

RESEARCH WITHIN REACH

ISSUE
89
JUN 2024

singteach
.nie.edu.sg



RPIC

REDESIGNING PEDAGOGY
INTERNATIONAL CONFERENCE 2024



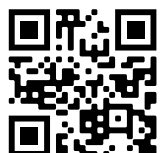
-
- 04 THE BIG IDEA**
Future-Ready Education: Evolving Pedagogies, Building Partnerships
-
- 07 CLASSROOM PERSPECTIVES**
Fostering Critical Thinking with Generative AI
-
- 12 PEOPLE**
Moving Beyond the Hype of AI in Education
-



An Institute of



Supported by



Read SingTeach online!

Contents

03 **EDITORIAL**
Reimagining Education in Singapore

04 **THE BIG IDEA**
Future-Ready Education: Evolving
Pedagogies, Building Partnerships



07 **CLASSROOM PERSPECTIVES**
Fostering Critical Thinking with
Generative AI

09 **RESEARCH IN ACTION**
Reigniting Joy in Learning through
Classroom Pedagogy

12 **PEOPLE**
Moving Beyond the Hype of AI
in Education

14 **IN THEIR OWN WORDS**
Embracing Future-Ready Teaching



Reimagining Education in Singapore



The Redesigning Pedagogy International Conference (RPIC) is the National Institute of Education's (NIE), Singapore flagship biennial conference organized by the institute's Office of Education Research.

After its last hybrid event, the tenth edition of RPIC was held physically at the university campus from 28 to 30 May 2024 and was attended by close to 1,000 delegates from Singapore and beyond. Focused on the central theme of "Growing future-ready teachers and learners: Collaborative research for collaborative change", the conference featured approximately 300 presentations in the form of keynote addresses, paper and poster sessions, symposia and workshops.

In this issue of *SingTeach*, the RPIC 2024 Conference Convenors share their thoughts on what being "future-ready" means, and how partnerships can foster collaborative innovations and development of new solutions to educational challenges. We also feature three thought-provoking paper presentations by fellow educators from various schools, a teacher leader from the Academy of Singapore Teachers (AST), and an NIE education research scientist about tapping on Universal Design for Learning to engage students, utilizing ChatGPT to foster critical thinking, and igniting emotional engagement in students to spark learning interest.

We spotlight three keynote addresses that shed light on the importance of growth and development in adolescents, how research-practice partnerships can help to reexamine teaching and learning in schools, and how AI and humans can potentially co-exist synergistically to enrich educational experiences. We also have three teachers from both primary and secondary schools who share with us their thoughts on being a "future-ready" teacher and how RPIC 2024 has added value to their professional development.

If you had attended RPIC 2024, we hope you found the keynote addresses and presentations valuable for your professional learning in the classroom and personal growth outside the classroom. For those who didn't have the opportunity to join us physically at RPIC, we hope this issue of *SingTeach* will provide you with insightful knowledge that can inspire you to innovate your teaching practices and continue your journey of lifelong learning.

See you at the next RPIC in 2026!

***SingTeach* editorial team**

Office of Education Research
National Institute of Education
Singapore

Online Exclusives

CLASSROOM PERSPECTIVES

Transform English Lessons into Engaging Adventures with Universal Design Principles

PEOPLE

Revitalizing Education Through Research-Practice Partnerships

Adolescence: Exploring the Second Window of Opportunity and Risk

VIRTUAL STAFF LOUNGE

Inquiry-Based Learning (IBL) for Geography Education in a Singapore School: Best Practices and Insights

Navigating Blended Learning: Insights from Students' Experiences

Nurturing Little Einsteins with Seamless Learning in Primary Science Classrooms

Scan the QR code below to read the online version of *SingTeach*!





FUTURE-READY EDUCATION: Evolving Pedagogies, Building Partnerships

In an era defined by rapid technological progress and evolving societal norms, the role of education in preparing future-ready teachers and students has become more critical. Classroom practices must increasingly be grounded in education research to ensure a robust foundation for understanding how students learn and to address diverse learning needs. The tenth edition of NIE's Redesigning Pedagogy International Conference (RPIC) brings together educators, school leaders, researchers and policymakers from around the globe to network, share new ideas and insights, and collaborate for the future of education. In this Big Idea article, Conference Convenors of RPIC 2024 Professor Kenneth Poon and Dr Dennis Kwek share more about what being future-ready means, and how collaborative partnerships can foster innovations and development of new solutions to educational challenges.

CONCEPT OF FUTURE-READINESS

The concept of future-readiness in education does not only lie within the boundaries of classroom instruction but extends to fostering lifelong learning habits, developing critical thinking and problem-solving skills, and preparing students to adapt to a rapidly changing world.

“Being future-ready refers to equipping learners with the skills, knowledge and mindsets necessary to thrive in an unpredictable and ever-changing future,” Professor Poon, who is also Dean of Office of Education Research at National Institute of Education (NIE), Singapore, says. “As an institute of teacher training, it becomes very critical that we first equip our educators, seasoned and new, with the technological fluency, global competence, emotional intelligence and also career adaptability skills for them to be able to effectively nurture the next generation of compassionate leaders.”

This holistic approach to teacher education ensures that our educators are not only proficient in the latest educational technologies but also adept at fostering a globally aware mindset among students.

“Educators can stay updated with the latest educational research and pedagogical strategies by engaging in continuous professional learning through seminars, online courses and education conferences where a myriad of speakers—sometimes international ones—can share insights into what has worked for them,” Dr Dennis Kwek, who is also Centre Director of Centre for Research in Pedagogy and Practice at NIE, adds.

REIMAGINING HOLISTIC EDUCATION IN SINGAPORE

At the NIE’s flagship biennial Redesigning Pedagogy International Conference that aims to gather like-minded individuals in education, teachers, researchers and policymakers share innovative ideas, discuss the latest research findings, collaborate on best practices, and explore new approaches to teaching and learning that can enhance educational outcomes.

“We invite three international keynote speakers, focusing on the areas of teacher education, research-practice partnerships and artificial intelligence in education,” Dennis shares. “Given their expertise in these areas, we hope that their sharing of the whats, whys and hows can provide our participants with insights into best practices and innovative strategies. These speakers bring a wealth of knowledge and experience from various educational contexts, offering

perspectives that we hope can help us critically evaluate, broaden and refine our own approaches.”

Singapore Minister for Education Mr Chan Chun Sing, at the opening address of the 3-day education conference, says that there is a need to reimagine how education is delivered and reassess what counts as success in education.

Centering on the theme “Growing future-ready teachers and learners: Collaborative research for education change”, Minister Chan shares with close to 1,000 conference delegates: “Education must transcend the mere acquisition of knowledge because knowledge is increasingly commoditized and ever changing. Instead, education must be about the acquisition of skills and dispositions for lifelong learning, especially those that distinguish us from machines and algorithms.”

He also emphasizes the importance of developing students holistically beyond just content knowledge. This means that teachers must facilitate the development of students’ skills in critical thinking, creativity, emotional intelligence and adaptability. “The teacher’s role becomes more of the facilitator for discovery rather than a didactic transmission of information,” Minister Chan says.

HARNESSING TECHNOLOGICAL INTEGRATION IN EDUCATION

As part of being future-ready, it becomes clear that harnessing technological integration in education is paramount. It not only enhances classroom instruction but also empowers teachers to create dynamic and personalized learning environments.

Minister Chan says, “Edtech recognizes that each student is unique. Our aspiration is to proliferate personalized learning systems at scale to cater to individual learners, their diverse learning objectives, and the unique learning contexts which they are in.”

Understanding the concerns of many educators, he affirms that artificial intelligence tools will not replace teachers. “Their professional judgement has to be the first and last mile to bridge what technology provides us and what our students need.”

As technology becomes more integrated into teaching, teachers face greater responsibility in discerning when, how and for whom to utilize it effectively. Mastering this new skill set is essential for their ongoing professional development. For example, with high-ability students, advanced technology can offer significant advantages by stretching their capabilities. However, for high-need

students, prioritizing interpersonal engagement is crucial to establish socio-emotional foundations before introducing suitable technology solutions.

THE ROLE OF COLLABORATIVE PARTNERSHIPS

To this end, it is crucial for teachers not to work in isolation but to actively seek partnerships and collaborate on research. Teachers can benefit from diverse perspectives and collective expertise that enhance their teaching practices through collaborative efforts.

“In this evolving educational landscape, collaborative research plays a pivotal role,” Professor Poon who is also leading a large commissioned project on adolescent development in Singapore says. “By engaging in collaborative research, teachers can share insights and strategies, learn from each other’s experiences, and develop evidence-based practices.”

Additionally, this collective effort that brings together diverse stakeholders can help create a dynamic and responsive education system that can adapt to new challenges and opportunities. By leveraging the strengths and expertise of individuals such as educators, researchers, policymakers and even industry professionals, collaborative partnerships create a synergistic effect that can lead to significant improvements in educational outcomes.

“One of the primary benefits of collaborative partnerships is the enhancement of teacher professional learning,” Dennis says. Through meaningful collaborations with universities and research institutions, teachers ensure continuous professional growth, acquiring deep knowledge and new skills necessary to address students’ diverse needs effectively.

Additionally, collaborative research enhances the relevance and applicability of research findings. “When educators are actively involved in the research process, the insights generated are more likely to be practical, contextually relevant and readily implementable in classrooms,” Dennis adds. This ensures that research has a direct and positive impact on teaching and learning practices.

Achieving all these goals, however, poses a multifaceted journey for teachers, filled with challenges and opportunities for growth. “If we can do all these, teaching will be a much more challenging, and yet much more fulfilling profession for our teachers in our system,” Minister Chan affirms at the end of his address. ■

COLLABORATE WITH NIE RESEARCHERS

The Research-Practice-Policy Group (RPPG) at the National Institute of Education, Singapore aims to bridge the gap between educational research and practice through its strategic dissemination, engagement and partnerships. This is achieved through fostering the exchange of information and expertise among NIE researchers, schoolteachers and policymakers.

If you are interested to collaborate with NIE researchers and work together to create a meaningful impact on education, you can contact the RPPG at oer.rppgroup@nie.edu.sg.



Scan the QR code to read more about Prof Poon's project on adolescent development in Singapore.



ABOUT THE CONFERENCE CONVENORS

Professor Kenneth Poon is Dean of Office of Education Research (OER) at NIE, Singapore and also Centre Director of NIE's Centre for Research in Child Development. Trained as a clinical psychologist and as an early interventionist, he has spent the past 20 years of experience working with children and persons with neurodevelopmental disabilities.

Dennis Kwek is Associate Dean (Strategic Engagement) of OER, and also Centre Director of NIE's Centre for Research in Pedagogy and Practice. He has over 30 years of research experience in the UK and Singapore that focuses on system studies in education, policy research and classroom pedagogies.



Fostering Critical Thinking with GENERATIVE AI

The integration of Artificial Intelligence (AI) tools into classrooms has sparked a blend of enthusiasm, apprehension and debate among educators and policymakers alike. As students become more familiar with using technology-driven solutions, it is feared they may become overly reliant on AI, potentially diminishing their critical thinking and problem-solving skills. In her presentation at the Redesigning Pedagogy International Conference 2024, Ms Low Xin Yee from Queensway Secondary School shares insights into her study that seeks to explore how ChatGPT can be used to enhance critical thinking skills among students of different profiles.

EMPOWERING STUDENTS TO USE AI RESPONSIBLY

Recent advancements in education technology have seen schools increasingly begin to integrate Artificial Intelligence (AI) tools in teaching and learning. In Singapore, generative AI tools are being used by students to source information, detect language errors in their own work and obtain personalized feedback.

However, the increasing sophistication of generative AI tools such as ChatGPT has led educators to raise concerns that the tools may pose a risk to the development of students' critical competencies as well as academic integrity.

"When students simply pass off AI-generated content as their own work, this constitutes plagiarism," Ms Low Xin Yee, a Senior Teacher/Chinese Language at Queensway Secondary School, notes. "Students are also less likely to apply their critical thinking skills and be fully engaged in the learning process if they use AI in an irresponsible manner."

With a focus on gaining a better understanding of how generative AI tools, more specifically, ChatGPT, can nurture students' critical thinking skills and how different student profiles can affect student's learning when using

those tools, Xin Yee embarked on a research study that involved Secondary 3 Chinese Language students from a mix of Express and Normal (Academic) classes.

"We hope to develop strategies that can nurture students' critical competencies and at the same time, address pertinent issues such as plagiarism, educating students on the responsible use of AI tools, and developing students into critical thinkers," she says.

STRATEGIES TO FOSTER CRITICAL THINKING SKILLS

"The study was conducted during the students' Chinese Language lessons," Xin Yee shares. "They were told to get in groups of 3 and 4 and each group was assigned a research topic based on contemporary issues."

One of the key tasks the students had to do was to present their opinions and viewpoints using the "Point, Elaboration, Examples, Link (PEEL)" format. They were given a month to conduct web research using ChatGPT and other online resources and write a script before presenting their arguments to their classmates.

The research study, she says, uses four strategies that aim to guide students in using ChatGPT responsibly.

“The first step that teachers should take is to show students examples of PEEL paragraphs and the success criteria their written argument should meet. This can help them to key in effective prompts for ChatGPT and select the necessary information,” she explains.

The second step involves teachers explicitly teaching students how to process the ChatGPT output. This can include teachers keying in the prompts, selecting points relevant to the topic, and justifying the selection. Teachers then demonstrate how to structure the content into the PEEL format.

“This involves guiding students on how to find areas for improvement in the AI-generated content, as well as how to corroborate the information found from other online sources,” she comments.

For the third step, students are required to document their research process. “This is a strategy that not only makes student thinking visible, but is also a way to mitigate the problem of plagiarism,” she notes.

The last step involves teachers checking the research documentation completed by students and conducting group consultations to give feedback and support.

“The study culminates in students presenting their arguments while teachers evaluate each group’s presentation according to a rubric,” she shares. “The rubric includes assessment based on oral presentation, which forms the main component of the grade, research documents of all group members as well as peer evaluation.”

STUDENTS’ RESPONSE AND TEACHER OBSERVATIONS

A survey of the students involved in the study revealed that high progress learners have a more favourable perception of AI tools, recognizing their usefulness in idea generation and content preparation. These students reported heightened confidence in oral presentations and a more structured approach to crafting PEEL paragraphs.

Conversely, more low progress learners responded that they faced challenges such as identifying relevant AI-generated content and grappling with complex texts.

Teacher observations also show that students who have stronger language skills are able to understand the content generated by ChatGPT without much difficulty. “They are able to enhance the ChatGPT output and weave their own arguments into it, while low progress learners require additional assistance in processing and expanding upon AI-generated information,” Xin Yee elaborates.

Teacher observations of students’ learning motivation reveal that students who are more diligent and motivated learn better with AI.

“Though some of them are weak in the language, they put in effort to make sense of the content generated by ChatGPT with the help of translation tools. As a result, they can understand the content better and provide their own opinions,” she notes.

Those who are less motivated, on the other hand, did not put much effort into making sense of the content generated by ChatGPT. To engage such students, she recommends that teachers demonstrate and provide more guidance on the process of using ChatGPT and documentation of ideas.

“It is also important to let weaker students attempt the task given on their own before turning to AI. This will ensure that they think on their own first before getting direct answers from AI tools,” she says.

THE DOUBLE-EDGED SWORD OF AI IN EDUCATION

Reflecting on the study and its findings, Xin Yee opines that AI tools can be double-edged swords. She advises that teachers take student readiness and student motivation into consideration when planning the use of educational technologies and AI.

“For those who are more diligent and have higher readiness in learning, technology and AI could enhance their thinking and deepen the depth of their understanding. However, those who possess lower motivation to learn may lack the drive to think independently,” she remarks.

There is a risk, she says, that students rely completely on AI tools and engage in less critical thinking. It is crucial, therefore, that teachers know how to adapt their teaching strategies to the evolving landscape of AI in education.

“Educators have the responsibility to nurture students so that they can thrive in an increasingly complex and interconnected world,” she asserts. “Through concerted efforts and strategic interventions, educators can pave the way for a future where all students, regardless of their proficiency levels, can reap the benefits of AI-driven learning experiences.” ■



ABOUT THE PRESENTER

Low Xin Yee is Senior Teacher/ Chinese Language at Queensway Secondary School.

This article is based on her paper “Nurturing Critical Learners using ChatGPT through Project Work” presented at the Redesigning Pedagogy International Conference 2024.



REIGNITING JOY

in Learning through Classroom Pedagogy

Recent research in educational neuroscience underscores the importance of emotional engagement in students to spark interest and nurture a lasting passion for learning across all subjects. How can we support teachers to have a better understanding of how students experience learning content in a subject area? Dr Tan Mei Ying, Dr Muhammad Nazir Bin Amir and Dr Tan Aik Lim share their concept paper, which introduces a way to reshape teachers' teaching practices, at the Redesigning Pedagogy International Conference (RPIC) 2024.

FOSTERING INTRINSIC MOTIVATION IN LEARNING

During the team's paper presentation at the Redesigning Pedagogy International Conference (RPIC) 2024, they handed out a colourful flying wheel toy to every participant and encouraged them to play with it. As everyone grew excited with the toy in hand, Dr Muhammad Nazir, Master Teacher/Educational Support at the Academy of Singapore Teachers, shares how he and his colleagues capitalized on the appeal of this toy to teach Science content.

"When I was teaching Science at a secondary school, I experienced that using a single pedagogy (which may be boring) did not always engage all students," Nazir shares. He saw this as an opportunity to collaborate with other teachers who were facing similar difficulties. Rather than thinking about "fixing" the students, they focused on "fixing" their lessons through exploring a variety of teaching approaches. "As toys usually appeal to students, we decided to experiment with using the flying wheel toy (see Figure 1) in the classroom to demonstrate scientific concepts," he adds.

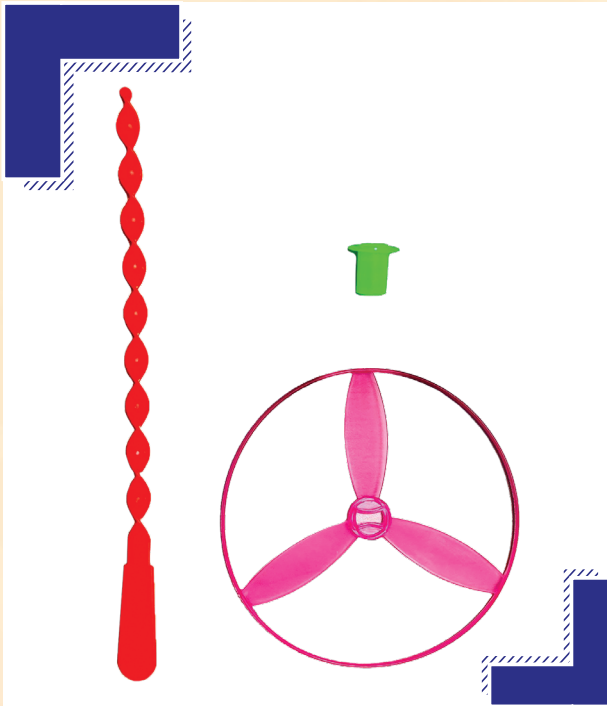


Figure 1. A flying wheel toy.

Such a move not only led to academically less-motivated students being more enthusiastic about learning but also brought joy and rigour in learning to students across all profiles. He emphasizes that the toy is used as a teaching tool to help create in the students an emotional connection to the content.

He reminds us that learning is both a cognitive and emotional process, and enjoyment is an important aspect of the learning process. In other examples, he demonstrated how several preschool teachers used a simple magic colouring book to enthuse children in learning about “pretend play”, and fondly recalls an unforgettable experience where his university lecturer used a drone with colourful lights in a dark lecture theatre to enthuse his students to learn coding as part of an engineering course.

Scan the QR code to find out more about the RAP pedagogical guideline.



Scan the QR code to watch videos that discuss the implementation and benefits of the RAP pedagogical guideline.



“Teachers play an important role in bringing about the joy of learning through our teaching and these teachers have prioritized their students’ learning experiences at the heart of their teaching. They showed that interest in a subject matter can be injected in an entire class through teaching that is situated within a universally appealing context—one that evokes a high level of emotional engagement,” he says.

The examples shared by Nazir illustrate how joyful teaching ideas can come alive in the classroom by using the Relevant, Appealing and Personal (RAP) pedagogical guideline. Developed through his research, this guideline aims to foster intrinsic motivation and engagement in students’ learning in Singapore classrooms (Amir, 2022).

“Using the RAP pedagogical guideline, teachers are able to develop creative and joyful teaching ideas to deliver subject content, which moves students’ motivation from ‘having to learn’ to ‘wanting to learn,’ and further develops students’ positive attitudes towards learning,” he remarks.

EMOTIONAL AROUSAL AS AN INDICATOR OF STUDENT ENGAGEMENT

How can teachers determine the level of student interest? Instead of focusing on facial expressions (i.e., smiling) and overt emotions (i.e., laughing), the team, led by Dr Tan Aik Lim, a Research Fellow with NIE’s Office of Education Research, introduces a novel perspective on how to look at determining students’ emotions.

“To better understand our students’ emotions, we propose using the framework developed by James Russell—the Circumplex model of affect (Russell, 1980) (see Figure 2). It maps different emotions onto a two-dimensional space of valence and arousal; the horizontal axis measures the valence (i.e., the type of emotion), while the vertical axis measures the arousal (i.e., the magnitude of emotion),” Aik Lim explains.

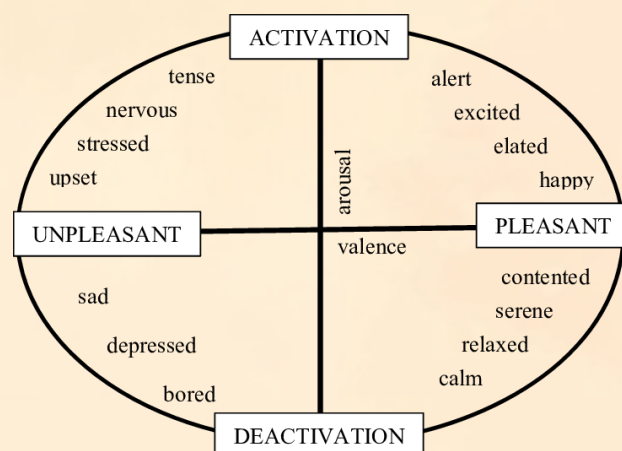


Figure 2. The Circumplex model of affect.

One way to measure the intensity or magnitude of emotions is through electrodermal activity (EDA), which refers to the varying electrical properties of the skin in response to sweat secretion by the eccrine sweat glands (Benedek & Kaernbach, 2010).

“Studies have shown that changes in electrical conduction of the skin are an indicator of arousal, attention, engagement and emotional responses. From my research, these changes also indicate triggers of interest as well,” he adds. (For more information, refer to the paper by Tan et al., 2023.)

To detect and monitor students’ EDA and heart rate, the team utilized physiological sensors that are found in new wearable technology. He points out how the physiological data derived directly from the wearer’s body can pinpoint the specific instances where there are peaks in the wearer’s emotions. This is more helpful and objective than just receiving lesson or activity feedback from students, which might be in the form of a general response such as “It was interesting” or “It was fun” and be subjected to external influences such as peer influence.

“The EDA data can provide us with a more nuanced and accurate view of parts of the activity that engaged the students or caught their attention. You can also discuss the data with the students or among other teachers,” he notes.

WHAT DOES IT MEAN FOR EDUCATORS?

When attempting to apply what they learnt at professional learning sessions about promoting student motivation in learning into practice, teachers may find it challenging to do so as there are conflicting findings in this topic. Furthermore, most of the studies measure the impact of motivation and engagement using a cognitive or behavioural lens.

“This is one of the pressures educators face when they are in the classroom, especially if they want to engage students in joyful learning experiences,” Dr Tan Mei Ying explains.

The team is hopeful that educators can begin to story or narrate teaching and learning in terms of these joyful learning experiences. “When different teachers come together to narrate and discuss their students’ peak moments of learning, they can strengthen their understanding of and hone their expertise in emotional engagement,” Mei Ying says.

“We are confident that the education fraternity can build teachers not only as narrators who can situate pedagogical innovation within the professional landscape, but also as innovators in teaching and learning across multiple layers of the education eco-system,” she adds. ■

REFERENCES

- Amir, N. (2022). Fostering Student Motivation and Engagement Through the Relevant, Appealing, and Personal (RAP) Pedagogical Guideline: Tech Stories From Singapore. In Bonk, C. J. & Zhu (Eds.), *Transformative Teaching Around the World: Stories of Cultural Impact, Technology Integration, and Innovative Pedagogy*, 87-91.
- Benedek, M., & Kaernbach, C. (2010). Decomposition of skin conductance data by means of nonnegative deconvolution. *Psychophysiology*, 47(4), 647-658.
- Russell, J. A. (1980). A circumplex model of affect. *Journal of Personality and Social Psychology*, 39(6), 1161-1178.
- Tan, A. L., Gillies, R., & Jamaludin, A. (2023). Psychophysiological methods to study the triggers of interest: A Singapore case study. *Current Psychology*, 42, 28298 – 28308.



ABOUT THE PRESENTERS

Muhammad Nazir Bin Amir is Master Teacher/Educational Support at the Academy of Singapore Teachers (AST), Ministry of Education.

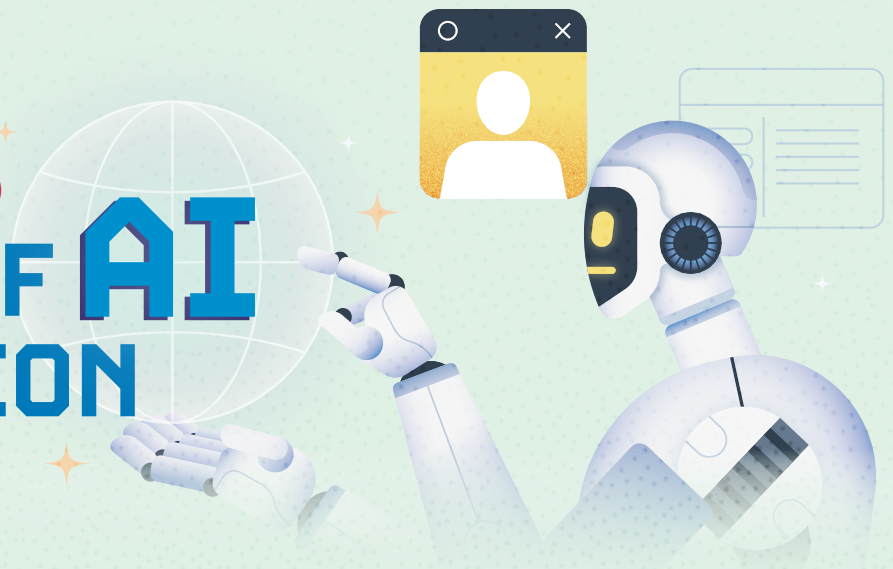
Tan Aik Lim is a Research Fellow at the Science of Learning in Education Centre (SoLEC), Office of Education Research at the National Institute of Education.

Tan Mei Ying was a former Research Fellow at the Science of Learning in Education Centre (SoLEC), Office of Education Research at the National Institute of Education.

This article is based on their concept paper “Using Narrative as Teacher Professional Development: Developing Epistemic Empathy through Innovative Pedagogy (Teaching in Enjoyable Ways) and Attending to Student Interest Triggers” presented at the Redesigning Pedagogy International Conference 2024. If you are interested to learn about their project, please email Dr Tan Aik Lim at aiklim.tan@nie.edu.sg.



MOVING BEYOND THE HYPE OF AI IN EDUCATION



The rise of generative AI has been touted as the next great, transformative tech that will revolutionize education, but how much of that is hype, and how much is, or will be reality? At the recent Redesigning Pedagogy International Conference (RPIC) 2024, Professor Mutlu Cukurova from the University College London provides international insights about AI, delving deeper into these questions and sharing more about his vision of a future in which humans and AI systems co-exist synergistically to enrich educational experiences. This article is based on his keynote address titled “Beyond the Hype of AI in Education to Visions for the Future” at the RPIC 2024.

DEFINING ARTIFICIAL INTELLIGENCE

How do we define Artificial Intelligence (AI) today? Modern AI, including recent advancements in generative pre-trained transformers, or GPTs, can be conceptualized in three ways: externalizing, internalizing, or extending human cognition.

In the externalization of cognition, certain human tasks are defined, modeled and replaced by AI as a tool. These are most of the tools we see today. In the second conceptualization, AI models can help humans change their representation of thought through the internalization of these models. In the third conceptualization, AI models can extend human cognition as part of tightly coupled human and AI systems, where the emergent intelligence is expected to be more than the sum of each agent’s intelligence.

AI: HYPE VS REALITY

Can AI Predict All Aspects of Human Learning?

According to the second conceptualization of AI, AI can be seen as computational models of learning phenomena for humans to internalize and change their representational thought. We can use the data derived to build machine learning classifications of success in learning environments.

For the last decade, my team at University College London (UCL) has been focusing on open-ended learning environments and designing analytics as well as AI solutions that support teachers and learners in such constructivist learning environments. For instance, we have been investigating students engaged in solving open-ended design problems and collecting multiple modalities of data to model their collaborative interactions.

The ultimate goal of such prediction models is to directly intervene in the practice of teaching and learning based on the predictions. However, using AI that directly intervenes presents significant challenges. These issues broadly relate to the threat against human agency, the accuracies of predictions in social contexts, and the normativity issue of not being able to decide what is good or bad in a complex social learning situation. These also include well-documented issues of algorithmic bias, transparency, hallucinations of these models, and the accountability of AI tools’ decisions. But the challenge is even bigger than this—is it always possible to explain or predict all aspects of human learning and competence development?

AI was coined as a term in the Dartmouth College summer school proposal in 1956 based on the conjecture that every aspect of learning or any other future of intelligence can in principle be so precisely described that a machine or any other tool can be built to simulate it. Since then, we have lived under the impression that if only we could find them,



there would be formulas and models to predict all aspects of human learning. However, it may be that some aspects of learning just come through the slow experience of living those learning moments. This makes the time spent on them more meaningful, as we can't just jump ahead to get the answer with predictions telling us what the most productive next step would be in such complex social constructivist learning environments.

AI Models as Objects to Think about Learning

On the other hand, if we take the second conceptualization of AI as computational models for humans to internalize, they can be considered as opportunities to describe the learning processes in more precision rather than aiming for the potential impossible task of predicting the future.

At UCL, we aim to use these models to describe lived learning experiences in a detailed and precise manner to make these experiences more reasonable for teachers and learners. We use these models to create specific and precise feedback opportunities to improve the awareness of students' lived experiences and to keep them more motivated to engage in the future.

Teachers and learners find such feedback extremely valuable in terms of increasing their awareness of their lived experiences and others' awareness in complex social constructivist learning activities. The accountability of this awareness tends to influence their engagement with learning experiences and potentially regulate their behaviours. Therefore, making the lived experiences of learning more visible and explicit with computational models still holds significant value regardless of any prescriptive advice from predictive models.

A VISION FOR THE FUTURE

If we map the three conceptualizations of AI based on Shneiderman's co-ordinates (scan the QR code to view Figure 1), perhaps most traditional education technology could be considered to have very low allowance on human agency and very low automation built into them.

We have yet to see substantial work in the third conceptualization of AI, that is human cognition being extended with AI in tightly coupled human-AI hybrid intelligence systems, the last corner on the framework that indicates high automation and high human agency. At best, the current complementary paradigm in AI education is to make a better match of what humans can do and what AI can do with the problems to be tackled at hand in order to be able to improve productivity. These approaches aim to improve productivity rather than human intelligence per se. More commonly, we give our agency to an AI system to complete a task, expecting to improve performance and task completion. We must be judicious in selecting the tasks we delegate to AI as over-

reliance could lead to atrophy of critical competencies in the long term.

To achieve human-AI hybrid intelligence systems, we need AI models that interact fluidly with us, understand our interests dynamically, and change accordingly. Current progress with Open AI GPT for Omni model is a step in the right direction, yet current AI systems still lack the ability to update their models based on real-time interaction data. Rather than pushing their predictions to us, human-AI hybrid intelligence systems would require interactions where AI encourages *us* to reach our own conclusions by enabling us with relevant information for the task at hand. I hope to see more of these in our community in the future.

Although we have significant technical progress in AI in recent years, real-world pedagogical adoption by practitioners and impact of AI in education are dependent on many other factors including technical infrastructure, school governance, pedagogical culture, teacher training, and assessment structures to count a few. AI solutions in education are not only closed engineering systems but part of a large socio-technical ecosystem. Therefore, based on decades of research in AI in education, I assert that AI tools alone are unlikely to democratize or revolutionize education. Change in education systems is likely to happen gradually, and it is our responsibility as key stakeholders to steer it towards an intentional, evidence-informed and human-centered direction. ■



Scan the QR code to view **Figure 1**.




Scan the QR code to watch the full keynote address.



ABOUT THE KEYNOTER

Professor Mutlu Cukurova is a Professor of Learning and Artificial Intelligence at University College London. He investigates the potential of analytics and AI to understand and support human learning with a particular interest in "learning how to learn" and solving complex problems collaboratively. He is the Director of the UCLAIT team and collaborates with UNESCO's Unit for Technology and AI in Education as an external expert. Currently serving as the editor of the *British Journal of Educational Technology* and an Associate Editor of the *International Journal of Child-Computer Interaction*, he continues to drive forward the discourse on AI and learning in academia, practice, and policy-making spheres.



EMBRACING FUTURE-READY TEACHING

The role of a teacher extends well beyond the transmission of knowledge, encompassing the development of students' critical thinking and emotional growth. Today, teachers also need to possess future-ready skills, and actively embrace technology, innovative teaching strategies and continuous professional development. Three teacher-participants from the Redesigning Pedagogy International Conference 2024 share their insights on being a future-ready teacher as well as key takeaways from the conference.

A) What does being a “future-ready teacher” mean to you?

B) Can you share one key takeaway from the conference that can add value to your professional development?



Mr Seck Hon Meng

School Staff Developer

Saint Anthony's Canossian Secondary School

A) I believe that a future-ready teacher is one who shapes the holistic character and moral development of students, designs and facilitates learning experiences by co-constructing students' knowledge in content, pedagogy and technology, and continues to reflect and grow in the teaching profession as a lifelong and adaptive learner. Future-ready teachers should also focus on fostering emerging 21st century competencies (e-21CCs) in our students as they are essential for success in our rapidly changing world.

B) The RPIC allows me to be updated with the emerging research, trends and best practices in education. It was a valuable opportunity for professional development and leadership growth to broaden my perspective and drive positive change in school. I appreciated the insightful sharing on the key components of metacognition (metacognitive knowledge, experiences and skills) from one of the symposium sessions. In terms of classroom implementation, metacognition may not be explicitly addressed in terms of our current practices. As metacognition is a key competency of future learners, I will read up more and share with fellow colleagues about the various metacognitive instructional approaches and strategies that enable our students to think, learn and self-regulate.



Mr Ng Joon Yong

*HOD Craft and Technology
Peirce Secondary School*



Ms Chan Jia Yu

*Teacher
New Town Primary School*

A) A future-ready teacher is one who can envision the future beyond his worldview. The different parts of the world at different developing stages allow some countries to take reference and envision what the future will be. More advanced countries will continue to take the lead in creating a “new” future. Singapore education has been looked upon by others based on measurable outcomes such as PISA and TIMSS. A future-ready teacher envisions and creates a future in his classroom. Be it transforming his classroom into a knowledge-creation community or an inclusive community, he plays an important role in creating the future of Singapore.

B) One key takeaway from the conference is how human competency can evolve with machine learning. The keynote speaker Professor Mutlu Cukurova reminded me of the responsible use of Artificial Intelligence (AI) so that I will not be over-reliant on AI, resulting in lowering my competencies while AI gains capabilities. The concept of confirmation bias in AI, where we tend to seek out, favour and interpret AI-generated outcomes that confirm what we think is right, is also intriguing. With actionable knowledge such as the PAIR framework to integrate AI into teaching and learning, this conference extends my worldview about the future I can create for my students in the classroom.

A) To me, being a “future-ready teacher” means staying abreast of technological advancements like AI that influence teaching and learning. It also means to role-model open-mindedness and embrace diverse perspectives during interactions with students. A future-ready teacher nurtures self-directedness through inquiry-based learning, encouraging students to explore and discover independently. This approach not only prepares students for future challenges but also develops their critical thinking and a lifelong love for learning.

B) One key takeaway for me is to continue experimenting with strategies to engage my students in the formative assessment and learning process. From the conference, I learnt how it is important to involve students metacognitively as that will eventually develop them into more independent learners. To do that, I need to adopt a process-oriented mindset that provides students the time and space to reflect and reattempt. It is through this empowering process that students can grow to be future-ready learners. ■



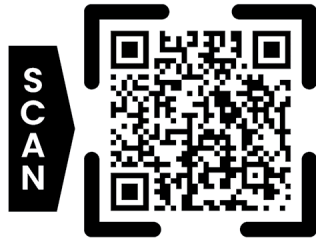
Join an NIE research study!

Educator-Researcher Connect

The Educator-Researcher Connect (or ER Connect) is a platform that aims to bridge researchers from the National Institute of Education (NIE), Singapore, and local teachers and school leaders in an effort to deepen, enhance and advance education research in Singapore. If you are interested to collaborate and be part of any NIE research project(s) listed in the ER Connect, based on your school's or your needs, please get in touch with the relevant Principal Investigator directly.

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



Office of Education Research



facebook.com/
nieoer



instagram.com/
oer_nie



twitter.com/
oer_nie



youtube.com/
@OERNIE



[https://www.ntu.edu.sg/nie/research/
office-of-education-research](https://www.ntu.edu.sg/nie/research/office-of-education-research)

SingTeach



facebook.com/
SingTeach



instagram.com/
singteach_oer



<https://singteach.nie.edu.sg/>

Copyright © 2024

singteach is an e-magazine by
**Office of
Education Research**

National Institute of Education,
Nanyang Technological University,
Singapore