

**Nurturing Critical and Creative Thinkers
through Inquiry-Based Teaching and
Learning in Early Childhood Care
and Education**



Dong Da Kindergarten in Hanoi, Vietnam.
Photo by SEAMEO INNOTECH (2016)

**Cultivating critical and creative thinking skills among young children will
help them prepare for successful integration in 21st-century life**

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For decades, the top-down approach to teaching and learning has been the accepted norm in many schools across Southeast Asia. The teacher is regarded as the bearer of information, the source of knowledge, and the undisputed authority in the sphere of education. Students, on the other hand, are expected to master

content by paying attention, following directions, and absorbing and retaining information imparted by the teacher. To a large extent, this pedagogical approach has thrived in Southeast Asia because of its compatibility with the Asian culture of respect for hierarchy.

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Educators, education scholars and cognitive scientists, however, note that this traditional teacher-oriented approach to learning has become less effective in the face of today's vastly transformed environment. Twenty-first century society is fast-paced, globally interconnected, and technology-driven, especially at the wake of the Fourth Industrial Revolution that ushers in more complex interconnection of technology, society, and even the human bodies. For individuals to successfully integrate in 21st-century life, they must be able to think critically and creatively, solve problems, communicate ideas, and collaborate with others. They must be flexible, adaptable, curious and eager to learn, culturally literate, and socially aware. Inquiry-based teaching and learning (IBTL) has been proposed as an alternative path for cultivating many, if not all, of these 21st-century skills.

IBTL is a pedagogical approach in which students construct knowledge by pursuing answers to questions which are often open-ended or by working out problems. They are encouraged to explore, investigate, analyze and ask more questions. The role of the teacher is to facilitate or guide the students' activities and discussions, prompt them to extend or deepen their thinking, direct them to relevant resources, and create a supportive learning environment. While the outcome of the inquiry is important, IBTL places as much value on the process of inquiry. It is through the inquiry process that students hone critical thinking or the ability to organize, evaluate, connect and synthesize data and information; exercise their creativity and imagination; and develop their ability to identify and assess various options to tackle the problem and take necessary action.

Against this backdrop, the Southeast Asian Ministers of Education Organization Regional Center for Educational Innovation and Technology (SEAMEO INNOTECH) embarked on a research project on "*Nurturing Critical and Creative Thinkers through Inquiry-based Teaching and Learning in Early Childhood Care and Education*" aimed at documenting various inquiry-based teaching and learning practices in selected learning institutions (i.e., schools and community learning centers) for early grade learners in selected countries in Southeast Asia. Anchored on the central question, "How does inquiry-based teaching and learning nurture critical and creative

thinking skills of children ages three to eight years in selected Southeast Asian learning institutions?" the research project specifically aimed to:

1. Document selected Southeast Asian learning institutions' inquiry-based teaching and learning policies and practices at the early childhood care and education (ECCE) level (for children ages 3 to 8). The study considered IBTL practices that are not subject-specific.
2. Explore the variables that affect/underpin the practice of IBTL in ECCE in Southeast Asian countries, such as curriculum, enabling policies, teaching-learning methodology that includes partnership of parents and teachers, students' learning assessment, learning materials, and learning environment.
3. Propose possible approaches in inquiry-based teaching and learning that may be contextualized and replicated by other interested pre-school or early grade learning institutions.

School heads, teachers, students, and parents from 16 schools from Brunei Darussalam, Malaysia, the Philippines, Singapore, Thailand and Vietnam participated in the study. Visits, key informant interviews and focus group discussions were held in selected schools. Representatives from teacher education institution and Ministries of Education from said countries were also interviewed.

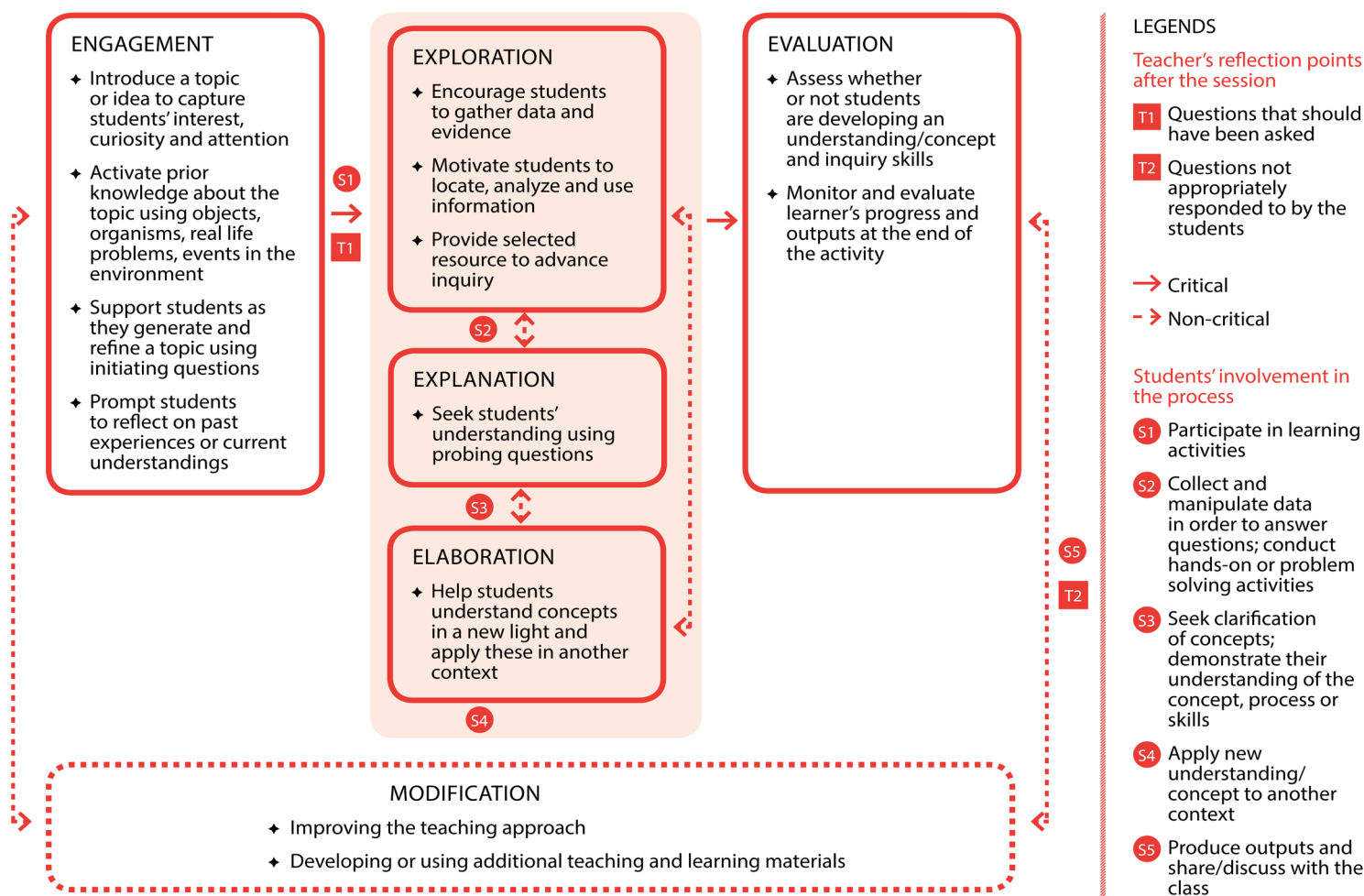
Insights gained from the study could be used as action points to inform future research agenda, and to modify, replicate or adapt various IBTL practices to effectively support ECCE in Southeast Asian countries.

IBTL Practices

One of the most recognized and applied IBTL models is the 5E Instructional Model -- Engage, Explore, Explain, Elaborate and Evaluate (Bybee, et. al., 2006). The study adapted the model and combined it with other related research on IBTL to develop the IBTL Process

Framework. The framework is divided into three fundamental phases, namely:

- **Phase I: Engagement**, wherein the teacher accesses the learner’s prior knowledge and experiences. Short activities that make connections between past and present learning experiences are conducted to promote curiosity and organize students’ thinking toward the learning outcomes of the planned activities.
- Grouped under **Phase II** are:
 - **Exploration** that allows students to undertake experiments or other activities that help them use prior knowledge to generate new ideas, explore questions and possibilities, and design and conduct research;
 - **Explanation**, wherein teachers have the opportunity to directly introduce a concept, process or skill. Teachers also seek students’ understanding using probing questions, and students explain or clarify their understanding of the concept; and
 - **Elaboration**, wherein teachers challenge and extend students’ understanding and skills. Students apply new understanding to new problems or another context.
- **Phase III: Evaluation** allows teachers to assess whether or not students are developing an understanding of concept/s. Using the 5E model, students produce outputs that they share for classroom observation (Chitman-Booker and Kopp, 2013; Bybee, et. al., 2006).



The IBTL Process Framework
SEAMEO INNOTECH (2016)

Phase IV: Modification, a non-compulsory phase, is added as an opportunity for teachers to enhance the teaching approach for a specific lesson, either in case the lesson needs to be repeated for the same class or for implementation in other future classes. *Section III* of the research report illustrates the phases of the IBTL Process Framework, while *Section IV* details the various IBTL practices documented in selected schools in the six countries mentioned earlier.

Research Findings

The following outlines key findings from the study:

1. *National Policy Environment.* The governments of Brunei Darussalam, Malaysia, Philippines, Singapore, Thailand and Vietnam all initiated measures in the past decade to align their respective educational systems with 21st century

requirements. They recast their educational frameworks and overhauled their basic education curriculum to place stronger emphasis on cultivating their young citizens' critical thinking skills, creativity and innovation, problem-solving abilities, communication skills, socio-cultural awareness and participation, and other life skills. These initiatives are anchored on laws, education development plans/blueprint, and curriculum framework.

However, while there is a clear preference for IBTL as an alternative learning method, most of the countries' national policies and plans fell short of indicating how the teachers will be capacitated or trained to use IBTL to deliver content. Only the Brunei Darussalam education ministry provided details on its professional enhancement plans for teachers.



Developing critical thinking by seeking clarification in English class at the Sekolah Kebangsaan Jalan 3 in Malaysia.
Photo by SEAMEO INNOTECH (2016)

- In addition to the lack of details on teacher preparation, it is worth noting that except for Singapore and Malaysia, none of the countries have specified in their national plans how student assessments will be done under an inquiry-based learning environment.
2. *School Policy on IBTL.* For the 10 public schools included in the study, state policy is the impetus for integrating inquiry as a pedagogical approach. The six private schools in the study, on the other hand, had more autonomy in terms of the timetable for introducing IBTL, the model used, and the level and content area where IBTL would be practiced.
 3. *Type of IBTL Practiced.* Research results show that there is no one type or model of IBTL practiced in the schools under study. Some schools follow the 5E model, while a few other schools are committed to the project-based approach. Still, other schools were unable to define the type of IBTL that their teachers are pursuing. On further examination, these are schools that have no explicit policy on IBTL and/or have no IBTL-oriented training program for teachers, but nonetheless encourage their teachers to use inquiry as one of their instructional strategies. Teachers with no formal training but were into IBTL were mostly self-taught and gained knowledge from their own supervisors/coordinators or from fellow teachers who are trained.
 4. *Level and Content Area.* Most of the schools have incorporated IBTL as early as pre-school, although some were unclear on whether it is confined to pre-school or applied in other grades as well. At least three public schools are using the inquiry approach to teach science; this practice is evidently a reflection of many Southeast Asian governments' policy to promote the sciences toward the production of more STEM graduates. Other schools ventured to use IBTL or elements of inquiry in other learning areas, such as math, reading, language, and the arts. Two private schools, meanwhile, have integrated the inquiry mode in all learning areas.
 5. *Student Evaluation or Assessment.* None of the schools have instituted a systematic method for assessing the specific outcomes of IBTL. The benefits mentioned by school administrators, teachers and parents are all casual/informal observations.
 6. *Benefits and Challenges.* All the school administrators and representatives interviewed reported observing positive behavioral changes in children exposed to the inquiry approach. Most mentioned that children seemed to have gained more confidence in communicating with others; became more independent thinkers and learners; and were more observant, inquisitive and adventurous. Some school administrators also mentioned that IBTL made learning fun and enjoyable for children.
- Most parent-informants positively view the inquiry-based approach since they reported observing noticeable changes in their children. Moreover, student-informants generally said that they enjoy and learn from IBTL activities in their schools. Children who were interviewed for this study mentioned that they had fun and learned new things by doing hands-on activities (science experiments, cooking, writing on the board, art activities), listening to stories, using picture cards, and playing games.
- However, effective implementation of IBTL is hampered by the following factors:
- *Resources* – lack of space and other learning resources for IBTL activities, such as science apparatus and internet connectivity
 - *Teacher attitude, preparation and experience* – lack of experience and preparation; lack of adequate knowledge and training on the IBTL process
 - *Complexity of the inquiry process* – planning lessons, identifying and organizing interesting activities, preparing visual aids and other

learning materials, and crafting appropriate questions are all time-consuming tasks; limited time allocation for each subject, which does not support the long-drawn process of inquiry practice

- *Parental knowledge and attitude* – lack of technological knowledge, unfamiliarity with the syllabus, and necessity of doing research to address the questions posed by their children

Section V of the report discusses in detail the research findings.

Recommendations

The study offers the following recommendations drawn from the various discussions with school heads, teachers, students, parents, representatives from teacher education institutions, and other education authorities during the study.

1. *Teacher Preparation.* National education authorities need to facilitate the convergence of efforts by Ministries of Education and teacher education institutions toward the goal of institutionalizing IBTL as a teaching practice. At the pre-service level, the inquiry process should be highlighted as an approach for learning, transitioning to the immersion of student-teachers on the application of IBTL theories to diverse learners in different contexts in laboratory and regular schools. Regular in-service training programs (i.e., professional development), such as distance education and school-based programs, for teachers and school administrators are likewise suggested to be offered collaboratively by national education authorities. The school head plays an important role as instructional leader in mentoring and coaching, especially in this type of training. Hence, instructional leadership skills of school heads, in areas such as leading curriculum implementation and contextualization, delivering planned learning outcomes, local language materials development and instructional mentoring/coaching should

also be strengthened. Knowledge-sharing among teachers and school heads/supervisors by establishing IBTL communities of practice; initiating and sustaining personal and professional learning networks through mobile devices, collaborative applications, blogs and social media; conducting lesson studies or learning action cells; and holding and participating in learning exchange programs can also be introduced to support professional development of both teachers and school administrators.

Education authorities are also encouraged to integrate the newly developed ECCE Teacher Competency Framework for Southeast Asia and the Regional Competency Framework for Teachers in Southeast Asia in pre-service and in-service training programs (i.e., professional development) for ECCE teachers. Professional development for teachers should likewise include development of both tangible skills, such as facilitating the development of learners' life and career skills, facilitating learning, preparing appropriate lesson plans in line with the school vision and mission, creating a conducive learning environment, developing and utilizing teaching and learning resources, developing higher order thinking skills, and enhancing and integrating ethical and moral values in all learning areas, and soft skills including rekindling and sustaining passion for teaching.

2. *Learning Materials.* Schools intending to pursue IBTL should identify and invest in the required resources and make these resources available to children to enrich their learning experience. Teacher-made materials or improvised teaching materials using locally available materials can also be applied if financial support is limited. It is also recommended that education authorities and teachers closely examine how technologies support and impact the inquiry-based learning process. A useful resource is SEAMEO INNOTECH's Mobile Technology for Teachers (MT4T), which orients teachers on the features of and the educational tools available in mobile gadgets (i.e., smart phones and tablets). The resource kit includes learning packets



Collecting information using technology at the Punggol View Primary School in Singapore.
Photo by SEAMEO INNOTECH (2016)

on digital citizenship that teachers can use to help children develop critical thinking and socio-emotional skills, and to learn how to overcome cyber risks and use ICT for learning, adapting and creating.

3. *Learning Environment.* Creating a conducive, learner-centered environment is one of the competencies identified in the competency frameworks for Southeast Asian school heads and teachers. Apart from identifying learning spaces where class activities (e.g., exploration, outdoor games) can be held, it is important to ensure that the learning environment stimulates inquiry and critical thinking and fosters love for learning. Pictures, maps, posters and educational toys are just some materials that can be made available for learners inside the classroom or within the learning area to facilitate learning. The learning environment should also be maintained as a safe space for children – physically safe (e.g., clean and

green, free from hazardous materials), socially safe (e.g., free from bullying and discrimination) and emotionally safe (e.g., children are free to ask questions without prejudice) – to help enrich the learning experience.

4. *Parental Engagement.* Schools and teachers should be made aware of and consider the limitations expressed by parents (lack of time, lack of technological know-how to help children with their projects) when they develop their IBTL program. Schools should try to engage the child's parental figure, be it a relative or a caregiver. Teachers are encouraged to further reach out to, and if need be, provide extra guidance to the child. It is important to orient parents (or the parental figure) on IBTL to familiarize them on the goals and strategies of IBTL; to clarify and manage their expectations, misconceptions and/or apprehensions; and to help them better understand their roles as learning partners of the school.



Assessing learning experience through drawing cum reflection at the Anubhan Nakhon Phatom in Thailand.
Photo by SEAMEO INNOTECH (2016)

5. *Assessment of Children's Progress.* Further study needs to be undertaken on how practitioners of IBTL in Southeast Asian schools assess children's progress. In general, involving students in their own assessment is a principle of IBTL. This principle is consistent with formative assessment methods which rely on constant and reciprocal feedback between the student and the teacher. Moreover, IBTL practitioners employ a range of tools and strategies that allow them to make a more holistic assessment of the breadth and depth of each student's learning for the duration of the course or class. These include authentic assessment strategies (e.g., community projects, performances, stories, presentations, audio-visual work), non-traditional techniques (e.g., student portfolio, which typically includes student journals, reflection pieces, and samples of best work), use of rubrics to assess student outputs, peer assessment, informal interviews, and class observations. Since national education policies still place much importance on standardized tests to measure learning outcomes, it is recommended that schools and teachers committed to IBTL design an assessment system that balances national requirements with student-centered/student-inclusive and holistic assessment that is aligned with the inquiry-based approach.
6. *The 5E Instructional Model and Other Instructional Approaches.* Informants from the study note that the 5E Instructional Model and other permutations of IBTL (e.g., problem-based, project-based learning) encourage children's curiosity, stimulate thinking, foster imagination, and give children opportunities to explore

new ways of learning and ask questions to seek knowledge. There is also consensus that through simple experiments, learners develop the habit of investigating and validating the information they come across. Moreover, informants attest to the socio-emotional benefits of IBTL; that is, it hones interpersonal skills; instills different mindset; builds initiative, independence and self-direction; improves self-confidence; and builds learning to learn skills among children.

For the 5E model and other IBTL instructional approaches to be effective, schools should be able to recognize how these approaches can be contextualized to suit their realities taking into consideration the differences in culture, available resources, teacher preparation and national or school-level policies on IBTL.

Further studies and documentation are also needed to be able to directly link better academic performance and positive behavior with the inquiry approach, and to determine the sustainability of its benefits.

7. *Enabling Policies.* Apart from national policies, schools should also develop their own policies on IBTL that are aligned with the national and/or regional/provincial/district policies, guidelines and standards. The critical role of the school head in instructional leadership, managerial leadership, strategic thinking and innovation, stakeholder engagement, and including personal excellence, should be underscored to support IBTL. Schools (and teachers) intending to introduce IBTL or expand its scope will need to craft a comprehensive plan, which identifies what IBTL model to follow (based on the school's assessment and experience of what works and considering the school's philosophy and culture); in which grades/levels and learning areas (i.e., specific lessons or competencies) to integrate the inquiry approach; how the inquiry approach can be integrated into the existing curriculum; what resources are available to teachers and students; what capacity building activities are needed for teachers to proficiently practice IBTL; and how to assess student progress.

In addition, schools should be able to commit to investing in the in-service training of teachers and other resources needed to support and sustain IBTL practice.

8. *Monitoring and Evaluation.* Education authorities should develop a monitoring and evaluation framework for IBTL practice—one that can be used across schools—which includes indicators to track changes/progress, methods and frequency of data collection, and method of analyzing data. Initial data from different implementing schools, such as documentation of practices, can be utilized to design the framework.

Action research, at the national or school level, may also be undertaken not only to establish tangible impact, but also to identify gaps and weaknesses in improving learning outcomes. National education authorities are encouraged to partner with teacher education institutions, schools, teacher associations, parent associations, and other stakeholders to define research priorities and facilitate the conduct of research. One important area of research is to determine the factors affecting children's engagement with IBTL, such as the language with which to effectively deliver inquiry-based learning. Other areas of research may include teacher preparation, actual day-to-day IBTL practices, assessment methods, and link between child-rearing practices and predisposition for inquiry, to name a few. These studies can become part of a national data network on IBTL, which can provide wider understanding of and lead to progress in the field.

Evaluation studies that provide evidence of positive impact are particularly critical if IBTL advocates and practitioners are to convince schools to integrate the inquiry practice in their system or to widen its scope to include all grades or learning areas (not just the sciences) for both monograde and multigrade schools.

Detailed recommendations can be found in *Section VI* of the report.

Conclusion

Developing higher order thinking skills as part of the 21st-century learning is one of the education goals in all countries where the study was conducted. All participating countries recognize IBTL as one of the promising approaches that can be used to enhance critical and creative thinking skills among children. Each country uses IBTL in different ways depending on their context, available resources, level of teacher readiness, and existing policies. The study also reveals that IBTL can be practiced not only in the sciences but also in other learning areas such as mathematics, language, literacy and numeracy, arts and crafts, and life skills. IBTL promotes the holistic development of children, imbuing them with critical thinking, creativity and other 21st century skills.

Acknowledging the benefits derived from the practice as shared by selected Southeast Asian schools that have embraced the inquiry approach, IBTL is an area that national education authorities are suggested to systematically investigate to scale-up the reported encouraging results among children. It is beneficial to inculcate the inquiry practice among children at an early age to nurture their natural state of inquisitiveness. Ultimately, these fundamental skills will prepare them for future jobs that are needed to propel the society's growth in the wake of the Fourth Industrial Revolution and increasing regional and global integration.

The **full report** (available by end of November 2018) and **photo essay** on "*Nurturing Critical and Creative Thinkers through Inquiry-Based Teaching and Learning in Early Childhood Care and Education*" can be accessed through www.seameo-innotech.org.

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