



# Singapore primary and secondary students' motivated approaches for learning: A validation study



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## ABSTRACT

This study aimed to develop and validate a 28-item questionnaire to measure Singapore primary and secondary students' ( $N = 1035$ ) motivation in relation to their self-directed learning (SDL) and collaborative learning (CL), with and without Information and Communication Technology (ICT), with an emphasis on investigating the high-order factor structure, if any. The instrument consists of seven dimensions: task value, self-efficacy, extrinsic goal, SDL, SDL with ICT, CL, and CL with ICT. By using confirmatory factor analysis with maximum likelihood method, the instrument was found to express satisfactory reliability and validity, and it can be best represented by a two-correlated-second-order-factor model. Besides, measurement invariance of the second-order model was also tested, and results showed that the second-order factor structure was generally invariant across gender (boys vs. girls) and grade levels (primary vs. secondary).

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## 1. Introduction

In the context current education reforms that are happening worldwide, self-directed learning (SDL) and collaborative learning (CL) have been identified as key pedagogical approaches to prepare students for the knowledge society (*The Partnership for 21st Century Skills, 2009; Voogt & Robin, 2012*). In addition, Information and Communication Technology (ICT) is introduced into the classroom environment as key pedagogical means for cultivating independent, autonomous, as well as collaborative learning in classrooms (*AACTE, 2008; Collins & Halverson, 2010; Howland, Jonassen, & Marra, 2012; Schleicher, 2006*). The proliferation of ICT has brought forth affordances such as allowing learners to access vast information resources and online courses and to form community of learners with relative ease. These affordances empower the learners to take ownership of their own learning and learn collaboratively with others. However, whether or not learners make good use of the ICT affordances for SDL or CL depends mostly on the learners' motivation.

The Singapore Ministry of Education has chosen SDL and CL as the foci of the third Masterplan for ICT in Education (see *Teo & Ting, 2010*) since 2009 and Singapore schools have been actively involved in reshaping the pedagogical practices. With the vision of "Harnessing ICT for future learning", one of the four main goals of this Masterplan was to allow students to possess competencies for self-directed learning (SDL) and collaborative learning (CL) through the effective use of ICT

(*Ministry of Education, 2008*). Therefore, the purpose of this paper is to explore Singapore students' motivation and their perceptions of engaging in SDL and CL, with or without the support of Information and Communication Technology (ICT) in the primary and secondary school classrooms.

However, there is a lack of valid and reliable survey instrument to look at the students' motivation towards learning in relation to the use of SDL and CL, either with or without ICT support in the classrooms. This study therefore adapted parts of the Motivated Strategies for Learning Questionnaire (MSLQ) and combined it with recently developed scales for measuring SDL and CL with or without ICT support (*Lee, Tsai, Chai, & Koh, 2014*) to create a new survey instrument. The validation of this survey can provide means to measure important students' perceptions of motivation to learn associated with SDL, CL and their perception of undertaking SDL and CL supported by ICT. Measuring students' perceptions in these aspects can provide indications of whether or not the pedagogical practices in school are oriented towards 21st century learning/skills (see *Binkley et al., 2012*).

## 2. Literature review

### 2.1. Motivated strategies for learning

Since the 1980s, motivation has been widely recognized as a key factor in determining students' learning outcomes. Motivated students are more attentive in class, put in more effort and are more persistent in face of difficulty (*Zimmerman & Schunk, 2008*). Given its importance,

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a number of surveys were created to research students' motivation to learn (Credé & Phillips, 2011). As Duncan and McKeachie (2005) pointed out, MSLQ was one of the most widely used instruments, and it was being adopted internationally to investigate the motivation and cognition and its association with the use of different learning strategies of college level students towards a course (Pintrich, Smith, Garcia, & McKeachie, 1991, 1993).

In the MSLQ, there are three *motivation* subsections: expectancy, value, and affect (Credé & Phillips, 2011; Hilpert, Stempien, Kraft, & Husman, 2013; Pintrich et al., 1993). More specifically, the *expectancy* subsection contains two subscales, namely Control Beliefs (i.e., belief about personal control over the learning performance) and Self-Efficacy for Learning and Performance (i.e., self-confidence that a task can be accomplished). The *value* subsection consists of Intrinsic Goal Orientation (i.e., whether learning is motivated by curiosity/interest or mastery of material), Extrinsic Goal Orientation (i.e., whether the purpose of learning is to gain good grades, reward, or approval), and Task Value (i.e., how important and usefulness of a learning task is). The *affect* subsection comprises only one subscale named Test Anxiety, which measures the degree to which students experience anxiety/fear when taking a test. There are also two subsections (nine subscales) in the *learning strategies* section, namely, *cognitive and metacognitive strategies* (including Rehearsal, Elaboration, Organization, Critical Thinking, and Meta-Cognitive Self-Regulation) and *resource management strategies* (including Time and Study Environment, Effort Regulation, Peer Learning, and Help Seeking).

The instrument has been validated and widely adopted by studies to assess students' motivation and use of learning strategies. The scales can be used separately or together and are designed to fit the needs of the research (Pintrich et al., 1991). Previous studies (see Duncan & McKeachie, 2005; Hilpert et al., 2013) that adapted Pintrich et al.'s (1991, 1993) MSLQ have employed exploratory factor analysis (EFA) and/or confirmatory factor analysis (CFA) to validate MSLQ. As seen from many previous studies, the subscales of MSLQ generally demonstrated acceptable reliability and convergent validity (e.g., Credé & Phillips, 2011; Duncan & McKeachie, 2005; Lin, Deng, Chai, & Tsai, 2013; Tseng & Tsai, 2010).

However, at least three methodological issues can be recognized from the previous MSLQ studies. First, either low correlation or poor discriminant validity between some subscales of MSLQ was commonly noticed (Hilpert et al., 2013; Malpass, O'Neil, & Hocesvar, 1999; Pintrich & DeGroot, 1990). This seems to challenge the underlying assumption of MSLQ that the sub-dimensions (or subscales) are correlated but different from one another. Second, as the name of the instrument ("MSLQ") implied, all subscales seem to be conceptually grouped into two dimensions: motivation and learning strategies (Pintrich et al., 1993). However, very few studies have tested such an implicit assumption. An exception was Hilpert et al.'s study that explored the latent factor structure with the item parceling approach (i.e., using the sums of the 15 subscales of MSLQ as first-order factors). Unfortunately, their data did not support the second-order factor structure hypothesized. Third, the existing studies (see Duncan & McKeachie, 2005 for a review) tended to validate the factor structure (both first-order and second-order) without further examining whether the factor structure is independent from the demographics (e.g., gender and age) of the sample. There is a dearth of research that has explicitly tested the invariance of factor structure across different subsamples (e.g., male and female students). All the above issues constituted the gaps this study attempted to fill in.

Furthermore, although the MSLQ was used in many research studies, there were limited studies that look into students' motivation and cognition in related to the use of Information and Communication Technology (ICT). Duncan and McKeachie (2005) surveyed 56 empirical studies using MSLQ from 2000 to 2004; eight of them are related to educational technology, such as online instruction or video conferencing. However, these studies did not investigate the differences in motivation with or without the integration of ICT in teaching and learning. The items and

subscales in MSLQ are created without reference towards ICT-based learning. The learning strategies section is generally undergirded by paper-based examination rather than measuring specific strategies that could facilitate the students' development of 21st century skills, such as SDL and CL. This study therefore attempts to provide alternative scales and items in these aspects.

## 2.2. Self-directed learning (SDL)

Self-directed learning (SDL) has been widely researched since early 20th century (Tan, Divaharan, Tan, & Cheah, 2011). Long (1994) defined SDL as "the learners' psychological processes that are purposively and consciously controlled, or directed, for the purpose of gaining knowledge and understanding, solving problems, and developing or strengthening a skill" (p. 14). It stresses on personal endeavor of individuals in their journey of gathering and deepening knowledge. In the process of SDL, learners are responsible to: formulate their own learning goals; diagnose the gap of learning between what they want to know and what they already knew; locate resources to facilitate their own learning; select and implement appropriate learning strategies; evaluate their own learning and the outcomes throughout the learning process (Kicken, Brand-Gruwel, Van Merriënboer, & Slot, 2009; Robertson, 2011).

SDL is seen as one of the most important approaches to and a prerequisite for lifelong learning (Fischer & Scharff, 1998; Greveson & Spencer, 2005). It is a broad concept that included self-regulated learning (SRL) but the learners have more freedom and flexibility in pursuing their learning goals in SDL (Loyens, Magda, & Rikers, 2008). In SRL, which is commonly practice in K-12 education, the learning goals and the tasks are set by the teacher. Based on these goals, the learners plan their sub-goals, learning activities and assess whether they have achieved the learning goals (Robertson, 2011). As such, SDL was referred by Fischer and Scharff (1998) as a process that comes after graduation and is meant to prepare students better when they join the workforce. In workplace setting, learners are required to constantly learn, unlearn and relearn especially for knowledge intensive economies. Thus, educators are trying to integrate SDL to K-12 education settings to facilitate students to develop self-directed learning skills. In addition, Nor and Saeednia (2008) suggested that SDL is "measurable among children" and "the quality of SDL in young ages is apparently congruent with that of adults."

SDL has been suggested as a key component of the 21st century skills (Binkley et al., 2012; Tan et al., 2011). Boyer and Maher (2004) discussed that using SDL to scaffold online learning is a highly effective way to involve the learners in the process of learning and it helps to transform traditional teacher-centered instruction to learner-centered experience. Studies have shown that learners enjoyed the integration of SDL to online learning and reported the learning experience to be meaningful (Boyer & Maher, 2004). On the other hand, there are also studies that discussed the critiques and challenges in conducting SDL. Learners who are used to the traditional teacher-centered teaching experienced difficulties to conduct SDL activities. Silen and Uhlin (2008) conducted a case study on students learning using the SDL approach, and reported that students expressed anxiety at the beginning of learning and perceived their learning to be a waste of time. Other studies also proposed that resistance to SDL among learners could be because of previously established paradigms in their education settings (Durr, 1994). Learners have adjusted themselves to fit in with the traditional didactic instruction that expected them to be passive recipients of knowledge with limited thinking. Hence, some learners may be reluctant to shift from their past practices because of their fear of additional accountability to their own learning.

Current advances in ICT have afforded ample opportunities for learners to be engaged in SDL (Collins & Halverson, 2010). One recent application of ICT to support SDL is in the form of flipped classroom

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