Conceptualising a Framework for Engaged Learning in the Context of IT MasterPlan II in Singapore

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Abstract
Recent literature has emphasised active and learner-centred learning as opposed to passive and didactic methods of learning. The term “engaged learning” is often used synonymously with active learning, self-directed learning, collaborative learning and other similar constructivist pedagogies. In this paper, we will track how Singapore’s education system has advanced from certain key initiatives in recent years to the next lap of embracing the engaged learning paradigm. We propose a definition and some indicators of engaged learning that are relevant to the Singapore context and advance a framework for bringing about engaged learning. In particular, the Instructional Science Academic Group of the National Institute of Education (NIE) will be developing a programme based on this framework of engaged learning for preservice and in-service teacher education and professional development. While this framework is conceptualised for teacher education and professional development, its components provide the basis for classroom teachers and administrators to design and implement effective instructional programmes that promote engaged learning in Singapore schools.

Introduction
The purpose of this paper is to articulate a framework for engaged learning that can be actualised among the participants of both pre- and in-service teachers at the National Institute of Education, Singapore (NIE). In recent years, different academic groups at NIE have been designing modules that address various aspects of teacher education with regards to IT integration, facilitation and other forms of process skills. We (at the Instructional Science Academic Group) recognise that it is time for a synthesis of the work done and consolidation of a pedagogical framework for engaged learning through IT. This framework defines the philosophy and approach to the modules we conduct in teacher education. The focus on teacher education is on both skills and knowledge but more importantly on the core values and beliefs of learning. The paper is organised around the context of two IT Masterplans (MOE, 1997a, 1997b, 2002) conceived by the Educational Technology Division (ETD) of the
Ministry of Education (MOE) and how we can facilitate engaged learning. The framework discusses how engaged learning could be realised in teacher education through understanding 1) how learning occurs; 2) a learner-centred curriculum; 3) the process skills and attitudes needed; 4) the relevant IT tools for these process skills both from the learners’ and teachers’ perspectives; 5) pedagogical approaches such as problem-based learning; and 6) approaches to assessment.

**First and Second Masterplans for IT in Education**

Since 1997, several new initiatives have been implemented in the Singapore education system. These include National Education, the first Masterplan for IT in Education (MPITE), Thinking Programme (TP) and Project Work (PW). These initiatives aim to prepare our learners for the knowledge-based economy in the 21st century to achieve the vision of “Thinking Schools, Learning Nation”. It is a vision for a total learning environment, including learners, teachers, parents, workers, companies, community organisations and the government. “Schools must develop future generations of thinking and committed citizens, capable of making good decisions to keep Singapore vibrant and successful in future.” (MOE, 1997a)

Among these new initiatives, the PW initiative provides learners with opportunities to explore the relationship and interconnectedness of knowledge across various disciplines. By introducing PW into the curriculum, it is anticipated that learners will be better equipped with creative and critical thinking skills, have their communication skills improved and have their collaborative learning skills fostered and their self-directed inquiry and life-long learning skills developed (MOE, 2000). The PW initiative is learner-centred and is supported by the implementation of MPITE, where technology is incorporated into the PW curriculum. The Minister of Education, Teo Chee Hean, in his opening speech at the launch of the MPITE on 28th April 1997, said that

“Singapore’s Masterplan for IT in Education lays out a comprehensive strategy for creating an IT-based teaching and learning environment in every school. It will be one of our key strategies for equipping our young with the skills that are critical for the future — creative thinking, the ability to learn independently and continuously and effective communication. The government spent S$2 billion from 1997 to 2002 to put information technology into all the schools to enhance teaching and learning.” (MOE, 1997b)

At the closure of the MPITE in 2002, the achievements of MPITE were summed up appropriately as

“The six-year MPITE has managed to equip teachers with the basic information technology skills so that they could use electronic resources and tools to enhance their teaching. The impact of the first Masterplan is evident in the way pupils have made use of technology to open up new boundaries of learning; in the professional growth of our teachers; in the development of a supportive school IT culture; and in the enhanced relationship between schools and the community.” (MOE, 2002)

In order to sustain the momentum gathered and make better use of technology to stimulate thinking and creative endeavour among our learners, MOE launched the second IT Masterplan (mp2), a five-year plan for schools spanning from 2003 to 2007. A key area of mp2 is to use IT to enhance the connections
between the curriculum, instruction and assessment methods. Another key area is the use of IT to stimulate pupils to think and experiment independently and creatively. These are fundamental learning objectives for an innovation-based era. In essence, mp2 focuses on getting learners to use IT for engaged learning (MOE, 2002).

**Engaged Learning**

We shall first discuss the concept of engaged learning, how Singapore is embracing engaged learning in the second IT Masterplan and the role of IT in actualising engaged learning. Engaged learning is not a totally new concept. It can be traced back to the earlier years of the 20th century, when Dewey (1933) argued for active and engaged learning through inquiry. Bangert-Drowns and Pyke (2001; p 215) called engagement “the mobilisation of cognitive, affective and motivational strategies for interpretive transactions”. Engaged learning has been revitalised by the North Central Regional Educational Laboratory (NCREL) because of the demands of 21st century skills. The goal of engaged learning is to produce learners who are strategic in managing their own learning; enthusiastic in pursuing understanding; and collaborative in social settings. To achieve the goal, learners are given challenging and authentic problems that usually require the integration of multidisciplinary knowledge to solve. As the problems are complex real world problems, collaborative knowledge building is called for. Learners in heterogeneous groups are to assume the roles of explorer, cognitive apprentice and producer of knowledge. Teachers act as guides, facilitators and co-investigators to support the learners’ pursuit of deep understanding. The resulting instructional models are highly interactive and generative. Assessment for engaged learning are performance-based, utilising performance criteria that are ideally negotiated outcomes between teachers and learners (Jones et al., 1995; Apple Computer, 2000). NCREL has also emphasised the importance of technology in actualising engaged learning.

Underlying the drive towards engaged learning is the concern about learners’ engagement in their learning. Generally, engagement is believed to be a valuable educational aim and a key to school improvement (Butler-Kisber & Portelli, 2003). The level of engagement or disengagement is positively or negatively related to learners’ achievements as highlighted by Finn, Pannozzo, and Voelkl (1995). Disengagement had been theorised as the process that eventually leads learners to drop out from schools (Finn, 1989). Moreover, learners’ engagement in learning should also enhance their capacity for life-long learning and development (Kuh, 2003).

Research studies have provided some support to the features of engaged learning described by NCREL. Conceptualising engagement from the perspective of the flow theory, Shernoff et al. (2003) investigated factors that contribute to learners’ engagement. Their study suggests that tasks that are relevant to learners’ needs and at the same time challenging but achievable can engage learners.
Learners are also more engaged in individual work and group work rather than listening to lectures. In addition, tasks that promote learner autonomy are also conducive in engaging learners.

**Defining Engaged Learning in Singapore Context**

Reform-oriented pedagogies such as "Engaged Learning", as proposed by mp2, describe the role of teachers as that of a facilitator rather than that of a transmitter. Embracing this form of learner-centred teaching requires teachers to be "practical intellectuals, curriculum developers and generators of knowledge in practice" (Feiman-Nemser, 2001; p 1015). As teachers are the key to the success of reform (Fullan, 2001), there is a need for teacher educators and researchers to innovate professional development for teachers. For this reason, the Instructional Science Academic Group (ISAG) of NIE has come up with a framework to implement engaged learning in our preservice and in-service teacher development modules.

To suit our local context, we define engaged learning as an ongoing process in which learners construct meaning, communicate and collaborate effectively, solve problems, self-regulate their learning and learn intentionally in a facilitated learning environment.

This working definition provides learning outcomes of what we want to see happening when our learners go through any learning task. Very often, we produce learners who might be engaged in their learning tasks and scoring straight As in their examinations. However, when it comes to working in the workplace, they might not be able to work well with others, think out of the box to innovate and be creative. Hence, the next critical question we need to address is defining why we need to have engaged learners and what it means for a learner to be engaged in the Singapore context — the rationale for facilitating engaged learning.

**Framework for Engaged Learning**

The Framework for Engaged Learning is the roadmap from a teacher’s perspective on how educators can implement engaged learning in schools. It has six components that serve as a scaffold to guide teachers bring about engaged learning. At the heart and centre of the framework lies the rationale hexagon (Figure 1). This framework also acts as a visual organiser to guide a teacher to think about the following six key questions:

- Who is the target learner and what does research say about how these learners learn?
- What do learners need to know?
- How do we teach for transfer?
- What are the tools needed to mediate engaged learning?
- How do teachers engage learners in learning?
- What will learners be able to do because of what they have learned?
## Conceptualising a Framework for Engaged Learning

### 1 Learners & Learning Theories
- Who is the target audience?
- What are their attitudes towards learning?
- How do learners learn?
- What does research (learning theories) say about how learners learn?

- Situated cognition, behaviourism, cognitivism, constructivism, social constructivism, learning styles

### 2 Curriculum
- What do learners need to know and be able to perform? (Goals & SIOs)
- How do we contextualise the curriculum for the learners?  
  E.g. formulate SIOs in knowledge and process skills & make meaning for the learners
- What are the milestones of the learning process?

### 3 Teaching for Transfer
- What are the necessary process skills to equip the learners with?
- How do we infuse these skills into the curriculum?

- **Thinking Skills**: comparing, classifying, deduction, problem solving, decision making.
- **Cooperative Learning skills**: think-pair-share, Jigsaw, gallery walk, role-play, etc.
- **Communication skills**
- **Metacognitive skills**

### 4 Tools
- What are the tools needed to mediate engaged learning?

- **Non-IT Tools**
  - Instruction sheets, activity sheets, construction kits, modeling kits, write/draw tools...
- **IT Tools**
  - Cognitive tool, visualisation tool, communication/collaboration tool, productivity tool, contextualisation tool, information tool, scaffolding tool

### 5 Pedagogical Approaches
- How do we engage learners in learning?

- **Learner-centred Approach**: meaningful, authentic and relevant
  - Project work, problem-based Learning, case studies, inquiry, role play, etc.
- **Teacher-centred Approach**
  - Lecture, tutorial, quiz, etc.
- **Facilitation Skills**: modeling, coaching, scaffolding
- **Classroom Management skills** for different learning environments.

### Fig. 1. Framework for engaged learning from the teacher's perspective.

**Central Hexagon: Rationale for Facilitating Engaged Learning**

Before we design the framework and programmes on engaged learning, we need to understand the rationale for engaged learning. Teachers need to ask "Why do learners need to know what we're teaching?" and "How does engaged learning prepare the students for life-long learning?" In line with our national goal to have a workforce that can constantly remake Singapore and contribute to the nation...
building in the global economy, we would like to prepare the learners (refer to both teachers and students) of today to become

- knowledge producers;
- effective team workers;
- effective problem solvers;
- effective communicators and collaborators;
- contributing citizens;
- technology literates;
- innovators and entrepreneurs.

As educators, we need to constantly reflect and ask whether what we teach and how learners learn can help them realise the above rationale as indicated in the central hexagon (refer to Figure 1). This central hexagon provides the focus of this proposed framework for engaged learning. It is hoped that it will provide the necessary anchor for teaching and learning in schools. These goals are what we hope to develop in learners so that they can contribute to the society and perhaps benefit from the communities in which they live in. This central hexagon also aims to prepare students for the “real world” in the work place. It is therefore important for teachers to experience engaged learning and provide learning opportunities to nurture learners in experiencing engaged learning while they are in schools. Currently, a module that is based on an engaged learning framework is being piloted on 210 trainee-teachers. It is hoped that through this piloted module the teachers would experience engaged learning for themselves as a start. In this module, there are key questions about engaged learning that teachers need to bear in mind:

- What is engaged learning for themselves and how do they encourage engaged learning among learners?
- How do teachers teach for transfer? What are the process skills that learners need to possess for engaged learning? What are the facilitative skills that teachers need to acquire in order to facilitate skilfully?
- What are the appropriate IT tools to use so as to foster learners’ learning? What are the IT tools that teachers can use as they facilitate and engage students in learning?
- How do teachers evaluate the processes and products of learners’ learning? How do teachers design authentic rubrics for evaluation and peer assessment?

This central hexagon addresses the “Why” question for all the teaching and learning activities: Why do learners need to know what we are teaching them? It provides the driving force for all the six components mentioned (refer to Figure 1), and details of each of the component will also be presented.
Hexagon 1: Learners and Learning Theories

Hexagon 1 addresses the first key question: Who are the target learners and what does research say about how these learners learn? The teacher needs to analyse the learners and their attitudes towards learning. For this part, this is similar to the first step of instructional design of analysing the target audience. However, what is not explicitly emphasised in instructional design theories is the use of learning theories and existing research on how specific learners learn. To improve practice, the teacher should be knowledgeable about such learning theories and research, especially in the area of situated cognition, behaviourism, cognitivism, constructivism, learning styles, multiple intelligences and brain research. This research will guide the teacher to better tailor instruction and strategies that match the learner’s profile. The key questions that trainee-teachers need to reconcile are: What is engaged learning? What are the indicators of engaged learning? How do teachers recognise that engaged learning has occurred? These questions are not trivial because much of what occurs in the classrooms in many educational settings requires large quantity of worksheets to be completed by learners, and these environments do not necessarily indicate that effective learning has occurred.

Hexagon 2: Curriculum

Hexagon 2 addresses the second key question: What do my learners need to know? Here we are concerned with the curriculum goals and specific instructional objectives for each of the goals and the milestones of the learning process. More importantly, for the teacher, it is not merely about transmitting facts but how we can contextualise the curriculum for the learners. Contextualising the curriculum is akin to Smith and Girod (2003) arguing that teachers should "psychologise" or reinterpret the fundamental concepts and methods of the respective disciplines in accessible, engaging and powerful ways for learners. Therefore, contextualising the curriculum is about making meaning of the subject matter for the learners. However meaning making must also be a constant activity for the learners, and a good way is to get learners in a community of practice engaged in collaborative dialogue and debate. In this sense, trainee-teachers need to develop the disposition to translate curriculum materials into meaningful learning outcomes based on the individual profiles of learners in their respective classrooms. Curriculum structures must also be sufficiently flexible so that teachers would have space to psychologise the content for the needs of the learners in their classrooms.

Hexagon 3: Teaching for Transfer

Hexagon 3 addresses the third key question: How do we teach for transfer? There are other related questions, such as What are the process skills and attitudes learners need to be equipped with? and How do we infuse these skills into the curriculum?
The process skills and attitude of learners are far more important than the subject matter knowledge. The process skills taught and individuals' dispositions pave the life-long learning journey of learners. Hence, we believe that this area of teaching for transfer merits a separate component in our framework that we hope to emphasise in working towards engaged learning. Transfer of learning means learning the knowledge and skills in one context and applying it in another (Fogarty, Perkins, & Barell, 1992). If there is no transfer at all, then students will need to be taught specifically every act that they will ever perform in any situation (Bigge & Shermis, 1991).

We could easily recall our own experiences of sitting through boring lessons that served no connections with our lives, and they were simply not engaging. Teachers should not encourage mere use of rote learning but facilitate by asking questions and setting the tasks that require higher level thinking from students. In order to nurture effective thinkers, teachers are required to teach students thinking skills such as comparing, classifying, deducing, problem solving and decision making. Cooperative learning could also be incorporated into learning activities involving group work. These cooperative learning strategies are think–pair–share, round robin, jigsaw, gallery walk and role play. Communication is another important skill for learners to acquire and teachers need to be mindful that our lessons are not too teacher-centred and teacher-led. Teachers should allow more time for learners to talk, ask questions and make oral presentations. There should be metacognitive activities to allow learners to monitor their progress, reflect and learn from their experiences. In short, teachers should understand learners, design appropriate curriculum and teach skills and strategies so as to help students make meaningful connections about their learning and solving problems.

In order to teach for transfer, Fogarty, Perkins, and Barell (1992) listed 10 mediation strategies to help students transfer learning within a subject area, across different subject areas and to real life situations. By teaching students to transfer the skills gained to real-life situations, lessons taught in schools will become meaningful and relevant to students. This may also have an impact on the students' attitude towards learning when they leave schools. Indeed, the teaching for transfer as mentioned in this third hexagon relates to the central hexagon of the rationale for engaged learning in this proposal.

**Hexagon 4: Tools**

Hexagon 4 addresses the fourth key question: What are the tools needed to mediate engaged learning? The tools that mediate and support engaged learning can be classified broadly under IT tools and non-IT tools.

IT tools are computer-assisted tools, which include production tools (e.g. video-editing, website production) and mind tools (Jonassen, Peck, & Wilson, 1999), which can include productivity tools like spreadsheet and concept-mapping tools. Such productivity tools, if used creatively by teachers, can be
turned into mind tools that engage learners actively in the understanding, synthesis and creation of knowledge rather than mere presentation or organisation of information. In essence, we can broadly conceptualise seven categories of IT tools. These broad categories of IT tools function as the following:

- a visualisation tool to enable learners to visualise difficult concepts through simulations
- a contextualisation tool for learners to represent contexts and problem solving situations through video and other forms of media
- a cognitive tool or mind tool to assist learners to conceptualise and associate meanings in the form of concept maps and other forms of epistemic structures
- a collaborative or communicative tool to facilitate knowledge building or the social construction of meanings
- a scaffolding tool to guide learners through a certain sequence or series of activities or outcomes without which the learner would be unable to achieve
- a productivity tool to perform a task more efficiently such as spreadsheets or calculators
- a information tool to assist learners to search for relevant information, etc.

These IT tools are used to facilitate learners in thinking, communication, collaboration, project work, problem solving and learning about concepts.

Non-IT tools include traditional teaching and learning aids like instruction and activity sheets, construction kits, modeling kits and writing and drawing tools. These tools would require teachers to customise instructions and design learning tasks to challenge learners to go beyond the regurgitation of facts. In order to maximise learners’ learning, teachers need to give more time for learners to concentrate on learning activities rather than on learning about the tools. Teachers may do so by providing brief instructional worksheets to help students use the tools effectively. Teachers would also need to design activity sheets that have a mix of knowledge domain questions and application-type problems so that learners can be challenged to use information sources and knowledge to solve problems meaningfully.

**Hexagon 5: Pedagogical Approaches**

Hexagon 5 addresses the fifth key question: How do teachers engage learners in learning? Under pedagogical approaches, we focus on both teacher-centred approaches and learner-centred approaches. Although most of the literature seems to favour learner-centred approaches and emphasises why learning should focus on learners, there is still a place for traditional teacher-centred approaches. Lectures, concept teaching and tutorials are some examples of teacher-centred approaches. Real-life constraints such as duration of lessons and learner abilities and other constraints such as shortage of resources may mean that it is impractical
and perhaps undesirable to conduct only learner-centred activities in classrooms. In fact, teacher-centred and learner-centred approaches should be incorporated in teaching and teachers need to be flexible enough to alternate between these two pedagogical approaches.

Learner-centred approaches include individual and group teaching. Role play, anchored instruction, project-based learning and problem-based learning are some examples of learner-centred approaches. In fact, project-based and problem-based learning share some common elements in that they emphasise the following:

- Authentic, "real-world" tasks play a central role in the educational process.
- Open-ended projects or problems with more than one answer or approach.
- Learner-centred approach with the teacher in the role of facilitator or coach.
- Learners are encouraged to seek out multiple sources of information.
- Cooperative groups work together to solve the problem.
- Authentic, performance-based assessment.

The importance of project-based learning approach is the impetus behind the Singapore Ministry of Education's Project Work initiative.

In this hexagon, teachers should be mindful of appropriate facilitation skills and classroom management skills in order to create conducive learning environments for teaching and learning to take place. Teachers should model, coach and scaffold learners within their zone of proximal development so that learners can eventually handle their learning tasks independently when scaffolding eventually fades. In order to engage learners in learning, facilitators should constantly pose questions to learners. These questions may include, "Do you know what this means?", "What are the implications of this piece of information?" or "Is there anything else that you want to ask?" This process will encourage learners to think critically and reflect on their understanding.

**Hexagon 6: Assessment**

Hexagon 6 addresses the sixth key question: How do educators assess our learners' learning and performance? Put in another way, "What will learners be able to do because of what they have learned?" This question relates back to the rationale of "Why do learners need to know what we are teaching?" The focus is on what we know about formative and summative assessment, standardised and alternative/authentic assessment methods; what we know about self-assessment, self-reflection and going beyond the acquisition of knowledge to the understanding and application of knowledge. Assessment here focuses on process and product. For assessing the learning process, aspects such as online discussion, ongoing reflection logs and portfolios can be included. Often, teachers may want to evaluate the thinking skills that are utilised by learners to complete the tasks assigned.
For assessing the product, aspects such as learners' work in the form of project write-ups, oral presentations and artefacts can also be included. With the engaged learning framework in mind, we need to check constantly the rationale of assessments by asking questions such as "How does the class work or homework assigned engage students in becoming contributing participants in their living communities in which they will live?"

**Indicators of Engaged Learning**

Thus far, the framework for engaged learning describes the six components that are necessary for realising the rationale of engaged learning (seventh component) for teacher education in the Singapore context. It is our plan that there should be sufficient and relevant teacher education and professional development modules for addressing each of the six components. We hope to use the engaged learning indicators to describe qualitatively about trainee teachers as engaged learners in teacher education.

With the trainee teachers in mind, we hope that with the teacher education at NIE and as a result of having been engaged in learning through the new programmes, our graduates possess the following capabilities:

- make connection with their learning meaningfully (Hexagons 2, 3, 7)
- source, evaluate and use information sources (Hexagons 4, 5, 6, 7)
- participate in learning individually and collaboratively (Hexagons 1, 3, 6, 7)
- use appropriate tools in learning tasks (Hexagons 4, 7)
- apply knowledge and skills to solve problems (Hexagons 2, 3, 6, 7)
- reflect and evaluate own learning tasks in both product and process (Hexagons 6, 7)
- identify future learning needs and show desire in pursuing them (Hexagons 6, 7).

**Engaged Learning and IT**

Traditionally, engaged learning can be realized without the use of IT tools. However, in this knowledge-based economy, we need to engage students in working creatively and critically with ideas. IT tools when employed as cognitive tools offer a range of affordances that enhances learners' ability to work with ideas. Jonassen (2000) summarised a number of studies that employed computers as cognitive tools. For example, databases and spreadsheets have been employed to help learners reason inductively and generate patterns and trends within data. This is achieved through assigning mundane repetitive tasks such as record keeping and complicated calculations to the computers, freeing the learners to handle more challenging and interpretative tasks. His studies have also documented substantial evidences of how cognitive tools enhance students' problem-solving performances. Other studies have also provided support of the role of IT in
enhancing learners' engagement in higher-order thinking. For example, it has been documented that collaborative knowledge building supported by a computer-supported collaborative learning system such as Knowledge Forum facilitates learners' engagement in knowledge transformation discourse (Scardamalia & Bereiter, 1996). Chen and McGrath's (2003) study of the effects of hypermedia tools on learners' engagement also yielded positive results.

Learners today must learn to search and discover knowledge, communicate with others and solve problems so that they can become contributing citizens in society. IT tools can help to do these tasks efficiently and effectively and hence make the realisation of engaged learning easier. It is in this context that IT can enhance the implementation of the framework.

**Actualising Engaged Learning with IT Tools**

In the previous section, we focused primarily on the conceptual framework of engaged learning. In this section, we will be considering the following matters with regards to actualising our engaged learning framework.

Ertmer (2003) outlined three important components of a teacher education programme to scaffold teachers' change effort. First, it is necessary to build collaborative structures among teachers and teacher educators. Secondly, teacher educators need to model effective technology use. Thirdly, it is necessary to anchor teachers' learning in reflective and inquiry-based activities. In other words, teacher educators need to provide authentic engaged learning experiences for teachers. The importance of experience is that it is where beliefs are derived (Hart, 2002). It is, therefore, not surprising that efforts to change beliefs are directed at creating new learning experiences among preservice teachers (for example, see Carlson & Mckenna, 2000).

To implement our framework, we will first realign our current preservice and in-service modules with the proposed framework and indicators of engaged learning. We have begun to restructure our foundational module — Introduction to Instructional Technology — for preservice teachers. Our work with in-service teachers through the Advanced Diploma in Information Technology in Education, which started in 2001, has helped us to learn more about the developmental needs of practising teachers. The experience has provided us with valuable insights on how to support teachers' change effort. For example, a preliminary study of teacher development in knowledge building community suggests that the experience of collaborative knowledge building helps teachers in gaining a deeper understanding of social constructivism (Chai, Tan, & Hung, 2003). Drawing on our study and those of others (for example, see Resta et al., 1999), we will explore further the potentials of computer-supported collaborative learning in engaging teachers in learning and knowledge building. Our in-service modules have also generated some real-life examples of how teachers use computers as cognitive tools. These examples, together with the practising teachers' reflection logs,
provide valuable resources for preservice teachers. In return, preservice teachers can also contribute innovative lesson materials for in-service teachers. We envisage that the cross-fertilization between pre- and in-service teachers in overlapping communities serves as a fertile ground for generating innovative and yet practical lesson ideas. Other than our pre- and in-service modules, we also intend to work in three areas of teacher education:

- build up case libraries and teacher education resources
- work with collaborators to build more resources
- build assessment tools to measure engaged learning outcomes

**Building Case Libraries for Teaching Resources**

Trainee teachers lack real-life teaching experience. The best way to teach pedagogies is the practicum experience in schools. However, due to many constraints, the duration of practicum in school is short (less than 3 months). Hence, the next best solution to sharing best practices in teaching is to have a library of teaching cases. We could start off by building a database of text-based cases demonstrating good and bad practices in the various components mentioned in the framework for engaged learning. Learners would need to analyse such cases and apply what they have learnt to solve the problems embedded in the cases. In a later phase, we could also graduate from text-based cases to build a video database of best practices and negative examples of teaching. These videos could serve as a rich resource for preservice teachers to draw upon and reflect among their community of practice. This would help to “bridge” the sharp learning curve encountered by the preservice teachers in teacher education.

The other area of teacher education resources to build up is a repository of engaged learning artefacts. Instead of having preservice teachers submit assignments that may not solve real-life classroom problems, we intend to allow them to submit small problem-based projects that focus on an area of the framework. An example of an IT project is "LEARNT", where LEARNT stands for "learners engaged in activities, reflection, negotiation and transfer". This is a small learning unit that requires learners to use a contextualising tool to present a small interdisciplinary problem. Learners can solve the problem by looking for relevant information, collaborate in a knowledge construction environment and use an IT tool to process and convert information into useful knowledge. The key feature of LEARNT activity focuses on how students transfer their own learning of the unit into their real-life situation.

**Working with Collaborators to Build More Resources**

As we plan to build a video database of positive and negative examples of classroom teaching, we would like to work with partners from the Educational
Technology Division (ETD) of MOE. Perhaps NIE can work on the pedagogies and storylines and the ETD collaborators can help by turning these storylines into production scripts to produce the video cases as ETD has the necessary technical expertise and resources. These videos can provide preservice teachers learning with opportunities to engage in discussion based on the video cases in the online communities. By incorporating the multiple perspectives gained in the discussion, teachers exchange ideas with one another and construct their knowledge through a collaborative community. It is also hoped that these video case resources can be further expanded to build up a repository of artefacts or "proven" lesson plans of experienced teachers.

Besides working with ETD, we also seek opportunities to collaborate with colleagues within NIE. Hexagons 1, 2 and 6 are potential areas for collaboration across academic groups and within each academic group. For example, we could co-teach with colleagues from the Psychological Studies Academic Group in elective modules that deal with learners' learning difficulties. Staff members from the ISAG can help trainee teachers in selecting appropriate IT applications for learners with specific learning difficulties. Another suggestion would be for us to work with colleagues from the curriculum studies as they are the content experts. We can co-design, co-teach and co-facilitate in teacher education and professional development.

Building Assessment Tools to Measure Engaged Learning

In the pipeline, we also plan to work with the external collaborators to develop assessment tools to measure the outcomes of engaged learning. These assessment tools should provide the depth and scope to describe the attributes of engaged learners and the learning processes.

Assessment tools are necessary to describe learners' levels of engagement in learning (Ainley, 1993; Robert & Curtis, 2002). Ainley (1993) classified learners' styles of engagement into six levels (detached, committed, hopeful, engaged, disengaged, keen-to-do-well). However, it is difficult to generalise his findings beyond a specific population and context. Bangert-Drowns and Pyke (2001) identified seven distinct modes of learner engagement with educational software. This piece of research raises concerns such as "Would this taxonomy be applicable for tasks that do not involve software?" Do teachers need to observe and code learners' level of engagement before some remediation or intervention could be proposed? If so, it would be a laborious process and teachers can ill afford that kind of time. There is thus a need to develop workable instruments that can provide useful information for teachers to assess learners' level of engagement. Building on the previous research in other countries, this is yet another area for potential collaboration between faculty members (teaching the engaged learning processes) and education measurement specialists.
Conclusion

We recognise that the engaged learning paradigm is not about technology *per se* but goes beyond that. While technology can help to bring about engaged learning, it can also hinder in some instances if used inappropriately. The success of engaged learning finally boils down to the attributes of an effective master teacher who may use any means of instructional and learning technologies (traditional and nontraditional). If a teacher is warm and caring, treats students as individuals, knows the subject matter well, empathises with students, enthuses students with a repertoire of strategies, makes connections of lesson materials to students' real life and dares to take risks for trying something new and innovative, engaged learning can be achieved. Within the 25,000-strong teaching profession of Singapore, we believe there are many such teachers. Before we lose the capital knowledge and experience of such teachers when they retire, MOE should seek them out and perhaps video-record or document their teaching experiences for the younger generation of teachers to emulate.

We recognise that the engaged learning framework will evolve as we implement the ideas and strategies across the modules conducted by the Instructional Science Academic Group at the National Institute of Education. We hope that through such a framework our trainee-teachers would be able to appropriate a distinctive understanding of the learning process and the process skills needed to assist learners to be engaged in learning. These process skills, we hope, would be actualised through the adoption of IT tools that would add value to the learning process. We envisage difficulties and problems with trainee-teachers and their perception of what they would learn and the hands-on activities that they would have to undertake. But we hope that these difficulties and limitations will be resolved when they perceive the values of engaged learning through IT and when they experience the process of engaged learning for themselves. Our basic principle is that as faculty members we need to model and create the environment for engaged learning in NIE and that trainee-teachers will first experience this process before they can actualise it in their own classrooms in schools.

The second IT masterplan has embraced engaged learning as a vision in moving schools beyond their current ability in using IT for teaching and learning. To dovetail our teacher education effort in the area of IT for engaged learning, a working definition and indicators of engaged learning for our local context have been proposed. The Framework for Engaged Learning is a proposed conceptual roadmap on how educators can implement a number of modules to realise engaged learning in teacher education. Further work will be done to actualise this framework into tangible goals and outcomes.

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