FLIPPED LEARNING TO NURTURE SELF-DIRECTED LEARNERS AT SINGAPORE POLYTECHNIC

Helene Leong, Chan Mei Yee, Chong Siew Kee

Department of Educational Development
Singapore Polytechnic

ABSTRACT

Self-directed Learning (SDL) is recognised as one of the critical 21st Century skills for life and career (Partnership for 21st Century Skills, 2011). As advances in technology increase the pace of change and the shelf life of knowledge decreases, students have to have more than thinking skills and content knowledge. They have to develop the skills sets and mindsets to be able to learn independently so as to be able to adapt to a constantly changing world. With the various definitions in mind, Singapore Polytechnic (SP) proposed a SDL model that involves 2 key components: Motivational or mindset component and Cognitive or skills set components. In this paper, the authors will describe the SDL model and will explore the extent to which flipped learning provide students with opportunities for self-directed learning. The paper will also detail a study, involving both qualitative and quantitative methods involving 4000 students, conducted to ascertain the impact of flipped learning on students' self-directed learning. The paper will present the analysis of the quantitative data findings of the study and the learning and future work that emerged.

KEYWORDS

Self-Directed Learning, Flipped Learning, Learning To Learn, Standards 7, 8, Evaluation.

INTRODUCTION

In recent years, there has been a growing recognition that the advances of technology is disrupting work and impacting the way we live. Many of today's professions did not exist twenty years ago and likewise, jobs that exist today may not exist in the future. In addition, the life expectancy of Singaporeans has been improving (Dept of Statistics, 2018). Singapore youths will live healthier lives and have longer working years. When this development is coupled with the speed of the digital revolution, it becomes plausible that today's youths will have 2 or more careers in their lifetime. In other words, they must acquire the versatility to ride the waves of transformation that will take place in their lifetime.

Hence, to progress in their careers and live fulfilling lives in this rapidly changing society, our graduates will have to constantly learn, unlearn and relearn throughout their life. They will have to have greater control over their own learning process to be able to steer their own career

development. To prepare our graduates for the challenges they will face in the future, we embarked on a whole institution curriculum revision to give our students more autonomy over their own learning. In the curriculum review, we aimed to nurture in our students the mindsets and skillsets to be self-directed learners. We also introduced flipped learning as the pedagogical approach to provide opportunities for students to learn and apply the self-directed learning process.

In the CDIO syllabus, the importance of self-directed learning is reflected in 2.4.5 (self-awareness, metacognition and knowledge integration), 2.4.6 (Lifelong learning and Educating) and 2.4.7 (Time and Resource Management) in the section on Attitudes, Thought and Learning.

In this paper, the authors will first describe the SDL model and the flipped learning approach adopted. Next, the paper will detail a study, involving both qualitative and quantitative methods, conducted to ascertain the impact of flipped learning on students' self-directed learning. The paper will present the **quantitative analysis** component of the findings of the study and the learning and future work that emerged.

SELF-DIRECTED LEARNING – A PROCESS AND AN OUTCOME

A key goal of higher education is to prepare graduates to be self-directed lifelong learners with the ability to continuously learn, unlearn and relearn to keep pace with the rapidly transforming industry needs. Self-directed Learning (SDL) is recognised as one of the critical 21st Century skills for life and career (Partnership for 21st Century Skills, 2007). Much of the definitions of SDL have focussed on either the process or learner attributes. Knowles (1975), for example, offered the following definition:
".. process in which individuals take initiative, with or without the help of others, in diagnosing their own learning needs, formulating goals, identifying human and material resources for learning, choosing and implementing appropriate learning strategies and evaluating learning outcomes."

Gibbon (2002), on the other hand, stressed the importance of developing ownership of learning and the motivation of the learner to pursue a learning goal and persist in the learning process. In his model, the students take on the personal responsibility of identifying learning gaps and setting learning goals; managing their tasks, time and resources and conscious efforts to improve their learning strategies; and extend their learning by making links with other formal and informal learning and interests. Building on Gibbons' work, Tan & Koh (2014) proposed considering self-directed learning as a spectrum that begins from the lowest level of incidental self-directed learning to the highest level of self-directed learning to indicate a progressive development of students' readiness in self-direction.

Similarly, Long (2000), proposed that self-regulation is a critical and necessary element in self-directed learning. Processes of self-regulation such as monitoring, goal setting, planning, choice of learning strategies and self-evaluation are important. Underpinning self-regulation is the students' abilities to engage in metacognitive monitoring where they analyse their personal strengths and weaknesses to identify the factors that influence task performances (Zimmerman & Campillo, 2003). Hence, students' ownership, control and metacognition of their learning are important when developing students' self-direction.

In the CDIO syllabus, the skills of self-directed learning are reflected in 2.4.5 (self-awareness, metacognition and knowledge integration), 2.4.6 (Lifelong learning and Educating) and 2.4.7

(Time and Resource Management) in the section on Attitudes, Thought and Learning (Table 1). Similar to Gibbons (2002), the CDIO syllabus also identifies "one's responsibility for self-improvement to overcome important weakness" as well as the importance of "task prioritisation". In addition, the syllabus also identifies the need for "motivation for continued self-education" and the "skills of self- education".

Table 1: Self-directed learning skills in CDIO syllabus

2. PERSONAL AND PROFESSIONAL SKILLS AND ATTRIBUTES

2.4 Attitudes, Thought and Learning

2.4.5 *Self-Awareness, Metacognition and Knowledge Integration*
- One's skills, interests, strengths and weaknesses
- The extent of one's abilities, and one's responsibility for self-improvement to overcome important weaknesses
- The importance of both depth and breadth of knowledge
- Identification of how effectively and in what way one is thinking
- Linking knowledge together and identifying the structure of knowledge

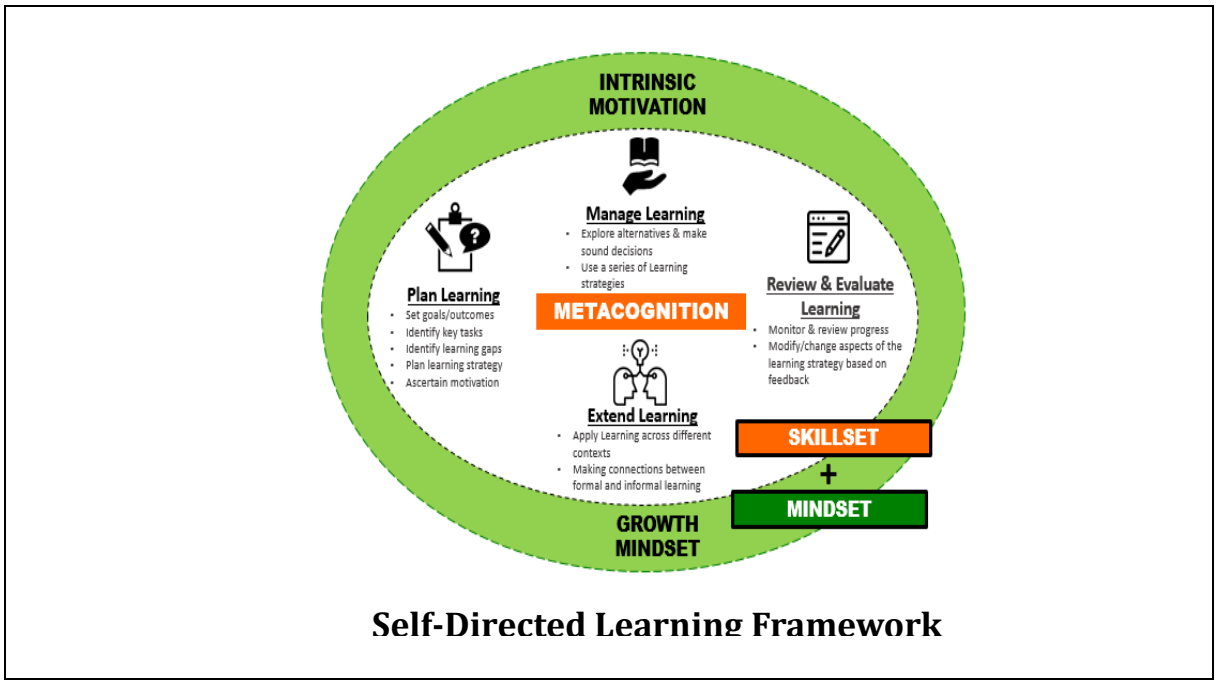
2.4.6 *Lifelong Learning and Educating*
- The motivation of continued self-education
- The skills of self-education
- One's own learning styles
- Relationships with mentors
- Enabling learning in others

2.4.7 *Time and Resource Management*
- Task prioritisation
- The importance and/or urgency of tasks
- Efficient execution of tasks

With the various definitions in mind, SP proposed a SDL model (Figure 1) that involves 2 key components:

1. Motivational or mindset component which includes the students' motivation and self-belief about themselves as learners; and
2. Cognitive or skills set components which includes the cognitive and metacognitive learning strategies that learners use.

Figure 1: Singapore Polytechnic's Self-directed Learning framework



FLIPPED LEARNING

Blended learning is an established part of the educational landscape and is growing in popularity as evidence suggests that not only is it more efficient and flexible but also more effective than either face-to-face or fully online learning (Means, Toyama, Murphy, Bakia, & Jones, 2010). Flipped learning is a particular format of blended learning and has become one of the emerging technology to foster students' active learning in higher education in recent years (Johnson, Adams Becker, Estrada & Freeman, 2014).

Flipped Learning is defined as "a pedagogical approach in which direct instruction moves from the group learning space to the individual learning space, and the resulting group space is transformed into a dynamic, interactive learning environment where the educator guides the students as they apply concepts and engage creatively with the subject matter" (Flipped Learning Network, 2014).

Tan & Koh (2014) wrote that "for self-directed learning experiences to be effective, teachers need to carefully structure the task environment to provide sufficient scope for students' self-direction" (p. 16-17) and one of the ways highlighted was the case of flipped learning. Abeysekera & Dawson (2014) also proposed that flipped learning might improve student motivation and help manage cognitive load. However, there is little literature on the effectiveness of flipped learning to inculcate self-directed learning in students.

In Singapore Polytechnic, we piloted flipped learning in our classes in 2015 in 3 schools: Business, Math and Science and Communication, Arts and Social Sciences. In April 2019, all programmes will adopt flipped learning in at least 25% of their first year curriculum.

In this paper, we will detail a study, involving both qualitative and quantitative methods, conducted to ascertain the impact of flipped learning on students' self-directed learning. The study was initiated to provide a structured research-driven approach to monitor and review the implementation of 2 key initiatives in Singapore Polytechnic: flipped learning and self-directed learning.

The evaluation activities were designed to address three broad research questions central to understanding the impact of key aspects of the two initiatives:

1. How are the students experiencing the flipped Classroom?
2. Does the flipped classroom format inculcate self-directed learning in students?
3. What is the impact of flipped classroom format on assessment outcomes?

We will focus on **research question 2** and report only the quantitative results of the study for the purpose of this paper.

METHODOLOGY

The study involved polytechnic diploma students from a mixture of academic schools and years of study. Table 2 gives the details of the students who participated in the study. The students had one semester of flipped learning where approximately 50% of the lectures were converted to online videos which the students viewed at home. During the face to face tutorials, the lecturers adopted active discussion teaching methods.

Table 2: Details of students who participated in the study

Module	Number of students	Year of study	Academic school/s
Engineering Math 1	2208	Year 1	Built Environment, Media and IT, Electrical and Electronics, Mechanical and Aeronautical, Singapore Maritime Academy, Chemical and Life Sciences
Communicating for Project Effectiveness	1428	Years 1 to 3	Built Environment, Media and IT, Electrical and Electronics, Mechanical and Aeronautical, Chemical and Life Sciences
Fundamentals of Marketing	903	Year 1	Business
Management & Organisational Behaviour	900	Year 1	Business

A mixed method approach involving qualitative, as well as quantitative data collection, was used. For the quantitative data, pre and post-tests were conducted using a 34 item questionnaire made up of the Learning Strategies and Motivation Scales of the Motivated Strategies for Learning Questionnaire (MSLQ) (Pintrich et al., 1991). The MSLQ is a validated questionnaire. The description of the scales is elaborated in Tables 3 and 4.

Table 3: Learning Strategies Scale

Sub-section	Scales
Cognitive and metacognitive component	• **Metacognitive Self-Regulation** Metacognition refers to the awareness, knowledge, and control of cognition. 3 processes make up the metacognitive self-regulatory activities: Planning, monitoring, and regulating. • **Elaboration strategies** help students store information into long-term memory by building internal connections between items to be learned e.g. summarizing, generative note-taking. These help the learner integrate and connect new information with prior knowledge.
Resource management component	• **Help Seeking** There is a large body of research that indicates that peer help, peer tutoring, and individual teacher assistance facilitate student achievement.

Table 4: Motivation Scales

Sub-section	Scales
Expectancy component	• **Control of learning beliefs** This refers to students' beliefs that their efforts to learn will result in positive outcomes. If students believe that their efforts to study make a difference in their learning, they should be more likely to study more strategically and effectively. • **Self-efficacy** This is a self-appraisal of one's ability to master a task. Self-efficacy includes judgments about one's ability to accomplish a task as well as one's confidence in one's skills to perform that task.

The two MSLQ scales were selected as they represented the research questions most closely. The Learning Strategies Scale contained questions on learners' resource management and the cognitive and metacognitive self-regulations strategies while the Motivation scale assessed the learners' expectancy component of their self-directedness. Table 5 shows the MSLQ scales used, the number of items in each scale and an example of an item for each scale.

Table 5: MSLQ scales used in the study

Section	**Sub-section**	**Scales**	**No of items**	**Example item**
Motivation	Expectancy	Control of learning belief	4	If I don't understand the module material, it is because I didn't try hard enough.
		Self-efficacy for learning and performance	8	I'm confident I can understand the most complex material presented by the lecturer in this module.
Learning strategies	Cognitive and meta cognitive strategy	Elaboration	6	I try to apply ideas from module materials (e.g. lecture notes, videos, readings and discussions) in other class activities such as lecture, tutorial and discussion.
		Meta-cognitive self-regulation	12	If module materials are difficult to understand, I change the way I learn the material.

	Resource management strategy	Help seeking	4	I ask the lecturer to clarify concepts I don't understand well.

The questionnaires were administered to students at the beginning of the semester and at the end of the semester using an online survey tool, Verint Systems. All 4000 students enrolled in the module were asked to participate. Participation was voluntary and no extra credit was given for participation. Altogether, 1231 respondents took the pre-test while there were 1242 respondents for the post-test. This is a response rate of approximately 30%.

The 34 items in the questionnaire were randomised. For each, question, the students rated themselves on a seven-point Likert scale where 1 is “not at all true of me” and 7 is “very true of me”. The student responses were analysed using independent t-test done at 5% significance level. The analysis was conducted on the student cohort as a whole and no attempt was made to identify individual students.

RESULTS

We will focus on **research question 2** and report only the quantitative results of the study for the purpose of this paper.

Table 6 shows the results of the independent t-test conducted on the survey results. Significant increases (p-value= 0.0001) were observed in all the 5 scales used in the study. The largest gain was in “self-efficacy for learning and performance” followed by ‘control of learning belief, ‘elaboration’ and ‘meta-cognitive self-regulation’. The smallest gain was observed for ‘help seeking’.

Table 6: Independent T-test analysis of selected MSLQ scales

Scale		Mean	Std Dev	SE Mean	Mean diff
Meta-cognitive self-regulation	Pre-test	4.650	1.420	0.013	0.211*
	Post-test	4.861	1.441	0.013	
Elaboration	Pre-test	4.750	1.361	0.015	0.243*
	Post-test	4.993	1.392	0.016	
Help seeking	Pre-test	5.034	1.438	0.023	0.175*
	Post-test	5.209	1.414	0.023	
Control of learning belief	Pre-test	5.262	1.353	0.019	0.27*
	Post-test	5.532	1.362	0.018	
Self-efficacy for learning and performance	Pre-test	4.808	1.311	0.0132	0.412*
	Post-test	5.220	1.312	0.0131	

*P-value = <0.0001
N= 1231 (pre-test) N=1242 (post-test)

DISCUSSION

Motivation: Expectancy

Of the 5 scales surveyed in this study, the highest mean difference observed was in self-efficacy for learning and performance. Students’ self-efficacy beliefs play an important part in their confidence in themselves as effective learners and their abilities to master a task. The significant increase in the self-efficacy scores in the study indicates that the students’

judgement about their ability to accomplish a task as well as their skills to perform the task was enhanced by flipped learning. According to Stegers-Jager *et al*. (2012), strengthening the students' self-efficacy will help to enhance student performance. Similar results were reported by Sun *et al.* (2018) who found that students' self-efficacy in learning math was significantly positively related to academic achievement in both pre- and in-class flipped learning environments.

The second highest score was obtained for 'control of learning beliefs'. This second scale in the motivation section refers to the students' beliefs that their efforts to learn will result in positive outcomes. If students believe that their efforts to study make a difference in their learning, they should be more likely to study more strategically and effectively.

According to Dweck (2006), non-cognitive factors, which includes students' belief about themselves, their goals in school, their feelings of social belonging and their self-regulatory skills, are critical for ongoing academic success. Dweck (2006) divides students into 2 groups. Students may view intelligence as a fixed quantity that they either possess or do not possess (a fixed mindset) or as a malleable quantity that can be increased with effort and learning (a growth mindset). The two motivation scales, self-efficacy and control of learning beliefs, are pertinent to students' mindsets of themselves as learners. The positive increases in both scales indicate that flipped learning helped to enhance the students' growth mindsets and motivation to learn. They developed confidence in themselves as learners and felt that their learning success was dependent on the effort they invested in their learning.

Learning Strategy: Cognitive and Meta-cognitive strategy

Learning strategies can be seen as a description of behaviours and thoughts which the learner engages in to support and facilitate their learning process (Hoskin and Fredriksson, 2008). These thoughts and behaviours may include plans of actions and learning techniques adopted by the learner to achieve a learning goal. Two scales were examined under the Learning strategy section: Elaboration and Meta-cognitive self-regulation.

Elaboration strategies refer to behaviours or thoughts which the learner engages in to help store information into long-term memory. These could include making connections between concepts learned in the pre-class to concepts to be learned in-class. For example, students may apply ideas learnt from video recordings or pre-class readings to other class activities like tutorial questions or class discussions. Adopting learning strategies like rehearsal, summarising, mindmapping, note taking and paraphrasing also help students integrate and connect new information with prior knowledge. In our study, the elaboration scale showed a significant positive mean difference between the pre- and post-tests of 0.243 indicating that students had a greater tendency to adopt learning to learn strategies in flipped learning.

The Metacognitive Self-Regulation scale measures the students' perception of their awareness, knowledge, and control of cognition. Self-regulation and metacognition are sometimes used interchangeably. However, according to Whitebread and Pino Pasternak (2010), there is consensus that "metacognition refers specifically to the monitoring and control of cognition, while self-regulation refers to the monitoring and control of all aspects of human functioning, including emotional, social, and motivational aspects" (p. 693). In our study, metacognition is described as the processes involved when learners plan, monitor, evaluate, and make changes to their own learning behaviours.

Research indicates that metacognition is a powerful predictor of learning. A learner's metacognitive practices can influence learning over and above the influence of intellectual ability and may compensate for any cognitive limitations (Veenman, Wilhelm, & Beishuizen, 2004). Nelson and Narens' (1990) Model of Metacognition describes metacognition at two levels: the object level and the meta level. In the object level, cognitive processes or 'one's thinking' occurs. At this level, cognitive strategies (e.g. paraphrasing) are used to help learners achieve a particular goal (e.g. understanding a concept). At the meta level, 'thinking about thinking' takes place. Here, metacognitive strategies are used to enable learners to reach learning goals. This includes monitoring how well they are learning and adapting their strategies accordingly. In our study, the meta-cognition self-regulation scale showed a significant positive mean difference between the pre- and post-tests of 0.211 indicating that flipped learning encouraged students to adopt meta-cognitive strategies as they learnt.

Learning Strategy: Resource management

In this resource management subsection of the Learning Strategies section, we analysed the students' 'Help seeking' inclinations. This refers to the learners' tendencies to seek assistance from either peers or lecturers when meeting difficulties in understanding the learning material.

Help-seeking behaviours, in a learning context, refers to the strategies learners use to determine when help is needed and how to receive that help (Nelson – Le Gall, 1986). In most instances, the learner will ask for help from a more knowledgeable person when faced with difficulties in understanding the learning material or in reaching their academic goals. Although help seeking is an important learning strategy for academic achievement, not all students use it. There are several reasons for this behaviour. For example, students may desire greater autonomy over their learning (Deci & Ryan, 1987) or may perceive asking for help as a sign of academic incompetence or lack of ability (Karabenick, 1998). Classroom environment and peer and teacher relationships may also affect the students' propensity to seek help.

In our study, the 'Help seeking' scale showed a significant positive mean difference between the pre- and post-tests of 0.175. While significant, this scale had the lowest mean difference indicating that in flipped learning the tendency for students to work independently even when they had difficulties understanding the materials.

CONCLUSION

The study was conducted to ascertain the impact of flipped learning on self-directed learning in students. The study addressed three broad research:

1. How are the students experiencing the flipped Classroom?
2. Does the flipped classroom format inculcate self-directed learning in students?
3. What is the impact of flipped classroom format on assessment outcomes?

Pre and post data were obtained using questions from 2 Sections of the MSLQ: Motivation and Learning Strategies. These 2 components were selected as they represented the skillsets and mindsets that students possess as self-directed learners. Statistical analysis using independent t-test was used to analyse the data.

The findings from the study show that flipped learning may have a positive impact on the students' metacognition and learning strategies. The independent t-test analysis of the means of the pre-test scores and post-test scores of the MSLQ components of 'meta-cognitive self-regulation', 'elaboration', 'help seeking', 'control of learning belief' and 'self-efficacy for learning and performance' showed significant, positive increases.

In the study, triangulation of data was employed to generate multiple framing and the possibility of enhancing validity in relation to some questions. Besides the reported survey, student co-participants were asked to blog their learning experience in a flipped classroom and their achievements in the flipped modules analysed. This paper, however, shares one aspect of the study, the quantitative data obtained for a survey of 4000 students, due to space and time constraints. A more complete picture would be obtained when the quantitative data is triangulated with the qualitative insights obtained from the co-participants' journaling and students' achievements. Areas for future exploration will include a study of the lecturers' perspectives and a longitudinal study of the impact of flipped learning on the students' self-directed learning abilities and mindset.

Self-directed learning skills and mindsets are important 21st century skills that graduates require to progress in a fast changing, technologically disrupted workplace. Flipped learning can play an important role in enhancing students' self-directed learning skills and mindsets, making the approach a valuable pedagogy in higher education.

ACKNOWLEDGMENTS

Lee Hwee Theng, Assistant Director & Academic Mentor, School of Mathematics and Science
Teresa Chua-Moraes, Assistant Director, School of Lifeskills and Communication
Neo Chip Chuan, Deputy Director & Academic Mentor, School of Business

REFERENCES

Abeysekera, L., & Dawson, P. (2014). Motivation and cognitive load in the flipped classroom: Definition, rationale and a call for research. Higher Education Research & Development, 34(1), 1-14.

Department of Statistics Singapore (2018). Complete Life Tables of Singapore Resident Population, 2016-2017. Retrieved from https://www.singstat.gov.sg/publications/population/-/media/Files/publications/population/lifetable16-17

Deci, E. L., & Ryan, R. M. (1987). The Support of Autonomy and the Control of Behavior. Journal of Personality and Social Psychology, 53, 1024-1037.

Dweck, C. S. (2006). Mindset: The new psychology of success. New York, NY, US: Random House.

Flipped Learning Network (2014). The Four Pillars of FLIP™. Retrieved from http://flippedlearning.org/site/default.aspx?PageID=1

Gibbons, M. (2002). The self-directed learning handbook: Challenging adolescent students to excel. San Francisco, CA: Jossey-Bass.

Hoskins, B., Fredriksson, U. (2008). European Commission, Joint Research Centre, Institute for the Protection and Security of the Citizen. Centre for Research on Lifelong Learning (CRELL). Luxembourg: Office for Official Publications of the European Communities © European Communities.

Johnson, L., Adams Becker, S., Estrada, V., & Freeman, A. (2014). NMC horizon report: 2014 Higher Education Edition. Austin, Texas: The New Media Consortium.

Karabenick, S. A. (1998). Strategic help seeking: Implications for learning and teaching. Mahwah, NJ: Erlbaum.

Knowles, M. S. (1975). Self-directed Learning: A Guide for Learners and Teachers. Cambridge Book Co., New York

Long, H. B. (2000). Understanding self-direction in learning. In H. B. Long & Associates (Eds.), Practice and theory in self-directed learning (pp. 11–24). Schaumburg, IL: Motorola University Press.

Means, B., Toyama, Y., Murphy, R., Bakia, M., & Jones, K. (2010). Evaluation of evidence-based practices in online learning: A meta-analysis and review of online learning studies. U.S. Department of Education, Office of Planning, Evaluation, and Policy Development

Nelson,-Le Gall, S. (1986). Help-seeking behavior in learning (LRDC-1986/3). Washington DC:National Institute of Education.

Nelson and Narens, T. O. (1990). Metamemory: A theoretical framework and new findings. Psychology of Learning and Motivation, 26, 125–173.

Pintrich, P., Smith, D., Garcia, T., & McKeachie, W. (1991). A manual for the use of the motivated strategies for learning questionnaire (MSLQ). Ann Arbor, MI: University of Michigan, National Center for Research to Improve Postsecondary Teaching and Learning.

Stegers-Jager KM, Cohen-Schotanus J, Themmen APN (2012). Motivation, learning strategies, participation and medical school performance. Med Educ 46, 678–688.

Sun, Z., Xie, K., & Anderman, L. H. (2018) The role of self-regulated learning in students' success in flipped undergraduate math courses. The Internet and Higher Education, 36, pp. 41-53.

Tan, L., & Koh, J. (2014). Self-directed learning: Learning in the 21st century education. Singapore: Educational Technology Division, Ministry of Education.

The Partnership for 21st Century Skills (2011). Framework for 21st Century learning. Retrieved from http://www.p21.org/storage/documents/1.__p21_framework_2-pager.pdf

Veenman, M. V. J., Wilhelm, P., & Beishuizen, J. J. (2004). The relation between intellectual and metacognitive skills from a developmental perspective. Learning and Instruction, 14, 89–109.

Whitebread, D., & Pino Pasternak, D. (2010). Metacognition, Self-Regulation and Meta-Knowing. In K. Littleton, C. Wood, & J. Kleine Staarman (Eds.), The International Handbook of Psychology in Education (pp. 673-711). England: Emerald.

Zimmerman, B. J., & Campillo, M. (2003). Motivating self-regulated problem solvers. In J. E. Davidson & R. J. Sternberg (Eds.) The nature of problem solving (pp. 239), New York: Cambridge University Press

BIOGRAPHICAL INFORMATION

Helene Leong-Wee Kwee Huay is the Director of the Department of Educational Development at Singapore Polytechnic. Her current focus is on the use of technology in education, enhancing students' intrinsic motivation, and the pedagogy for professional formation and identity. She is co-director of the CDIO Initiative.

Chan Mei Yee is the Deputy Director overseeing Learning Technologies and Media Development in the Department of Educational Development, Singapore Polytechnic. She manages the Flipped Learning implementation in the Polytechnic, and is also the project lead for the Flipped Learning Evaluation Study completed in 2018. Her other recent major educational technology projects include the implementation of a Polytechnic sector-wide eLearning Platform known as the PolyMall, and the migration of Singapore Polytechnic's enterprise Learning Management System to the Cloud SaaS platform.

Chong Siew Kee is an Educational Technologist from the Department of Educational Development at Singapore Polytechnic (SP). She provides pedagogic & technical support to schools and works closely with lecturers to integrate educational technology in their classes to enhance learning experiences and outcomes. She currently supports the flipped learning initiative in SP.

Corresponding author

Helene Leong
Director
Department of Educational Development
Singapore Polytechnic
Helene_Leong@sp.edu.sg