

levelling up low achievers

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research in education at the National Institute of Education, Singapore

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Editorial



Associate Professor Kenneth Poon
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One of the greatest educational challenges is not on the attainment of excellent examination grades but rather, on the ways educators strive to meet the varied needs of every child in the classroom.

Invariably, every classroom contains students with diverse backgrounds, and who have different attitudes and learning styles. These also include those who seem to be struggling academically as compared to their other peers. Although this is a helpful heuristic for thinking about the learning needs of students, it is important to keep in mind that in considering “low achievement” or “low progress learner”, we should not be making value statements about a person. Likewise, it is also not a diagnostic category. Rather, it is the performance of a student on a specific subject of study that we are referring to.

As we seek to prepare our young students to face the new challenges in the 21st century as well as to fulfil the vision of achieving a student-centric education where each student matters, it is the role of every education researcher and teacher alike to help each and every learner succeed during their school years and even beyond that.

In this issue of *ReEd*, we look at four research projects from the Office of Education Research at NIE that explore on the ways we can help to enhance teachers’ pedagogic practices in our classrooms.

Associate Professor Toh Tin Lam’s project focuses on the effects of using alternative approaches such as story-telling and comics to teach Math in the classroom. Dr Josh Wang looks at conceptualizing a professional development programme for teachers of lower progress learners. Assistant Professor Leonel Lim’s project explores the ways to enhance teachers’ pedagogic practices that are sociologically and culturally informed. Lastly, Dr Rachel Jane Lam wants to understand how lower progress students can collaborate effectively to solve national and global issues.

Every child is unique. Thus as educational researchers, we aim to inform and better the teaching and learning of our local lower progress students. At the crux of these research studies is also our hope to level up our low achievers and guide them to success. ■

EDITORIAL TEAM

Aneetha Sundram
Clement Lim
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ReEd (*Research in Education*) is a research bulletin aimed at sharing our research contributions with the global community. This is an initiative of the Office of Education Research at the National Institute of Education (NIE), Singapore.

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Inspiring Low-Attaining Students to Learn Mathematics

PROJECT TEAM

Principal Investigator Toh Tin Lam, *National Institute of Education, Singapore*

Co-Principal Investigators Cheng Lu Pien, Lim Lee Hean, Lim Kam Ming, Chan Chun Ming Eric, *National Institute of Education, Singapore*

Collaborator Low Leng, *Academy of Singapore Teachers, Singapore*

STUDENTS IN the Normal Technical (NT) stream are often presumed to be weak in mathematics or unable to solve complex mathematical problems. Associate Professor Toh Tin Lam, Deputy Head of NIE's Mathematics and Mathematics Education Academic Group, nonetheless thinks otherwise.

"After observing NT classes during practicum supervision and listening to the conversations between the students, I realized that they actually possess the thinking skills required to solve complex mathematical problems," explains Tin Lam. "These students, however, often lack the motivation to learn mathematics."

This observation prompted Tin Lam to explore alternative pedagogical strategies to better engage students and motivate them to learn the subject.

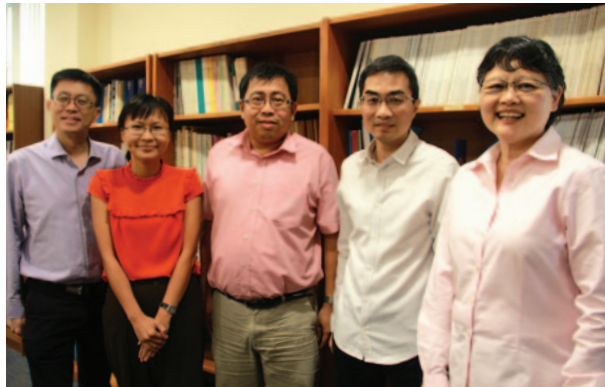
Comics as a Teaching Tool "One way to teach mathematics is to tie it with something that students are interested in, such as pop culture and comics," says Tin Lam.

This led Tin Lam and his research team to pilot a teaching package (MAGICAL), which utilizes comics to teach two topics in Secondary One NT mathematics: percentage and statistics. His research team collaborated with three secondary schools to trial the package, which has both hard copy and online versions.

"Some schools distribute the comics to students as a closed passage and get them to complete the stories while others task students with completing the exercises online," Tin Lam shares. "There are also teachers who use the comics for storytelling and involve students in role-play."

MAGICAL Results "After teachers started using comics as a teaching tool, we found that students were eager to read through the comics and rush ahead of teachers," shares Tin Lam. "Our interviews with students also revealed that the use of comics as a teaching tool has helped to contextualize mathematical concepts and enable students to see their relevance in everyday life."

These outcomes show that students are not only more engaged in mathematics lessons, but also becoming inspired to learn the subject.



Tin Lam (centre) and his research team created a teaching package which uses comics to teach Normal Technical students mathematics.

"Teachers have also given feedback that at school examinations, students perform better in topics covered in the package than those not taught using comics," Tin Lam adds.

Scaling Up MAGICAL Following the successful pilot of MAGICAL, Tin Lam and his research team embarked on efforts to scale up the research project (SUPER-MAGICAL).

This involves developing materials to cover more topics in the NT syllabus using comics, introducing MAGICAL to more secondary schools and tailoring the package for upper primary mathematics.

"Our team is now working with 10 schools—nine secondary schools and one primary school," Tin Lam shares. "The three pilot schools have also started using the package to teach three topics in Secondary Two NT mathematics—data analysis, probability and application of mathematics."

Despite the positive feedback that the team has received thus far, Tin Lam is cautious about the pace of scaling up the research project. "We want to make sure that schools find the package workable before implementing it on a larger scale," Tin Lam explains.

Ultimately, Tin Lam hopes that regardless of whether teachers use comics or other approaches to teach mathematics, students will see the relevance and applicability of mathematics in everyday life. ■

Confident Teachers, Productive Learners

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PROJECT TEAM

Principal Investigator Josh Wang Li-Yi, *National Institute of Education, Singapore*

Co-Principal Investigators Roberto de Rook, Teo Tang Wee, *National Institute of Education, Singapore*

Research Assistant Natalie Lim Xue Fang, *National Institute of Education, Singapore*

TO LEVEL UP academically, low progress learners (LPLs) need teachers who are confident in employing strategies that meet their learning needs. However, one NIE research study completed in 2015 showed that LPL teachers tend to lack the confidence to do so.

To help them gain confidence in their teaching abilities and ultimately improve students' learning outcomes, a professional development (PD) programme was introduced in 2016 to create positive learning experiences that can boost their self-efficacy in teaching LPLs.

Teacher Confidence Boosts Student Outcomes

NIE Research Scientist Dr Josh Wang Li-Yi and Research Assistant Natalie Lim gained insights from their previous study that teaching experience does not necessarily correlate with teaching self-efficacy.

"While some studies have shown a positive correlation between teaching experience and self-efficacy, we see contradictory evidence from our study," Josh shares. Some experienced teachers may not have higher self-efficacy in the context of teaching LPLs.

Defined as self-perceived capacity to bring about desired student outcomes, teachers with lower efficacy may struggle in teaching LPLs due to the diverse cognitive and psychological needs of their students. "What we found from the literature is that the improvement of teacher self-efficacy enhances teacher quality, teaching practice and student outcomes," he adds.

As such, Josh and Natalie designed a PD programme for teachers of LPL in secondary schools to help enhance their sense of self-efficacy. Through collaborations with high self-efficacy teachers and NIE researchers, low self-efficacy teachers are immersed in different kinds of teaching and learning experiences, allowing them to gain confidence in their teaching abilities.

"Lower self-efficacy teachers tend to struggle in engaging and managing LPLs," Natalie shares. "Their main concerns are giving students clear instructions, gaining students' attention and understanding lower progress learners' needs."

To Instruct, Engage and Manage This programme aims to increase teacher self-efficacy through three main components that provide seven specific Sources of Efficacy Information.



Josh and Natalie found that higher levels of teacher confidence lead to better student outcomes.

The first component is *informative sharing* which comprises three discussions sessions that centre on LPLs. These sessions are facilitated by a high self-efficacy teacher and NIE researchers. They discuss teaching techniques in instruction, engagement and management, students' profiles and characteristics, and techniques in building strong teacher-student rapport.

The second component, *actual modelling*, gives teachers with lower self-efficacy the opportunity to observe two lessons taught by the high self-efficacy teacher. "This allows the teachers to gain vicarious experiences, which is a powerful source of efficacy," Natalie adds.

In the last component, *co-teaching*, a lower self-efficacy teacher pairs with a high self-efficacy teacher to conduct two lessons together. The co-teaching experience provides lower self-efficacy teachers with efficacy sources of mastery experience, verbal persuasion, and physiological and emotional arousal, which are also influential in developing a high level of self-efficacy.

Targeting Diverse Needs Ultimately, providing teachers of LPL with knowledge and skills to understand, teach and build rapport with their students is necessary to meet LPLs' needs and cultivate a better sense of teacher self-efficacy.

The eventual goal is to help teachers of LPL attain self-efficacy growth, and effectuate the quality teaching and positive student outcomes associated with the teachers' self-efficacy gain. "We hope to hear good feedback from the participating teachers about whether they feel more confident in their abilities and better equipped to teach LPLs," says Josh. ■

Culturally Relevant Pedagogy for Low-Progress Learners

PROJECT TEAM

Principal Investigator Leonel Lim, *National Institute of Education, Singapore*

Co-Principal Investigator Michael Tan, *National Institute of Education, Singapore*

Collaborators Leslie Toh, *Curriculum Planning and Development Division, Ministry of Education, Singapore*; Eisuke Saito, *Monash University*

UNDERSTANDING AND ENGAGING students—especially lower progress students—are no mean feats. This was what an NIE Assistant Professor realized when, in his previous career as a primary school teacher, he was put in charge of a class of lower stream students.

“There needs to be an element of understanding of who my students are, what family environments they come from, and what motivates them for me to establish a stronger bond with them,” Assistant Professor Leonel Lim shares.

While NIE had prepared him well in areas such as teaching content, psychological studies and classroom management, Leonel feels that more could be done for teachers to connect with lower progress learners to enhance their learning experiences. As such, he decides to explore the unique cultural backgrounds of lower progress learners to contribute to our understandings of pedagogy in ways that are sociologically and culturally informed.

Unique Cultural Backgrounds Over the past two decades, the notion of culturally relevant pedagogy has gained attention as a student-centred approach to helping lower progress learners achieve academic success.

“Different individuals in society are shaped by different influences,” explains Leonel. “A lot of it comes from family backgrounds and conditions, and the inspirations, aspirations and challenges they give rise to.”

Leonel also emphasizes that it is important for researchers to understand the family and cultural backgrounds of students in ways that are non-reductive, non-essentializing, complex and nuanced, as they inevitably relate to wider societal patterns and behaviours.

“A number of lower progress students tend to come from lower socio-economic status backgrounds, although we have to bear in mind still that it might also not always be the case.” This brings about an essential need to understand their unique preferences, aspirations and concerns, and to relate to them on their own terms.

Culturally Relevant Pedagogy Leonel and his team observe how five teachers across different schools carry out their lessons in their respective classrooms. “We document how these teachers

incorporate elements of students’ various cultural backgrounds into their pedagogic interactions.”

Citing an example, he shares how an English Language teacher actively draws upon students’ rhythmic knocking and thumping on their desks—something familiar to most lower progress classrooms and which is often perceived as a sign of students’ restlessness—to introduce prosody, and to build students’ confidence in pronouncing difficult words and reading out long sentences.

For Leonel and his team, it is important to understand the factors that motivate students to act the way they do because who they are in the classroom is also shaped by external influences. With this understanding, teachers can better plan for their pedagogical interactions with their students.

Interactions Versus Instructions “It is very important for us as an education fraternity to develop a more nuanced understanding of the cultural backgrounds and reference points of lower progress students and the ways in which these help their participation in schools,” Leonel says.

While some scholars tend to approach pedagogies as a discreet and self-contained set of skills, Leonel feels that sociologically-informed understandings of the notion of pedagogy also have their distinct contributions.

On this reading, pedagogy refers to a set of interactions that a teacher consciously or unconsciously brings into a classroom and even beyond the instructional curriculum. As such, this understanding of pedagogy tends to emphasize more on student-teacher interactions than instructions.

Moving forward, he hopes for these cultural elements to inform teacher education in a more formalized and systematic manner to better equip teachers when working with lower progress learners. ■



Leonel believes deeper understanding of students’ backgrounds leads to enhanced learning experiences.

Preparing Students for Collaborative Learning **Re**

PROJECT TEAM

Principal Investigator Rachel Jane Lam, *National Institute of Education, Singapore*
Co-Principal Investigator Roberto de Rook, *National Institute of Education, Singapore*
Collaborator Ronnel King, *The Hong Kong Institute of Education, China*

HAVING WORKED with numerous schools in Singapore, Research Scientist Rachel Lam observes that instruction for struggling learners, unless they are under specialized programmes, tends to be very basic and offers few opportunities for them to engage in critical thinking or creative collaboration.

Yet her teaching experience has showed her that these students *can* be creative and capable of working in a team when provided with a safe and engaging learning environment.

Preparation for Future Collaboration

Framework Keen to give the students such an experience and investigate how preparatory activities can improve learning outcomes during collaboration, Rachel designed a series of four lessons for Primary 4 students around a framework called Preparation for Future Collaboration (PFC).

An instructional design centered on the use of preparatory activities to cognitively prepare students to engage in collaboration for learning, PFC at Juying Primary School took the form of a 3-phase instructional design consisting of individual preparatory work, peer collaboration and teacher instruction.

The aim was to provide the right classroom conditions and scaffolding to encourage students to share their ideas and eventually collaborate to solve a global environmental problem.

Adapting Lessons to Meet Student Needs

Write or draw one thing you threw away today. This was the activity that Rachel prepared for the students as part of their individual preparatory work in the first lesson. However, what was meant to be a 5-minute activity eventually became a 40-minute one, as she found students struggled with open-ended questions and needed more structured preparation to reap the benefits of collaboration.

Her response—to adapt on the spot by framing her questions differently—is something teachers who are uncomfortable dealing with open-endedness in the classroom may find challenging at first.

However, Rachel emphasizes that modifying the lesson was an important step to get students comfortable enough to share their thoughts in the first place.

“I wanted to earn their trust and make them realize their contributions mattered,” she says.

By dedicating more time to the introduction and prompting students instead of spoon-feeding them the answers, she and the teachers assisting her were able to guide students through their thought processes to arrive at the answers themselves.

An Informal Style of Collaboration Instruction

Once students gained confidence and adjusted to this open-ended style of instruction, they did well during collaboration, shares Rachel. No set template was given, but many were able to compare and contrast their ideas, engage in argumentation with their peers and even come up with original solutions to the problem.

Though there were some who got distracted and needed more specific instructions, to Rachel, this is all part of having differentiation in the classroom.

“Adaptability is needed to meet the unique needs of learners,” she says. “The teachers were not used to dealing with so much variability, so it was good that I could help to address their worries by modelling this type of teaching.” ■



Rachel designed a series of lessons to engage students in critical thinking and creative collaboration.

Ed Researcher in the Spotlight

Dr Imelda Caleon



AS A RESEARCH SCIENTIST and Research Convenor of the Children at Risk Task Force at the Centre for Research in Pedagogy and Practice—a research centre under the Office of Education Research—Dr Imelda Caleon is passionate in the areas of science education and positive education. She focuses on empowering learners, especially those placed at risk, by supporting them in recognizing, growing and accessing their rich resources (emotional, psychological, social and cognitive) so they can thrive in school and beyond.

Can you share about your area of research interest and how the interest came about?

Having experienced and overcome a number of hurdles in life myself, my research interest gravitated towards the “ordinary magic” of resilience that is linked to people who are able to thrive in the face of adversities. I am particularly interested in promoting resilience in lower progress learners. Resilience is a very relevant construct for this group of learners as they are likely to have experienced or have been experiencing adverse conditions that placed them at risk of continued low performance at school.

Another area that I am interested in is positive education. I would like to examine how the principles and activities rooted in positive psychology, which is the scientific study of human happiness, can be utilized to facilitate students’ learning.

What is your research project that pertains to lower progress learners about?

I have led two projects focusing on the resilience of lower progress learners. One of them focuses on the psychological and social factors that can buffer the effects of adverse conditions that predispose students to follow a trajectory of poor academic performance. Among this group of students, whom I regard as academically at-risk, there is a significant percentage who were able to excel and deviate from the path of low achievement. I am particularly

interested in this group of students. I would like to know their success stories against the backdrop of risk factors, the enablers or key ingredients for such success stories, and to share such enablers with students, teachers, school leaders and other members of the students’ social circle.

The other project also focuses on resilience, in particular “turnaround” teachers identified as being instrumental in unexpected good performances of academically at-risk students. I would like to know what they do inside and outside the classroom that could have enabled these students who were initially struggling in their core subjects (Mathematics, English Language and Science) to excel in their studies.

I am also engaged in a project that involves the development of intervention packages based on the principles of positive psychology. They focused on the cultivation of gratitude, hope and character strengths. The impact of the packages was evaluated in terms of the improvements that they generate on students’ well-being and academic outcomes (such as motivation, achievement and use of learning strategies).

Which areas in research on lower progress learners do you think merit further attention and research?

It is important to pursue research on supporting students who are between academic streams to be able to cross over and take on a more challenging curriculum. In my research, some students who excel within particular streams hesitated or refused to be laterally transferred to adjacent streams (e.g., from Normal Academic to Express) for fear of being ostracized or being left behind. I see this as a missed opportunity for some students who struggled and managed to develop resilience.

Another fertile research area for lower progress learners is examining how higher order thinking skills can be infused into their curriculum to broaden their boundaries of knowledge. This approach is easy to say but difficult to implement in actual classroom lessons, where teachers need to prioritize topics that are assessed during national examinations.

The growing movement of positive education is also a promising field to pursue in relation to lower progress learners. I believe that positive psychology activities may reinforce the various forms of assistance being accorded to lower progress learners, thereby providing additional layers of protective factors that can facilitate the resilience process for these learners.

Events by Office of Education Research

OER Organizes 18th Request for Proposal (RFP) Ideation Session



With an aim to encourage collaborative research between NIE researchers and its key stakeholders, the Office of Education Research (OER) held its third run of ideation session for the 18th RFP on 5 April 2017 at NIE.

Themed “*Educational Change: Innovations and Transitions in Leadership, Curriculum, Assessment Pedagogy and Identity*”, the session began with an opening address by OER’s visiting professor from University College London (Institute of Education), Professor Andrew Brown. He spoke on the topic of “*The Path to Research Enhanced Practice (and Practice Enhanced Research)*” before the participants engaged in a breakout session facilitated by OER researchers. The breakout session focused

on discussing potential research proposals in six areas, namely leadership, transitions, identities, curriculum, assessment and pedagogy innovations. The discussions that ensued between OER researchers and participants from MOE, Academy of Singapore Teachers and the schools paved the way for potential collaborative research between OER and its key stakeholders.

The session was concluded with moderators summarizing their respective group discussions. Overall, the ideation among the key stakeholders provided an excellent opportunity for networking and an exchange of ideas and opportunities for future research collaborations.

OER Organizes Science Research Sharing Seminar

OER held a science research sharing seminar on 21 March 2017 in collaboration with the Academy of Singapore Teachers (AST).

Themed “*Science Education in Singapore: Where to Next?*”, this seminar sought to generate conversations on the state of science education in Singapore and how pedagogical practices can be transformed to improve students’ reasoning and inquiry skills in the Sciences.

The seminar attracted a good turnout of approximately 200 participants comprising teachers, subject heads and MOE policymakers.



Researchers from OER’s Centre for Research in Pedagogy and Practice, and Learning Sciences Lab, and NIE’s Natural Sciences and Science Education Academic Group delivered presentations on the role of science education, the challenges facing the future of science education and pedagogies that can enrich students’ learning of the Sciences. Some of these speakers included Dr Dennis Kwek (Assistant Dean of Research Communications, OER) and Dr Michael Tan (Research Scientist, OER).

The seminar concluded with a panel discussion moderated by Professor Andrew Brown, where he spoke about Singapore’s accomplishments in science education and exchanged views with speakers on pedagogies that can increase students’ motivation in science learning.

Ed Research Highlights

Events by Office of Education Research

Redesigning Pedagogy International Conference 2017

One of the largest educational research conferences in Southeast Asia, the *Redesigning Pedagogy International Conference* (RPIC), was held at Nanyang Technological University from 31 May to 2 June 2017.

The conference organized by the National Institute of Education (NIE) brought together over 1,300 participants including those hailing from countries like Canada, Finland, Hong Kong, India, Indonesia, Japan, Norway, UK and USA. Most of the other local participants were representatives from local and international schools and institutions, the Ministry of Education, government agencies, and community organizations.

Focused on the theme “*Educating for the Future: Creativity, Innovation, Values*”, more than 407 presentations were featured in the form of keynote addresses, paper sessions, workshops, symposia and poster presentations.

As in previous conferences, there was a strong emphasis on researcher-practitioner collaboration at the biennial conference. The three-day programme included the launch of the Singapore Teaching Practice (STP) on the first day during the Opening Ceremony.

The STP brings together our teachers’ beliefs and practices to describe how effective teaching and learning can be achieved in the Singapore classroom. It is co-developed by the Ministry of Education and NIE. The STP provides the professional language and common reference point for the education fraternity to enhance their professional practice.



Upcoming Event by Office of Education Research

International Congress for School Effectiveness and Improvement Conference 2018

The 31st *International Congress for School Effectiveness and Improvement* (ICSEI) Conference will be hosted by NIE from **8 to 12 January 2018**.

The 2018 conference strives to unpack the theme of “*Deepening School Change for Scaling: Principles, Pathways, Partnerships*” through engaging keynotes, state of the art session, symposia and individual paper presentations by practitioners, academics, policymakers and researchers.

It is an opportunity for researchers and other stakeholders to gather from around the globe to discuss issues and concerns that impact school effectiveness and improvement.

For more information and registration, visit: <https://www.icsei.net/2018>

For any other enquiries, email: icsei2018@nie.edu.sg



New Publication

OER Knowledge Bites Volume 3

The latest volume of *OER Knowledge Bites* is now available for download on the NIE website. This volume, which sports a new look and feel, is a curation of a roundtable session organized by the Office of Education Research (OER), together with the Building a Reading Culture Project team, in February 2017.

Held at Commonwealth Secondary School, the roundtable, “How Design Can Help Us Rethink Library Spaces”, is the first of three series chaired by Assistant Professor Loh Chin Ee and Dr Mary Ellis from the English Language & Literature Academic Group at NIE. The second series of roundtable will happen this September 2017.

OER Knowledge Bites aims to share and discuss education research and issues in the Singapore context. It is also a platform for education researchers to share ideas in a way that is accessible to policymakers, educators and members of the public.

To download or for more information about this publication, visit:
<http://www.nie.edu.sg/research/publication/oer-knowledge-bites>



Others

OER at the American Educational Research Association Conference 2017



Following its inaugural exhibition booth at the Australian Association for Research in Education Conference at Melbourne, Australia last year, OER had its second booth set up at the recent American Educational Research Association (AERA) Conference. Held from 27 April to 1 May 2017 at San Antonio, Texas, OER aimed to increase international awareness of the three NIE journals—*Asia Pacific Journal of Education (APJE)*, *Pedagogies: An International Journal*, and *Learning: Research & Practice*—through the exhibition.

The AERA conference also saw an NIE reception on the second day of the conference where the three journals also made their presence. More than 150 people attended the reception.

Both the exhibition booth and NIE reception provided the Associate Editors, Editors and Editorial Administrators of the journals to speak with potential authors and reviewers. It also allowed existing authors to check the status of their manuscripts and provide instant qualitative feedback to the team.

An APJE author from Murdoch University, Australia, shares: “I find the publishing process very smooth and I am happy with the reviews that I received because they are very constructive.”

Ed Research Highlights

CONGRATULATIONS TO our colleagues whose research projects were approved for funding in the 17th Request for Proposals by the Office of Education Research.

Project No.	Project Title	Principal Investigator
OER 04/17 OBA	Technology-Based Tools for Teaching Early Literacy Skills	Beth Ann O'Brien
OER 01/17 JS	Inquiry Into Patriotism Among Social Studies Teachers in Singapore	Sim Boon Yee Jasmine
OER 02/17 HTT	Exploratory Study of Singapore Teachers' Implementations and Experiences of Differentiated Instruction	Heng Tang Tang
OER 03/17 RDR	Investigating 21st Century Competencies among Normal Technical Students	Roberto de Rook
OER 05/17 KYH	Syntactic Resonance in Child-Caretaker Interaction and Children's Peer Talk	Kim Younhee
OER 06/17 LWS	Teacher Motivation and Practices: Leadership Antecedents and Student Outcomes	Luo Wenshu Serena
OER 07/17 CWL	Assessment and Visualization of Collaborative Argumentation in Science Classroom	Chen Wenli
OER 08/17 VC	Digital Storytelling for Character and Citizenship Education: a Knowledge Forensics Approach	Chen Der-Thang Victor
OER 09/17 CYL	Impacts of a Socio-cognitive and Motivation-and-learning Approach on Students' Writing Quality and Reception of Self-directed and Collaborative Learning	Cheung Yin Ling
OER 10/17 KBK	Core 3 Research Programme: Baseline Investigation of Subject-Domain Pedagogies in Singapore's Primary and Secondary Classrooms (C3-PP)	Dennis Kwek
DEV 01/17 LYT	Learning Mathematics with Portable, Programmable Robots	Kenneth Lim Yang Teck
AFD 01/17 SR	Developing Teachers' Topic-Specific Pedagogical Content Knowledge (PCK) in Secondary Physics	S Ravindran
AFD 03/17 VA	Cognitive Diagnostic Assessment System (CoDiAS) for Singapore's Secondary Schools: Toward Individualized Learning and Assessment in Language Education	Vahid Aryadoust

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

read

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