened by AI.

One way to overcome these feelings and emotions is to develop the basic foundational knowledge and skills of handling new technology and to have a realistic vision of what it can do, its limitations, and how we maintain the agency for human good. ■

**Read the online version of this article to discover the four ways AI technologies can benefit teacher education programmes.**

### ABOUT THE INTERVIEWEE

***Tan Seng Chee*** *is Associate Professor with the Learning Sciences and Assessment Academic Group at NIE. As an active researcher in the field of educational technology for schools, he has won more than S$6 million competitive research grants in various roles and helped to secure a ring-fenced grant of S$5 million for a research centre.*



# EDUCATORS' INSIGHTS into the Classrooms of Tomorrow

**The integration of Artificial Intelligence (AI) into the classroom holds immense potential to revolutionize the way teachers teach and students learn. AI-driven tools and platforms, for example, can help personalize instruction, automate administrative tasks and analyse data to provide insightful feedback to students and teachers. In this article, two teachers from Anglo-Chinese Junior College and Raffles Institution (Junior College) share their insights on the role of AI in education as well as its integration in the classroom.**

***Mr Lau Chee Keen***
*Head of Department of Education Technology and Innovation*
*Anglo-Chinese Junior College*

***Mr Chan Kuang Wen***
*Chemistry teacher*
*Raffles Institution*

## WHAT SPARKED YOUR INTEREST IN THE POTENTIAL OF UTILIZING AI TO ENHANCE EDUCATION?

**Chee Keen:** My interest was sparked by the rapid advancements in AI and machine learning, including the launch of *ChatGPT 3.0* and its widespread adoption. As I teach at the junior college level, I'm particularly interested in how AI can support student-centred and self-directed learning.

Initially, we used Large Language Models (LLMs) to streamline administrative tasks like drafting emails, planning events and generating testimonials. Emboldened by this success, we then began to explore LLMs for innovative lesson design and differentiated assessments.

**Kuang Wen:** As a chemistry teacher, my interest in AI began with a desire to create an auto-grader for students' short answers. This would increase my grading speed and allow me to gain insights into the responses that my students are giving, especially regarding their alternative conceptions.

## AS AI CONTINUES TO BE INTEGRATED INTO EDUCATIONAL SETTINGS, HOW DO YOU ENVISION THE FUTURE OF CLASSROOMS EVOLVING?

**Chee Keen:** Teachers' traditional roles as the sole knowledge providers may diminish, but their importance in providing values education and emotional support will likely grow. Young learners who are still developing core literacy and numeracy skills will need significant guidance from teachers to make sense of AI-generated information as compared to mature learners.

AI can also revolutionize curriculum design by personalizing content depth, breadth, pacing and delivery, creating a more personalized learning environment. This will require teachers to continually explore the boundaries of what AI can offer to leverage its full potential.

However, both teachers and students may face challenges in understanding the data presented in learning dashboards. Algorithmic, adaptive learning might challenge conventional forms of education. Consequently, educational institutions could face unforeseen disruptions as learning becomes anytime, anywhere.

While AI holds promise, educators must prepare for AI-assisted student work. Understandably, many educators worry about academic integrity. With limited detection methods, teachers need to adapt and work within this new AI-supported learning reality.

**Kuang Wen:** I believe the affordances of AI are plentiful. With AI, tasks such as grading students' work can potentially be automated. Additionally, students may also benefit from personalized tutoring due to the faster feedback loop of AI tools, enabling students to enhance their learning at a rapid pace. This would then free up educators' time to deliberately create lesson resources and engage in creative lesson planning. Thus, what I envision is teachers coming together to meaningfully infuse our pedagogical knowledge into AI tools to ensure that they provide substantial value in education.

Crucially, since we are preparing students for the future, schools should also help to foster AI literacy in students. This may involve educating students on cyber wellness in AI usage, and how to use AI effectively and responsibly in both their daily lives and academic pursuits. This can be done through the practical incorporation of AI into continuous assessments and daily curricula.

Beyond that, AI empowers us to analyse and uncover new insights or patterns from the large amounts of data that we collect. For instance, in professional development, I can utilize AI transcription tools to transcribe audio recordings of my lessons. I can also leverage additional AI tools to gain valuable insights into my teaching methods so that I can improve my teaching.

## WHAT ADVICE WOULD YOU GIVE TO OTHER EDUCATORS WHO ARE INTERESTED IN EXPLORING AI IN THEIR TEACHING BUT ARE UNSURE OF WHERE TO START OR HOW TO PROCEED ETHICALLY?

**Chee Keen:** I encourage keeping an open mind amidst the transformative changes ahead. Experts predict even more reliable and accurate AI coming our way, with some futurists anticipating General AI within a decade.

Foremost, I believe prompt engineering and critical evaluation skills are crucial. When we craft prompts effectively, AI becomes our powerful teaching and learning assistant. We also need to fact-check and be aware of AI's potential for generating "hallucinations" when the system's training data is limited, which can lead to controversial and inappropriate outputs.

To navigate this evolving landscape, we exemplify what lifelong learning is all about. Let us support each other in adapting our teaching models and empowering students for an AI-driven future by prioritizing skills development, adaptability and ethical values.

**Kuang Wen:** My advice would be for educators to form collaborative teams and identify a specific problem that they wish to solve before deciding on an appropriate AI tool to explore together. For instance, Raffles Institution has launched a new initiative—Gryphon Node—where like-minded teachers from various schools can collaborate in a well-supported environment to explore AI's meaningful applications in education. ■

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