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vol 20 | 20 16 sep

nurturing innovative learners

contents

Editorial

Prof David Hung
Associate Dean (Education Research),
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In the 21st century milieu of education, we find that the various facets of teaching and learning are increasingly not confined to traditional cognitive dimensions of academia but also to the non-academic aspects of learning such as resilience, strength, empathy and other social-emotional dimensions. While disciplinary content and methods of acquiring understanding are important, *innovative learning* should be undertaken in authentic learning situations to encourage non-academic aspects of learning to be integrated.

Over the years, researchers at the Office of Education Research (OER) at NIE have studied how learning opportunities within the school setting such as between classroom and outside classroom can be bridged to take authentic learning to the next level.

Such an integrated approach propels us in the right direction as we progress to nurture future-ready students. When students and teachers are able to maximize learning opportunities within and outside classroom settings, we are likely to maximize students' holistic development.

In this issue, we highlight various OER research on nurturing innovative learners. These include informal learning, makerspaces, co-curricular activities (CCAs) and analogical transfers.

Dr David Huang shares his research on Analogical Transfers; skills that can be used to find structural patterns in problems to help resolve these issues with creativity and innovation (e.g., using metaphors to mediate everyday experiences and classroom-learned concepts). Other projects such as Informal Learning, Makerspace and CCAs are in the same vein as within school-orchestrated learning opportunities that are outside the conventional teaching and learning mandates of the classroom.

Dr Wu Longkai steers his research towards learning beyond grades as he delves into the study of informal learning and interest-driven learning spaces.

This issue also looks at how CCAs spur learners to be innovative by giving them time and space, and contrasting student experiences in the usual classroom setting. In my study, Dr Chong Sau Kew and I hope that the ways in which students are assessed would be relooked and even broadened to include more parameters to complement holistic learning and practices.

As we delve deeper into innovation and new learning skills, Dr Michael Tan uses design as the process of narrowing the gap between what is, and what ought to be. Design is an interdisciplinary approach that melds the sciences (the knowledge of what is), and the humanities and the arts (the knowledge of what ought to be) to create artefacts of value.

These projects help widen our approach on how to nurture innovative learners. This is further charted by research into seeding critical thinking skills towards 21st century dispositions and process skills as outlined in this issue's Researcher in the Spotlight, Research Scientist Azilawati Bte Jamaludin.

As we increasingly synergize our research efforts towards innovative learning in an integrative fashion, holistic opportunities for learning will present itself for all students, though it may be executed in stages or in phases. ■

EDITORIAL TEAM

Re A Makerspace… Without a Space

PROJECT TEAM

Principal Investigator Michael Tan, *National Institute of Education, Singapore*
Co-Principal Investigators David Hung, Lee Shu Shing, *National Institute of Education, Singapore*

THE CONCEPT of makerspaces has been gaining traction in the Singapore education landscape. Makerspaces go beyond just tools and technology. Rather, it fosters an innovative culture in schools.

"Makerspaces can be framed as re-imagined engineering workshops, with equipment that supports digital fabrication and rapid prototyping technologies that represent the future of manufacturing processes," says Research Scientist Dr Michael Tan.

Michael notes that when designing a prototype in makerspaces, creative problem-solving by students is needed.

Makerspaces can be sites for self-directed learning as students take ownership of their own learning motivated by their personal interests. Even though they may not be able to get it right the first time, the process of repeated trial and error—guided by their instructor—builds perseverance, an important character trait for learning.

The "Is-ought" Gap in Design In design, there is a process of closing the gap between "what is" and "what ought to be".

"Science, Technology, Engineering and Mathematics (STEM) subjects offer very good ways of appreciating 'what is'," Michael says. "However, 'what ought to be' belongs to the realms of the arts, humanities and social sciences."

To create successful and innovative designs, one has to meld the arts and sciences together to figure out not only "what is", but also "what ought to be".

"You think about 'what ought to be', and then you use the sciences and technology of 'what is' to achieve that goal," Michael explains. "You need both perspectives to arrive at an optimal design."

Making and designing in makerspaces presents a novel value proposition for instructors interested in a deliberate inter-disciplinary approach to learning.

Maker Pedagogy in Classrooms The school that Michael worked with for his project was not equipped with the resources or facilities to set up a physical makerspace. So he decided to focus on the curriculum and pedagogical principles behind

Michael wants students to take charge of their own learning by creating makerspaces for them.

makerspaces and how inter-disciplinarity can be cultivated through attempts to close the "is-ought" gap in design. For students in the arts programme, this could spark their interest in STEM subjects.

"What we did was to trial the pedagogical principles of teaching in a makerspace instead," Michael says. This was done through collaborative projects where students were asked to identify a problem to be addressed and to devise a solution to the problem.

One group of students designed proposals to build and set up a light installation that guides human traffic to a butterfly garden near a busy commuter interchange.

There were minimal directives from the teacher, who acted as a facilitator, thereby fulfilling the makerspace's criteria for autonomous and self-directed learning.

"The classroom became a makerspace without a space," says Michael.

Translating Gaps into Innovation It is hoped that a makerspace approach would change students' mind-sets about failures or setbacks.

"The students involved in this project presented interesting perspectives about risk tolerance," shares Michael. "They viewed the consequences of failure negatively, even though they exhibited an understanding that failures cannot be avoided."

However, Michael is cautiously optimistic, saying that if schools promote the makerspace culture of teaching and learning, "getting students to step out of their safe zones, and taking risks and being unafraid of failures will be a big step towards innovation." ■

Co-curricular Activities as Learning Spaces **Re**

PROJECT TEAM

Principal Investigator David Hung, *National Institute of Education, Singapore*
Co-Principal Investigator Chong Sau Kew, *National Institute of Education, Singapore*

MANY MIGHT THINK that learning happens mostly within the confines of the classroom. However, there are ways to extend learning beyond the classroom, with co-curricular activities (CCAs) as one such avenue.

Very few studies in Singapore have looked at how CCAs provide students with the space to apply what they have learned in classrooms. To address this, Associate Dean of the Office of Education Research (OER) Prof David Hung and OER Research Fellow Dr Chong Sau Kew embarked on a research project to explore how CCAs can contribute to learning, which includes literacy development.

Space for Literacy Development Driven by her interest in the use of literacy in everyday life, Sau Kew is keen to study how CCAs can encourage literacy learning beyond classrooms.

"A lot of people tend to look at CCAs as outside the academic curriculum and literacy as located within the classroom," she shares. "But literacy is actually very broad, with the use of it going beyond the classroom."

In the CCA under study—the Design and Innovation Club—Sau Kew found that club members were involved in a range of literacy-related activities, such as writing emails to potential sponsors, journaling to document work progress, preparing oral presentation scripts and collaboratively developing a portfolio for participating in competition.

In Infomedia Club, the members were asked to create short video clips. "Creating a video clip involves not just writing or editing it, but also interacting with interviewees, planning who will speak to a particular interviewee and learning from other members how to translate from one language to another," says Sau Kew. "In this regard, CCAs offer students a lot of opportunities for learning."

What this project aims to explore then are the inter-relationships across learning spaces and how one can better maximize these interplays within schools.

Space to be Innovative For Prof Hung, what students can potentially achieve in CCAs, away

As part of his project, Prof Hung is exploring how CCAs can help students extend their learning beyond the confines of a classroom.

from the pressures of academic schooling, is of interest to him.

The learning context of CCAs provides students with more time and space to be innovative. "The learning opportunities offered by CCAs tend to be broader and richer," says Sau Kew. Students usually have to exercise decision-making more often in the course of their CCA participation than in classroom learning.

Beyond Academic Grades Prof Hung hopes that this research study would spur others to appreciate the value of developing alternative proxies for assessing students. Beyond grades and the ability to study well, he feels that students' competencies, skills and dispositions displayed in less formal learning settings, such as CCAs, should be given more attention. "It is important that talent can be recognized and represented in a more integrated and holistic way," he shares.

With CCAs increasingly being seen as an integral part of the school curriculum, it is hoped this study would motivate teachers and policymakers to make use of the rich learning opportunities afforded by CCAs to identify and enhance students' talents. ∎

Solving Problems through Analogies

PROJECT TEAM

Principal Investigator David Huang, *National Institute of Education, Singapore*
Co-Principal Investigator Rachel Jane Lam, *National Institute of Education, Singapore*

A BIG GROUP of soldiers plans to attack a small island, but the island is only connected to the mainland by narrow roads. A doctor wants to destroy a tumour in a patient's brain using a strong laser beam, but risks causing damage to the good tissues in the surrounding area. What do both problems have in common?

According to researchers at NIE, students often have difficulty seeing similarities between such situations and transferring the solution from one context to the other. The ability to transfer from one problem to another similar one is known as analogical transfer.

Dr David Huang, Assistant Dean (Research Strategy) from the Office of Education Research at NIE, together with his Co-Principal Investigator Dr Rachel Jane Lam, aim to prepare students for such transfer of learning by getting them to generate their own analogies before providing them instructions on how to solve the problems.

Finding Structural Patterns in Problems In the examples above, the soldiers could break into smaller groups and then converge through the narrow roads to conquer the island. Using analogical transfer, the doctor could use a few weaker laser beams to destroy the tumour without harming the good tissues. Uniting weaker forces to form a greater collective entity is a common solution for both problems.

In a typical Math classroom, students learn a new formula and would then apply it to problems set by the teachers. But they tend to struggle to identify similarities between two different problems.

"Being able to see the connection between two seemingly different problems, to see them as something similar—that in itself embodies novelty, creativity and innovation," says David.

Building on Past Research Through his previous work, David found that school leaders could shift their mental models more effectively through analogical thinking.

David studied the diffusion of innovations in schools, and strived to show school leaders how new pedagogical innovations could spread in a school—not just through a top-down approach, but by integrating a bottom-up approach as well.

David wants to help students develop the ability to transfer between two problems.

David likened diffusion to viral infections in which "infected" teachers could transmit the "virus" by convincing their peers that a new pedagogy could work.

Instead of expounding theories, David recognized that using analogies to facilitate reflection was more effective in changing the way school leaders thought about spreading innovations.

Encouraging Analogical Transfer For this project, David and Rachel hope to identify effective ways to prepare students for future transfer of learning. Working with Secondary 1 students from two schools, the study examines transfer mechanisms related to two design elements.

First, a change in pedagogical sequence: Students will receive instructions before doing a generative task and vice versa.

Second, a change of generative tasks: One task involves generating a problem that is similar to a given problem and then, comparing the two. The other task involves comparing the two given problems to generate a list of their similarities and differences.

Ultimately, the project aims to find effective ways to prepare students to solve future novel, analogous problems.

David shares: "It is not possible for us to train our students for problems or situations that they may encounter in the future, but we can examine pedagogical approaches that better equip them with analogical thinking abilities to deal with such issues in the future."

Investigation of Making-centered Learning Spaces in Singapore Schools to Promote Students' Interests in Science and Technology

PROJECT TITLE

Innovating through Informal Learning

Re

PROJECT TEAM

Principal Investigator Wu Longkai, *National Institute of Education, Singapore*
Co-Principal Investigators Paul Chua, Kenneth Lim, *National Institute of Education, Singapore*
Research Assistant He Sujin, *National Institute of Education,* Singapore
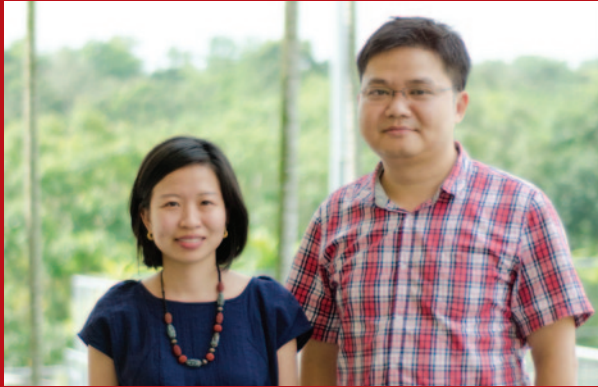
Longkai (right) and his Research Assistant Sujin are exploring students' learning process in the classrooms.

FOR NIE RESEARCHER Dr Wu Longkai, grades do not define a student's ability. Instead, it is the learning process that nurtures and prepares students to be future innovators.

This can be realized through a process of informal learning and in interest-driven learning spaces.

The Learning Process "Our research aims to explore and document students' learning process in the classroom," says Longkai. "We want to understand the mechanisms that motivate students to learn."

Working closely with three secondary schools, Longkai and his team strategically observed several classrooms over a period of 9 months.

He found that in a typical classroom, there are four phases of learning: guided instruction (receiving knowledge from the teacher), applied learning (doing activities within their own workspaces), unguided exploration (inside and outside of school) and tinkering (open-ended hands-on informal learning that allows for unstructured time to explore and experiment).

"The school environment plays a huge part in enhancing the students' intrinsic motivation to learn," Longkai shares. "Informal learning could be one such avenue for these students."

Informal Learning for Innovations "Informal learning is characterized as learning that takes place outside formal academic environment," explains Research Assistant He Sujin.

One example of informal learning that the research team observed is the use of an *Arduino* board, an open-source platform used for building electronic projects. Students were given the freedom to explore and create interactive electronic objects such as underwater robots and solar-powered cups with simple programming.

This is unlike the traditional method of learning electronics via textbooks and worksheets. Here, students can explore and tinker by themselves.

"We observed that the use of *Arduino* boards in the classroom engages students and transits them from individual problem-solving to collaborative problem solving and creation," Longkai explains.

The ability to collaborate is an asset in the 21st century, and Longkai feels that when students come together to use the circuit boards, they co-create knowledge in the process.

"It is not simply assembling circuits," he explains. "They are *making* circuits."

Future Innovators Such is the value of informal learning—it encourages student-led exploration and tinkering.

"Schools can be a place to nurture 21st century competencies in students," Longkai says. "This helps them deal and cope with the 'messy' world when they graduate."

There would be positive outcomes only if the school environment is conducive for students to collaborate and create. This includes having activities that invite inquiry from learners and creating environments which support initiatives from students.

"With the appropriate environment, and by understanding students' intrinsic motivation to learn, schools can be incubators for innovation," Longkai says. "We see students not just building, but *innovating* together in their classrooms and beyond."

And only through such collaborations and co-creations, can students aspire and be motivated to be future innovators. ■

Ed Researcher in the Spotlight

Dr Azilawati Jamaludin

NEWLY APPOINTED Research Scientist with the Learning Sciences Lab in the Office of Education Research at the National Institute of Education Dr Azilawati Jamaludin is interested in how pedagogical innovations and innovative spaces facilitate students' learning and development of process skills.

Can you share about the research you're working on that pertains to innovative learning?

I am currently the Principal Investigator of a development project that aims to seed students' critical thinking skills towards 21st century dispositions and process skills. My team focuses on technology-facilitated research that develops the learners' analytical, inference and argumentation skills.

Our key outcome is to develop students' critical thinking and to advance scientific arguments coherently using evidence-based practices, which are underpinned by investigative modes of learning such as interpreting authentic data curated from data.gov.sg, a publicly-available local dataset.

Broadly, *innovative learning* is a shift from current practice, in a novel way. The pedagogical innovation that my team and I are developing is oriented towards achieving desirable and achievable shifts in teaching and learning mediated by not only new pedagogical ideas, but also new technologies (e.g., mobile ubiquity), and new collaborative relations between participating schools and the wider community.

eduLab is an example of an innovative "living lab" that supports teachers' experimentation in using ICT meaningfully for their teaching and learning. At eduLab, I look at how pedagogical innovations translate and diffuse across different contexts such as subject disciplines, levels and schools.

Why are you interested in this area of research?

My first degree in Computer Science was an experience in innovation. When I moved into Learning Sciences, the design of meaningful interventions to innovate and/or disrupt traditional practices in schools enhanced my understanding of how technological-facilitated innovative systems change classroom practices.

Over the past decade, the exponential growth of technology has radically transformed how we interact and learn. The World Economic Forum (WEF) formulated that by 2020, we would be in the midst of pervasive innovations such as advanced robotics and autonomous transport, artificial intelligence, biotechnology and more. On the WEF's list of key skills for the 21st century, complex problem-solving ranks the highest.

Against a backdrop of rapid global, social and economic shifts, how do we prepare our children for complex problem-solving in contexts or jobs that do not even exist yet? This creates pressure on schools, educators and researchers to implement pedagogical innovations that improve overall teaching and learning.

While I believe that mastering academic content will remain important, as a researcher and mother, I see that we need to know how to best prepare our children to navigate, and tackle complex, novel and unseen problems while contributing meaningfully to society.

Which areas in research on innovative learning do you think merit further attention and research?

NIE researchers have been involved in studies and research in schools since 2003, when the Centre for Research in Pedagogy and Practice (CRPP) was established. It is important to continue research into innovative forms of learning—learning that significantly shifts from the conventional amassment of information to student-directed meaning-making to co-appropriation of knowledge.

Beyond cognitive gains, more research can be conducted in advancing knowledge in affective domains of innovative learning.

As we observe pockets of change across the system, further research into advancing innovative learning with each learner's own developmental trajectory in mind is critical. While our education landscape is primed for innovative learning, there is also a need to *reign in* the proliferation of current interventions, particularly those with established "*proof of concepts*".

So I see the pertinent need to couple interventions work with research in areas of scaling, translation, and diffusion of innovations. By doing so, we would be able to create equitable learning opportunities that serve to improve our education system as a whole.

Cultivating Reflective Practitioners

The last in a suite of four projects, *Building an Evidence-Base for Teacher Education: Phase II* is a methodological investigation of how a seamless continuum of professional learning for teachers can be established in Singapore.

This longitudinal study was conceived in 2009 to investigate the impact of Initial Teacher Education (ITE) programmes conducted at the National Institute of Education (NIE) on subsequent teacher professional learning and development (TPL&D). The study places a special focus on the first 2 years of education experienced by student-teachers at NIE.

Led by Associate Professor Low Ee Ling in a joint collaboration with the Ministry of Education's (MOE) Deputy Director–General of Education Mrs Chua Yen Ching, this study is the first of its kind in Singapore to provide empirical evidence that can inform policy on and practice of both ITE and TPL&D programmes.

The research team is looking into the development of teacher professional competency and teacher identity during pre-service education.

"We are looking at how to develop these competencies and identify some of these in the early careers for beginning teachers," Mrs Chua says. "So studying the impact of ITE is important because it can highlight some of the blind spots or gaps (on the development of the teachers' professional competencies) that we might have missed."

This has implications on the retention of teachers in the teaching profession. "If we have a better understanding of, say, what other quality professional learning opportunities that our beginning teachers value, we will be able to implement some of the things," Mrs Chua explains.

It is clear to Mrs Chua that NIE plays a very important role because the institution is the first place that student–teachers experience formal training prior to entering schools as beginning teachers.

"If there is quality ITE at NIE, which we do have and are experiencing now, it will be useful for our beginning teachers."

As the transition from a student-teacher to a beginning teacher is a big one, Mrs Chua mentioned the important role of NIE in providing the necessary preparation and support required by these student-teachers.

Deputy Director-General of Education (MOE) Mrs Chua Yen Ching (pictured) works closely with Associate Professor Low Ee Ling from NIE in the study of professional learning for teachers.

They have to be supported by quality instructional mentoring by NIE lecturers, structured induction programme, and other professional learning platforms and programmes.

When supported by relevant research, ITE also provides student-teachers a sound and fundamental understanding of the research-practice nexus, which will in turn imbue them with a solid foundation in pedagogical content knowledge.

"It is obvious that there are strong links between theory and practice," Mrs Chua said. "We need to continue to develop in this area because this is one area where we will be able to help teachers understand and explore the inter-connectedness between educational theories and classroom practices."

Mrs Chua also mentions that the findings of this research surfaced the challenge in instilling a disposition of reflection among student-teachers. "We must continue with this effort in the area of in-service for professional development to continue to cultivate our teachers as reflective practitioners." Traditionally, educators have focused on curriculum, pedagogy and assessment. "But we also must be very mindful about the learners and learning," Mrs Chua says.

The ultimate aim is to have strong links between ITE and continuing professional development for teachers. "This is especially very important for our beginning teachers," says Mrs Chua. To this end, it is crucial for MOE and NIE to work very closely together for the three main components—policy, preparation and practice—to come together.

Policy refers to MOE, while preparation is represented by NIE, and practice, the school. "This tripartite is very important," she says.

Ed Research Highlights

OER Symposium Series

The Office of Education Research (OER) recently kicked off a series of symposiums. The inaugural session held on 24 May 2016 was themed "Educating for Innovation". Led by Assistant Dean (Research Communications) Dr Dennis Kwek, who also gave the opening address, the symposium sought to engage in beginning discussions around innovation and entrepreneurship education.

"This symposium is the first in a series of discussions and presentations around an increasingly important area of research and educational policy in Singapore: innovation education," says Dennis.

The presenters for the symposium included Research Scientists Dr Michael Tan (OER), Dr Kenneth Lim (OER), Dr Wu Longkai (OER) and Assistant Professor Loh Chin Ee (English Language and Literature Academic Group).

Following this symposium, a second session themed "Learning Analytics: Possibilities, Paradoxes, Pathways" was organized together with eduLab and the Centre for Research and Development in Learning at Nanyang Technological University.

Held on 16 Jun 2016, the full-day symposium highlighted sharings on the use of learning analytics for 21st century teaching and learning by international speakers such as Professor Shane Dawson (University of South Australia, Australia), Professor Carolyn Rosé (Carnegie Mellon University, USA), Dr Nabil Zary (Karolinska Institutet, Sweden) and Professor Dragan Gasevic (University of Edinburgh, UK).

Assistant Dean (Knowledge Mobilization) Dr Jennifer Tan and Research Scientist Dr Elizabeth Koh from OER also presented their research work. The symposium ended with a lively panel discussion around pertinent topics such as ethics and privacy issues in this era of big data and learning analytics.

Cluster Networking and Engagement Session

Close to 40 principals, vice-principals and school leaders from the West Zone 3 (W3) cluster gathered at Xing Nan Primary School for a Cluster Board Meeting on 26 May 2016. Dr Tan Liang See, Assistant Dean of School Partnerships at OER and her team led a session of sharing and networking with the W3 cluster members.

Following a short sharing session from OER researchers about their projects and research aims, the participants were divided into smaller groups and the researchers explored with them their schools' possible research needs through a series of guiding questions.

It is hoped that through such sharing sessions, the School Partnership team will be able to identify gaps in research that need to be addressed.

Mr Lee Seng Hai, Cluster Superintendent of W3, expresses his appreciation for this network opportunity between his cluster and NIE. "It is a win-win situation when schools work with NIE to harness educational research," he says. "NIE can tap on practice to improve theory, while schools can tap on theory to improve practice, thus strengthening the theory-practice nexus in the process."

Other Event

First International Learning Sciences Conference at NIE

For the first time, the 12th International Conference of the Learning Sciences (ICLS) was hosted in Singapore at the National Institute of Education on 20–24 Jun 2016.

Themed *Transforming Learning, Empowering Learners*, the biennial conference focused on the learning sciences where it seeks to provide participants with insightful understanding of the conditions and processes that lead to effective learning in the classroom.

With more than 500 local and international participants, a Professor from University of Pennsylvania shared her experience, "I learned quite a bit more about NIE and its very strong goals to support excellence in teaching and learning. This is very impressive and I think (this) puts NIE—and Singapore in general—on the map as global leaders in educational reform."

The Associate Dean (Education Research) of OER, Prof David Hung, gave a keynote address on the 4th day where he spoke about the diffusion of inquiry-based practices in the context of a local education system. Other keynoters include Professor Elsbeth Stern (ETH Zürich) and Associate Professor Yael Kali (Univeristy of Haifa), who spoke about educational neuroscience and transformative learning respectively.

Another Professor from Munich Center of the Learning Sciences shared, "I am impressed by how many current and former NIE scholars attended the conference and presented their work. I take this as strong evidence for the exceptional role that NIE plays in the field of the Learning Sciences and its high international visibility."

The next ICLS is set to be hosted in London in 2018.

Research Impact

NIE Journal Improves in Impact Factor

NIE's flagship journal, Asia Pacific Journal of Education (APJE), achieved an impact factor of 0.531 in 2015. This is a new high for the journal and represents a 48 per cent increase from its 2014 impact factor of 0.359.

According to the 2015 Journal Citation Reports released by Thomson Reuters, APJE is now ranked 176 among 230 journals in the "education & educational research" category.

The impact factor is commonly used as a measure of the frequency with which the "average article" in a journal has been cited in a particular period. An impact factor of 0.531 means that the average article published between 2013 and 2014 was cited 0.531 times in 2015.

APJE is currently helmed by Lead Editor and NIE Director Professor Tan Oon Seng. He is assisted by Editors Professor Christine Goh, Dean of Office of Graduate Studies and Professional Learning, and Associate Professor Liu Woon Chia, Dean of Office of Teacher Education.

More information on the journal is available at: http://www.tandfonline.com/cape

Ed Research Highlights

CONGRATULATIONS TO our colleagues whose research projects were approved for funding in the 15th Request for Proposals by the Office of Education Research.

Project No.	Project Title	Principal Investigator
OER 01/16 CBL	Justification in Mathematics (JiM)	Chua Boon Liang
OER 07/16 SM	Physiological Workload, Musculoskeletal Injuries and Dysfunctions Amongst Physical Education Teachers in Singapore Schools – A Prospective Investigation	Swarup Mukherjee
OER 03/16 CBH	Portraits of Teacher Noticing during Orchestration of Learning Experiences in the Mathematics Classrooms	Choy Ban Heng
OER 04/16 LCK	Researching and Developing Pedagogies Using Unplugged and Computational Thinking Approaches for Teaching Computing in the Schools	Looi Chee Kit
OER 05/16 LCE	Building a Reading Culture: A Nation-wide Study of Reading and School Libraries in Singapore Secondary Schools	Loh Chin Ee
OER 02/16 LSS	Characterising Situated Professional Development for Diffusing Innovations in the Singapore Education Landscape	Lee Shu Shing
OER 06/16 LEL	An Exploratory Study of Beginning Teacher Mentoring Practices in Singapore	Low Ee Ling
OER 09/16 WLY	The Influence of a Collaborative PD Programme on Teachers' Self-efficacy and its Sustainability in Teaching Low Progress Students	Wang Li-Yi
OER 10/16 TTW	"We 'Own' the Teachers": Understanding Subcultures of Singapore Lower Track Science Classrooms	Teo Tang Wee
OER 08/16 CCH	Developing Learning Progression for Climate Change in Geography Education	Chang Chew Hung
OER 32/15 KP	Singapore Ability Scales Norming Study	Kenneth Poon
DEV 01/16 CGG	Improving Disciplinary Literacy by Developing Vocabulary and Grammatical Profiles	Clarence Gerald Green
AFR 01/16 SAJ	Learning the Language of Mathematics: An Exploration of Children's Experiences of Learning English and Mathematics at School and Elsewhere in Multilingual, Postcolonial Singapore	Sally Ann Jones
AFD 02/16 SR	Incorporating Nature of Science Elements in A-level Physics Lessons in Singapore	Subramaniam Ramanathan

The full list of projects is available on the NIE website (www.nie.edu.sg) under *Research@NIE.*

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