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Innovative Interventions

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Big Idea

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A Case for Research Interventions in Schools

The changing educational landscape means that classroom pedagogy and the culture of learning are evolving. One way schools can adapt to such changes is by working with researchers on research interventions.

In education, an intervention happens when researchers or teachers introduce a new or different teaching approach in the classroom, and then compare it to a conventional teaching method (Levin & O'Donnell, 1999). Usually, this is done by looking at outcomes that are of interest, such as student gains.

But with over 20 years of experience in working with schools as a researcher, Prof David Hung knows that such gains are not always obvious.

Student Gains from Interventions

The saying of how good things come to those who wait may, in fact, be true. Often, success does not happen overnight for an intervention. Schools, parents and even the researchers themselves need to be patient and wait for interventions to bear fruit in the long run.

"The process isn't like solving your headache with a painkiller, but more of solving the root cause of your headache!" explains Prof Hung, who is the Associate Dean (Education Research) of the Office of Education Research (OER) in NIE.

This is because interventions delve deep and address the root of existing problems. While the results are not instantly obvious, their effect on learning is long-term.

"It's not always possible to measure the direct gains in terms of assessment," says Prof Hung. But research has shown us that a well-designed intervention will lay

The crux of the matter, really, is how teachers can take the opportunity and be courageous in experimenting with different curricular designs, and yet maintain good student performance in assessments.

- Professor David Hung,
Office of Education Research



An Institute of



In this issue



Sustaining a Teaching Intervention



Spreading a Good Intervention



The Student-centred Classroom

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the ground for conceptual intuitive understandings, and students will be able to “transfer” their learning as they progress to the next level in school.

Such gains, if achieved, can prove to be lifelong as students continue to learn and build on their solid conceptual foundations.

Do Schools Need Interventions?

If we use student performance in standardized tests to gauge how well Singapore teachers are teaching, then they are at the top of their game. Singapore students are known to ace international assessments such as Programme for International Student Assessment (PISA) and Trends in International Mathematics and Science Study (TIMSS).

If both teachers and students are already doing well, is there really a need for research interventions in Singapore schools?

There is cause for change, says Prof Hung. The educational landscape is changing and the emphasis is now on 21st century competencies (21CC). As 21st century learners, students are encouraged to learn more actively and independently.

The intent is to shift classroom pedagogy as we move towards 21st century learning.

- Prof Hung on the goal of research interventions

“If we know what our educational goals are for the 21st century, we can create interventions to address certain needs,” says Prof Hung. “The intent is to shift classroom pedagogy as we move towards 21st century learning.”

Many of OER’s research interventions are about 21CC and inquiry-based learning, he continues. Such efforts include the Critical Web Reader (See “Using Technology for Inquiry-based Learning” in this issue) and the Starling project (See “Bringing Second Life to Geography Lessons” in this issue).

At the same time, MOE has also been giving teachers more autonomy in designing the curriculum for their schools.

“The crux of the matter, really, is how teachers can take the opportunity and be courageous in experimenting with different curricular designs, and yet maintain good student performance in assessments,” says Prof Hung.

This balancing act is not an easy one. Coupled with the need for them to explore using technology in the classroom, teachers would probably appreciate a little support when they are trying out something new. This is where researchers can lend a helping hand.

Working with Researchers

Researchers usually think of their role as an outsider who might bring new perspectives to the table, when they collaborate with schools.

“They are very mindful that as outsiders, they will have to go through a process of trust-building with the teachers, to build a partnership in which both parties are equally important,” Prof Hung notes.

From there, they can work together to redesign a curriculum, which teachers then enact during their lessons while the researchers observe and collect evidence of the intervention’s impact.

Should a school take an intervention further and implement it in more classrooms? The answer to this lies in school leaders making an educated decision. Such a move requires more resources and certainly more of teachers’ time.

“You’ll want to ground your decisions on concrete evidence that an intervention does work, how it works, and what kind of students it works better for,” Prof Hung says. “If we scale the intervention from one school to a few schools, that calls for even more substantive evidence!”

Researchers will also act as a sounding board for teachers and provide constructive feedback as they work together to build teacher capacity. But to sustain the intervention, researchers will eventually step back and let teachers take over it.

“Our experience so far has shown us that that’s the way to go. Relying on researchers to sustain an innovation is not a sustainable strategy.”

Online Extras!

Read about the trajectory of a successful intervention in our online version.

Instead, a good intervention will rely on teachers who will see it through, year after year.

“Sustainability only occurs when a passionate teacher influences other passionate teachers and brings them to the same cause, and because they realize that by doing it, they engage in a meaningful experience for student gains,” Prof Hung notes. In many cases, teachers become convinced when they witness how low-progress students benefit from alternative approaches.

A Change of Cultures

After more than 10 years of collaboration, OER researchers have learned a lot from teachers and schools. They now have a better idea of what is needed for an intervention to flourish. “We found through our research that it is not as simplistic as just having an idea and just wanting to implement it,” says Prof Hung. “Really, it requires a change of cultures.”

For example, school leaders should try to give teachers more time and space to try out new approaches.

“You need to give the teacher more time to think through, to prepare, to go through a cycle of designing the lessons, trying them out and after that, reflecting on the lessons and retrying it on the same or different class,” says Prof Hung. “This iterative learning cycle needs to be introduced into the school culture and practices.”

In schools of the 21st century, students are not the only learners anymore. Teachers and school leaders are continually educating themselves to keep up with the times. They should embody the spirit of learning, as they take up the challenge of improving the education of their young charges.

“We want teachers and schools to continue to adapt and to develop a healthy culture of continuous learning,” says Prof Hung. He hopes that researchers can try out interventions that let teachers redesign curriculum and formative assessments, which will, in turn, create new classroom practices.

“If we can do so across schools in Singapore,” he says, “we can help to change the culture of learning.”

Reference

Levin, J. R., & O'Donnell, A. M. (1999). What to do about educational research's credibility gaps? *Issues in Education: Contributions from Educational Psychology*, 5, 177–229.

Professor David Hung is Professor and Associate Dean of Education Research with Office of Education Research, NIE. He is also the Head of Centre for Research in Pedagogy and Practice. His research interests are in the area of learning, in particular, socio-cultural orientations to cognition and communities of practice. In 2004, he initiated the set-up of the Learning Sciences Laboratory to focus on research on ICT infusion in student-centred learning.

Research

Sustaining a Teaching Intervention

Being part of a research-based teaching intervention is not easy, especially when it requires long-term commitment. However, some teachers took on this challenge by relooking at the way they teach reading comprehension.

Why Intervention Research?

Different types of research have different goals, and intervention research's is to make a change in the classroom.

NIE researcher Associate Professor Rita Silver says, “We're not just trying to find out about something or make recommendations. We're trying to change something during the research process, so it's really very intensive.”

For an intervention to work, Rita believes that a lot of time is needed for the teachers to understand the process as well as the new strategies. They have to be comfortable enough to adapt them for their own students.

“That's always the goal—not to follow the researcher's recipe, but to understand the innovation deeply and adapt it to what the students need,” Rita explains. “And if you want something to take hold, a longer commitment is needed from both the researchers and the teachers.”

Rita and Dr Jessie Png, Sub-Dean of the Diploma Programme and School Partnerships in NIE, embarked on a 3-year research project with a primary school to improve pupils' reading comprehension through discussion. The heart of the intervention is to encourage teachers to pose questions and probe students' understanding as they read a piece of text, so that they become more critical readers (Find out more about the project in “Sustaining Good Classroom Interventions” in *ReEd*, Volume 14).

That's always the goal—not to follow the researcher's recipe, but to understand the innovation deeply and adapt it to what the students need.

- Rita Silver,
English Language and
Literature Academic Group



Rita and Jessie believe that fostering good relationships with school leaders and teachers is important for a successful intervention.

Sustaining an Intervention

What makes for a successful intervention? Sustainability is one clear indication. And to sustain the intervention, Rita says that researchers and teachers have to work together to maintain it.

The issue for some schools is that after providing guidance for a short-term intervention, the researchers leave. The teachers either feel stranded, or start a new project without mastering what they had learned from the previous one.

Rita notes, “Even though it is tedious to keep working on it over several years, we found that it’s really important to do interventions longitudinally.

“In the first year, the teachers were trying to figure out what they were supposed to do. In the second year, they were practising it, getting more comfortable and adapting it to their pupils’ needs. It was only in the third year that they could really run with it.”

In the school Rita and Jessie worked with, the teachers mastered questioning techniques for teaching reading comprehension, and then mentored and trained other teachers.

“At the start of the second year, we asked if the teachers involved were able to share their new knowledge with their colleagues,” Rita shares. “But they didn’t feel confident enough. So we gave them another year, and they actually agreed to teach the other teachers. So again, the longitudinal aspect of the project is very important.”

By the end of the research project, the school took over the intervention and wove it into their teachers’ professional learning community (PLC) discussions.

“Even though the teachers and Head of Department were hesitant at first, they were willing to try, and they saw the change in their teaching,” Rita says. “It’s really a joy for us to see how it has progressed.”

Close Collaborations

Rita and Jessie found that close collaborations between the school leaders, teachers and researchers are also important for a successful intervention.

“Having an expert to guide the teachers along is important,” adds Jessie. “It can be quite challenging for the school if they have to constantly try and figure things out on their own.”

Despite taking a step back after the school had successfully taken over the intervention, Rita and Jessie still participate in their PLC discussions by invitation. The teachers find it especially useful when they are given critical feedback by Rita and Jessie, because some do not feel comfortable providing such feedback to their own peers.

Jessie notes that teachers have to be open-minded when participating in any intervention. Some teachers initially did not feel ready to change their questioning style. They worried about unexpected questions and answers. But through practice and mentoring, they learned to be more confident.

Rita emphasizes that teachers have to be willing to take time. She and Jessie tracked the students with reading comprehension tests at the start, middle and end of every year, and found that there were no significant differences between students in the project and other students during the first 2 years.

However, in the final year, they found that students who were taught by the most experienced teachers in the project did better comparatively. Hence, only when teachers were using the intervention methods more consistently and effectively did the students produce better results.

“Work with a group of peers and work with a mentor,” Rita advises teachers. “Don’t expect immediate results—it takes some time for the teachers to learn, just as it takes time for the pupils to learn.”

Online Extras!

Read more about how Rita and Jessie carried out this intervention in our online version.

Rita Silver is an Associate Professor and Deputy Head (Research) with the English Language and Literature Academic Group (ELL AG). **Jessie Png** is a Senior Lecturer with the ELL AG, and Sub-Dean of the Diploma Programme and School Partnerships at the Office of Teacher Education at NIE.

Their project on reading comprehension is titled “Comprehending Reading Comprehension: An Intervention in P4 Reading”.

Spreading a Good Intervention

Would too many cooks spoil the broth? Not when it comes to scaling up an intervention! Beginning and experienced teachers from six schools, researchers, and Education Technology Officers from MOE all got down to work to see how they can spread the use of technology in inquiry-based learning.

Learning is an important part of being a teacher. And much like students, teachers learn more when they collaborate with others.

Nan Chiau Primary School had a promising intervention on their hands. Good ideas are meant to be spread, and they did just that, by working with four other schools in a North Zone cluster to scale it up, which includes Xishan Primary School.

Inquiry-based Learning and Technology

Can 40 pupils all actively participate in class and still be heard at the same time? With technology, the answer is yes!

In inquiry-based learning, teachers do not just provide information and facts to their pupils. Instead, pupils take the lead in their own learning: They collaborate, discuss, rationalize and vocalize their answers.

This is where technology comes in, to let pupils express themselves in different ways. Teachers can also capture their conversations and answers, and identify any misconceptions pupils may hold.

“In the past, lessons are more teacher-centred,” Ms Jenny Lee, the Subject Head of InfoComm Technology at Nan Chiau Primary, notes. “But after we embarked on this project, we use the smartphones to focus on in-class participation.”

For example, Jenny uses mobile apps, such as Socrative, which let pupils respond real-time to class discussions.

“We go through their responses and ask them to explain why someone gave a correct answer or a wrong one, so that they can elaborate and voice out how they feel about things.”

Learning beyond the Classroom

Jenny’s pupils enjoy using the smartphones outside of the classroom as well. With an app like MyDesk, teachers are able to set online assignments and assign more than just worksheets.

Nicole Naomi Tan, a Primary 4 pupil in Nan Chiau Primary, especially loves using the Sketchbook section of the MyDesk app. “We were out for an excursion and used the phone to create a digital sketchbook to do an assignment. Then, we submitted it to our teachers on the spot.”

Her classmate Tan Shan Lyn adds that besides being convenient, the app made their learning more fun. “We get to write, draw and include pictures from the Internet!” she enthuses. “Our teacher will also show us her favourite sketchbooks afterwards and we can learn from each other and see how interesting and creative we are in our work!”

Furthermore, with the devices, the pupils enjoyed the classes more because they get to collaborate with their classmates. “Instead of the teacher always telling us that we cannot talk to our friends, we get to interact with them through the apps,” says Nicole.

“Certain skills are being taught in the process as we get them to do different things in class, like presentations and debates,” notes Jenny. “This gives them different ways to learn in the classroom, not just with worksheets or pen and paper. Students get to talk and discuss, vote in polls, or give comments about what their friends draw.”

Planting the Seed of Intervention

This intervention is part of the project “Inquiry-based Seamless Learning in Primary Science”, a collaboration between Nan Chiau Primary and NIE researchers like Prof Looi Chee Kit and Dr Wu Longkai. Led by Jenny, the project kicked off in 2008 when Nan Chiau Primary’s in-house research centre first opened its doors.

It started with a pilot Primary 3 Science class, but the intervention was soon diffused to the Primary 4 classes and even other subjects in 2010. In 2013, Nan Chiau Primary’s Cluster Superintendent Mr Loke Chee Peng suggested that they scale it to other schools in the North Zone clusters, and five schools soon joined them in this effort.



In the past, lessons are more teacher-centred but after we embarked on this project, we use the smartphones to focus on in-class participation.

**- Jenny Lee,
Nan Chiau Primary School**

Online Extras!

Find out how Jenny gets her pupils to conduct Science experiments at home. Read our online version!



(From left) Razinah, Cloud, Diane, Li Xin and Amanda believe that using the tablets make their Science lessons more meaningful.

Since Amanda and I co-teach, we give each other feedback after the lessons and make sure we're on track. It's a constant source of support.

- Razinah Abu Bakar on supporting each other during the intervention

One of them is Xishan Primary School. Ms Amanda Tan, the Head of Department (Science), Ms Razinah Abu Bakar and their two other colleagues represented the school for this research intervention.

As part of their professional development (PD), they observed lessons at Nan Chiau Primary and then co-designed their curriculum to incorporate the use of technology.

"We wanted to know how Nan Chiau did it," says Amanda. "The format of this project first allowed us to be on-site and to see how their teachers implemented it. In the co-design sessions, we looked at how we could adapt it for the profile of our children."

"When we use the ICT tools in the classroom, it's not about adopting their platform wholesale," she continued. "It's about using the platform meaningfully in our Science classroom and context."

As with Nan Chiau Primary, pupils at Xishan Primary are also happy to work with technological devices—tablets, in their case. Primary 3 pupils Simon Diane Clarice, Su Li Xin and Cloud Borja say that the tablets got them excited about learning Science. They use an app called Linoit, where teachers pose questions and pupils would write their answers on sticky notes.

"When the question is too difficult, I will go out of the app and research for the answer," says Cloud. "And then I learn about it. Sometimes, it's not even in the textbook."

When asked if reading her peers' answers helped, Diane notes: "Yes, I'll read and think to myself that that's a better answer, and I should learn from that and change my answer."

The Right Mix

Behind every successful intervention, there is a lot of work and people involved. Getting the right mix of people to work together is crucial.

"We have very experienced teachers, beginning teachers, researchers who are very strong in research and pedagogies, and Education Technology Division officers who know the curriculum and technology well," says Jenny. "This made for a very effective group during PD sessions!"

For example, NIE researchers worked closely with her throughout the project. "As a teacher, sometimes I can't explain what pedagogy or model I'm using in the classroom, but the researchers can break it down for me," Jenny adds. "They're able to explain the good things we're doing in class and how it impacts our pupils. This makes me find my job even more meaningful."

She feels like she has become a better teacher from this experience, especially when she is now able to mentor other teachers.

The researchers were also crucial in getting other schools and teachers committed for this project. "When teachers see the research done on the rise of 21st century competencies and how to engage students, they understand why our project is important," she explains.

The teachers at Xishan Primary also appreciate working with their colleagues from other schools and organizations.

"Having a mentor and a group to work with really helps," Razinah adds. "Jenny has done the intervention at Nan Chiau before, so based on what she shared, we didn't have to reinvent the wheel."

Jenny Lee is the Subject Head of InfoComm Technology (Special Programme) at Nan Chiau Primary School. She has been teaching for 9 years. **Amanda Tan** is the Head of Department (Science) at Xishan Primary School. She has been teaching for 5 years. **Razinah Abu Bakar** is a Primary 4 Form Teacher at Xishan Primary School. She has been teaching for 11 years.

The project they are involved in is "Inquiry-based Seamless Learning in Primary Science".

Within the classroom, the teachers also look out for each other. Razinah says, “Since Amanda and I co-teach, we give each other feedback after the lessons and make sure we’re on track. It’s a constant source of support.”

Jenny agrees that working together can only help in the scaling up of the intervention. “Nan Chiau took 5 years from a pilot class to a successful roll-out. We wanted to shorten the learning curve for all the schools based on our experience,” she says.

In the end, she reminds teachers to always keep the students in mind. It’s not just about delivering the content, but also about engaging them. To do that, they may need to step out of their comfort zone.

Working with observers in the classroom, for example, is something that some teachers need to get used to, Jenny says. “But you have to be receptive to what the researchers and your colleagues say. Don’t say you can’t do it—you need to have the spirit of trying!”

People

The Student-centred Classroom

For too long, the teacher has taken on a central role in the classroom. What happens when a teacher decides to direct the focus to the students and their ideas instead? According to Dr Teo Chew Lee from MOE, the results of doing so may surprise many.

The possibility of having knowledge-building classrooms in Singapore has always intrigued Dr Teo Chew Lee, a Lead Specialist at MOE. Starting out as a Physics teacher for Normal Technical students some 12 years ago, Chew Lee faced what most other teachers face—difficulty getting the students to understand scientific concepts.

While doing her Masters at NIE, Chew Lee was introduced to the knowledge-building approach to teaching. She tried it out on her students, and was pleasantly surprised by the positive results. Seeing the change in her students got Chew Lee all excited about the possibilities of knowledge-building classrooms in Singapore (Read about her project with Associate Professor Tan Seng Chee in “Creating Idea-centred Classrooms” in *ReEd*, Volume 8). We talk to Chew Lee about her views on knowledge building and why an “idea-centred” classroom is the way to go.

Q: What is knowledge building about?

Knowledge building is about putting the students’ ideas and questions in the centre of the classroom. When you adopt an idea-centred approach, you focus more on understanding the students’ thinking and ideas. An idea-centred teacher might try to ask the student about the idea and where he gets it, and whether other people have ways to build onto his idea so that the whole class understands. The students become your teaching resource.

Q: Did your knowledge-building project involve intervention in the classrooms?

Yes. We called it the principle-based approach to teaching and learning. Teachers have to understand the principles that underline these classrooms. Knowledge building has 12 principles. One of them is to get students to bring in constructive use of authoritative sources to bring about an improvement of their ideas.

To the teachers, these are very technical terms. But we encapsulate the principles into key ideas. We don’t change what the teachers do immediately. In my work with the teachers in Singapore, they are very passionate about their craft. But the problem is usually time constraints, and teachers stop short of the most exciting part. For example, teachers will set up very nice demonstrations, and when the students start asking questions, they would stop there.

Knowledge building starts when the students start asking questions. When I introduce this intervention to the teachers, I hope to let them understand the principles underlying it. The intervention I do is also about embedding knowledge-building theory, pedagogy and technology within the complexity of the classroom. This means that I have to understand everything the teacher has to deal with while making sense of this approach.

Q: You mentioned about designing the intervention for the complex nature of the classroom. Can you give us an example from your own experience?



Knowledge building starts when the students start asking questions. When I introduce this intervention to the teachers, I hope to let them understand the principles underlying it.

- Teo Chew Lee,
Ministry of Education

I find that schools right now are very advanced in their thinking, and our principals are very willing to embrace innovative practices.

- Chew Lee on working with schools

Let's say you look at a natural classroom environment and its curriculum coverage. If you want to construct an idea-centred classroom, you've got to help teachers see the big ideas within the curriculum in order for them to allow the ideas to come into the classrooms. So you've got to deal with curriculum issues. Once you allay that fear, teachers are able to focus on students' ideas in the classroom and you get very good knowledge-building practice. If you just go in to focus on knowledge building and not the curriculum, it may not turn out well.

You need to also understand what the teachers are most concerned with—the curriculum, pedagogy, classroom environment and so on. Of course, the last bit that everybody worries about is assessment. So in order for your intervention to work in the classroom environment, you've got to be able to explain your intervention and the outcome in relation to the kind of assessment that the schools are looking at. Seek for ways where you can even redesign some of the questions in the exam. We had a Math teacher who used the knowledge-building approach and put in a very difficult question in the Primary 5 exam and found that the student was able to tackle the exam.

Once you get a hang of these broad areas, you can explain your design to the schools, identify the limitations, and work out a compromise. This shouldn't compromise the rigour of the research, but rather, shows the respect you have for the school.

Q: What is key to a successful intervention?

I think the whole design has to be really teacher- and student-centric. By choosing to work on knowledge building in the schools, you have to design it based on the natural school and classroom environment. You have to find creative ways not to disrupt that natural environment, and yet, be rigorous enough to understand the impact of your study.

It is important to also look at the trajectory of the students at each cycle. For example, in the first term, you can analyse their scientific literacy based on discussions in class. Then, you can assess the development in their literacy skills in the second term, and so on. In other words, we look at the trajectory of the students at each cycle instead of comparing them to another class.

I find that schools right now are very advanced in their thinking, and our principals are very willing to embrace innovative practices. By partnering with the schools in these intervention projects, we have allowed trust to be built up quite naturally over time. My experience with the Singapore teachers and principals has also been very positive. Also, the support I received from NIE through my collaboration with Seng Chee on the knowledge-building project has helped make this possible.

Q: Are there any instruments to evaluate the students' learning gains from this approach? Are these gains only in terms of assessment?

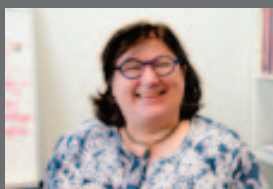
There are ways to translate motivation and engagement into constructs for measurements. But my focus is not so much on those. Most of the time, the teachers know it. For me, the focus has very much been on measuring the knowledge-building activity that has been captured on the Knowledge Forum (an electronic group workspace designed to support the process of knowledge-building). This forum offers an online platform for students to share information, launch collaborative investigations, and build networks of new ideas.

We will look at the collaborative indicators to ascertain how much a student has contributed to knowledge building in the classroom. For example, for self-directed learning, we look at the students' vocabulary and writing ability growth. In scientific literacy, we do coding against the quality of the questions and their explanations, and the "scientific-ness" of their ideas. Then, we formulate this composite picture of their knowledge-building activity, and analyse this against their school results.

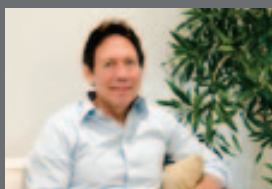
Teo Chew Lee is a Lead Specialist, Learning Partnership in Educational Technology, at the MOE. She was formerly a Science teacher. She is involved in the project "Designing Knowledge Building Environment (with Technologies) through Teachers' Collective Discourse".

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