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Measuring Singaporean Students' Motivation and Strategies of Bilingual Learning

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Abstract This paper reports a pilot study on the development and validation of the bilingual (Chinese and English) “Motivation and Attitudes for Language Learning Inventory” (MALLI). MALLI is designed to measure secondary school students’ learning motivations, and several other factors in the learning of both Chinese and English languages. We adapted relevant subscales from “Motivation and Strategies in Learning Questionnaire” and “Chinese Language Classroom Environment Inventory” to create the MALLI (Chinese) and MALLI (English) versions to investigate the factors with reference to Chinese and English learning respectively. Both instruments contain the same set of items with reference to Chinese and English learning correspondingly. After going through initial validation, the instruments were administered to 318 students from various secondary schools in Singapore. Exploratory Factor Analysis resulted in the selection of 33 items from six identified subscales: intrinsic value, extrinsic goal orientation, self-efficacy, study management, teacher support (TS), and ICT for learning (ICT). To demonstrate how the questionnaire can be applied to compare the students’ perceptions related to learning of the

two languages, a series of paired *t* tests was performed on the questionnaire data. It was found that there are significant differences in the students’ perceptions on TS and ICT in the learning of both languages. We discussed the implications of the findings at the end of the paper.

Keywords Bilingual learning · Learning motivation · Learning attitudes

Introduction

Success for language learning is dependent on motivation. Motivation represents one of the appealing, yet complex, variable used to explain individual differences in language learning (MacIntyre et al. 2001). However, the socio-educational approach to measuring language learning motivation has its focus on social attitude rather than language-relevant feelings and behaviors in the classroom (Soh 1993). The need for a more practitioner-oriented and psychology-based approach to assess language learning motivation, which has a closer link with what the teacher does and what the students do for and about the language to be learned, has been highlighted (Dörnyei 2010).

Singapore government has been consistently implementing the “English-knowing bilingualism” policy, i.e., English plus one’s mother tongue. All Singaporean children are required to learn English as the “first language,” and a mother tongue language based on their either parent’s ethnicity—Chinese, Malay, or Tamil languages (Bokhorst-Heng and Caleon 2009). In secondary schools, all subjects are taught in English except for the mother tongues. In addition, as an indigenized language in Singapore, English is seen as a natural and perfect candidate for a local lingua franca (Alsagoff 2010) that is able to foster social cohesion

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among the various ethnic groups by affording a neutral means of communication.

Within such a unique societal context, English language (EL) has secured its dominating popularity and become the preferred day-to-day language among the younger generation. Conversely, there is increasing evidence that Chinese language (CL) teachers are facing greater challenges in engaging and motivating students to learn the CL; the students' CL proficiency level has been declining (Ong 2002; Wong et al. 2011b). At the same time, some Singapore parents had voiced their concerns about their children's capacity to deal with two different languages and other subjects in schools and demand that the level of CL proficiency should be set at a more reasonable and achievable level (CLCPRC 2004).

Furthermore, with about 75 % of Chinese citizens, Singapore is not lacking of CL media and opportunities to use the language in authentic situations. Nevertheless, it seems the younger generation of Singapore is not keen to learn CL, perhaps due to the inherent learning difficulties pertaining to the logographic nature of the Chinese scripts (Shen 2005; Wong et al. 2011a). Moreover, English-speaking families are on the raise. Parents of the current K-12 students learned English well enough, since the implementation of bilingual education, to use the language at home. They may believe that speaking English at home would help their children succeed in Singapore's competitive school system and bring economic benefits (Dixon 2005).

Several student surveys were conducted in the past two decades to determine the Singapore students' CL learning motivation with the aim of unveiling the relationships between students' motivation to learn CL and other factors. For example, Soh (1993) developed and validated both Chinese Language Motivation Scale (CLMOTS) and English Language Motivation Scale (ELMOTS) for measuring students' CL and EL learning motivations, respectively. Chua et al. (2009) moved one step further by combining their self-developed Chinese Language Classroom Environment Inventory (CLCEI) and Soh's (1993) CLMOTS to investigate students' perceptions toward CL classroom learning environments and their CL learning motivation, respectively. The CLCEI survey concludes that academically motivated students are usually those who are task oriented in their classroom learning. Nevertheless, the stated survey lacks a holistic view in studying the students' learning motivations as the classroom environment is only one factor among many others that could influence students' learning motivation.

Conversely, studies in motivation in EL learning among Singaporean students are rare, perhaps owing to the above-stated commonsense that the majority of the student population is far more motivated in EL than CL learning. Our

ERIC database and web of Science searches with the combined keywords of "Singapore AND 'English Language' AND learning AND motivation" returned a good amount of papers. However, very few of them were particularly focusing on studying the English learning motivation. The reported studies were pertaining to students' language learning strategies, localized English accents or vocabularies, teachers' classroom pedagogies, etc.

Therefore, we are keen to explore multiple factors pertaining to Singapore students' CL learning and the potential relationships with motivations, as well as how the factors pertaining to students' EL learning may affect their CL learning motivations, or vice versa. Investigating students' motivation and attitude for two languages that may be competing concurrently is rare in literature. We looked into various existing survey instruments related to learning in general or language learning in particular, and select components that are relevant for our purpose. The two existing instruments that we plan to adapt are: Motivated Strategies for Learning Questionnaire (MSLQ) and CLCEI (see above).

Research on Motivation

Motivation has been regarded by many educators as a crucial factor that promotes students' engagement and consequently their performances in learning (Pavlou 2006). It anchors "the process whereby goal-directed activity is instigated and sustained" (Pintrich and Schunk 2002, p. 5). For the past two decades, sustained interest in this area of research has resulted myriad studies that explore the connections between students' motivation and their academic achievement. These studies generally established positive relationships between students' motivation and performances. Motivated students are attentive in class. They also tend to persevere in face of difficulties and they seek help when needed (Pintrich 2004; Zimmerman and Martinez-Pons 1992). Although these studies supported the positive relationships between motivation and achievements, they are largely confined to content based academic subjects.

The interest in studying students' motivation naturally leads to the development of a number of instrument developments. To date, examples of self-report motivation scales are the Situational Intrinsic Motivation Scale (SIMS), the Student Engagement and Effort Scale (SEES), the Student Motivation Measure (SMM) (Hardré et al. 2008), and the MSLQ (Duncan and McKeachie 2005). Duncan and McKeachie (2005), and Crede and Phillips (2011) have pointed out that the MSLQ is one of the most used survey instruments which was validated in a number of different contexts.

Motivated Strategies for Learning Questionnaire (MSLQ)

The MSLQ is an 81-item, self-report instrument designed to measure students' motivational orientations and their use of various learning strategies (Pintrich et al. 1991). The first part consists 31 items that measure learning motivation with 6 subscales (intrinsic goal orientation, extrinsic goal orientation (EGO), task value, control of learning beliefs, self-efficacy (SE) for learning and performance, and test anxiety). The second part with 50 items measures the learning strategies with 9 subscales (rehearsal, elaboration, organization, critical thinking, metacognitive self-regulation, time and study environment management, effort regulation, peer learning, and help seeking).

The instrument underwent 10 years of formal development using a social cognitive view of motivation and self-regulated learning (Pintrich 2003). In this model, students' motivation is directly linked to their ability to self-regulate their learning. It assumes that motivation is dynamic and contextually bound (e.g., varying from course to course) (Duncan and McKeachie 2005). The MSLQ has been translated into more than 20 languages and has undergone assessment of validity and reliability in two other languages: Spanish and Chinese (Duncan and McKeachie 2005). Specifically, Rao and Sachs (1999) have translated it to Chinese and partially validated the instrument among Hong Kong students. In addition, Rotgans and Schmidt (2010) had partially validated the MSLQ among Singaporean students. However, their validation excluded test anxiety and task value subscales from the motivation part.

Chinese Language Classroom Environment Inventory (CLCEI)

Chua et al. (2009) CLCEI examines various dimensions of CL classroom learning environments, including student cohesiveness, TS, involvement, cooperation, task orientation, and equity. As the instrument has been validated in Singapore context, the authors argue that other researchers and teachers in the area of CL learning can have confidence in using it in Singapore to pursue various research and practical applications.

In essence, we argue that MSLQ is more versatile in measuring the learners' motivation and behaviors in learning; as compared to CLCEI that focuses more on classroom teaching and learning. However, both instruments do not cover the use of ICT as part of students' learning strategies. In addition, existing survey that is meant for measuring learners' perceptions or attitudes toward the use of ICT for language learning seems rare. Consequently, we developed items for this aspect based on

our experience in conducting computer-assisted CL learning research for the last decade.

Methodology

In this study, Motivation and Attitudes for Language Learning Inventory (MALLI) is developed to measure multiple variables within the same group of the students learning both CL and EL. It consists of two questionnaires, namely, MALLI (C) and MALLI (E). Both questionnaires have same items but except for the reference to the language learnt and all items are presented in both English and Chinese versions. For example, a particular item in MALLI (C) reads, "It is important for me to learn the course material in Chinese class." The corresponding item in MALLI (E) reads, "It is important for me to learn the course material in English class."

A total of seven subscales from MSLQ and CLCEI, complemented by a self-developed subscale on the use of ICT in language learning were created. We chose these subscales as they are either meant for measuring the students learning motivation and attitude (intrinsic goal orientation, EGO), or the potential factors that may affect their motivation/attitude [task value, SE, TS, ICT for learning (ICT)], or the self-regulated strategies (time and study environment, effort regulation) that are usually correlated to goal orientations. The cognitive learning strategy and peer learning-related subscales in both MSLQ and CLCEI were not incorporated into MALLI as they are not the foci of the questionnaire to be developed. While we are aware of the value of these factors, to demand the students to fill up two questionnaires with 80 items may lead to survey fatigue and hence inaccurate responses. Consequently, a 54-item questionnaire classified under 8 subscales was generated, as summarized in Table 1. A 5-point Likert scale was used for all the items with 1 indicating strongly disagree and 5 representing strongly agree.

We developed the first versions of MALLI (C) and MALLI (E) in English only. However, while the majority of Singapore students are well-versed in English, a small number of students favor the use of Chinese, including those who came from mainland China and Taiwan. In turn, the "back translation process" (Huang and Fraser 1997) was adopted to generate bilingual instruments with as little variations as possible in meanings of individual items in Chinese and English. The instruments were first translated to Chinese and vetted by 5 CL teachers, translated back to EL by a bilingual scholar, and vetted by another EL teacher. After the back-and-forth translations, two Secondary 1 students (one from a Mandarin-speaking family and another from an English-speaking family) were invited to try filling up the instruments. Difficult or ambiguous items

Table 1 The structure of the original versions of MALLI (C) and MALLI (E)

Original instrument	Factor (No.of items)	Description
MSLQ	Intrinsic goal orientation (4)	The factor measures the degree to which the student perceives herself to be participating in a task for reasons such as challenge, curiosity, mastery—the task participation is an end itself, rather than being a means to an end
	EGO (4)	The factor measures the degree to which the student perceives herself to be participating in a task for reasons such as grades, rewards, performance, evaluation by others, and competition
	Task value (6)	The factor measures students' perceptions of the course material in terms of interest, importance, and utility
	SE (8)	The factor measures student's self-appraisal of one's ability to master a task
	Time and study environment (8)	The factor measures students' ability to manage their time for learning and the study environment
	Effort regulation (4)	The factor measures students' ability to control their effort and attention in the face of distractions and uninteresting tasks
CLCEI	TS (8)	The factor measures student's perceptions on their CL/EL teachers' levels of assistance, friendliness, trust and care
(Drafted by the authors)	ICT (12)	The factor measures student's perceptions of ICT use in CL/EL learning

were surfaced and final revisions were made based on their comments.

The study on the bilingual instruments was conducted with 318 secondary 1 students from a traditional Chinese school, a traditional English school, and two neighborhood schools (typical government schools). The students filled up both the surveys on different days (about a week apart). After the student responses were imported into SPSS 18, we performed Exploratory Factor Analysis (EFA) with principal axis factoring and direct oblimin rotation. Factor loading greater than 0.40 was employed for item retention.

Results of Exploratory Factor Analysis

An important consideration during EFA is that we need to identify a common subscale structure for both MALLI (C) and MALLI (E) to make direct cross-examination between the matching factors of the two language subjects in the future. First, Barlett's Test of Sphericity and KMO Test were applied on the data sets of MALLI (C) and MALLI (E), respectively. We obtained MALLI (C)'s KMO = 0.89 (>0.50), Barlett's test of sphericity was significant ($p = 0.000$); and MALLI (E)'s KMO = 0.89 (>0.50), Barlett's test of sphericity was significant ($p = 0.000$). Therefore, both datasets are suitable for factor analysis. A principal axis factoring analysis with a direct oblimin rotation was conducted on the scores of MALLI (C) and MALLI (E). Moreover, we used parallel analysis to determine the number of factors (Hayton et al. 2004). The first 10 actual, average, and 95th percentile Eigen values of 54-item short form of both instruments are shown in

Table 2 The actual, average, and 95th percentile Eigen value of MALLI (C)

Actual Eigen value	Average Eigen value	95th percentile Eigen value
14.36	1.91	1.90
5.76	1.83	1.81
3.58	1.77	1.75
2.68	1.70	1.69
2.05	1.65	1.65
1.79	1.61	1.60
1.52	1.56	1.55
1.26	1.52	1.51
1.12	1.48	1.48
1.02	1.45	1.44

Tables 2 and 3 respectively. The results in Tables 2 and 3 revealed that only the first 6 actual Eigen values are greater than both the average and 95th percentile criteria. Hence, six factors of both instruments would be retained in this study. Next, items which factor loadings were less than 0.40 or cross-loaded were gradually omitted, resulting in the removal of 21 items.

Tables 4 and 5 present the factor loadings of the remaining 33 items in MALLI (C) and MALLI (E), respectively. These items constitute 6 subscales of MALLI (C) and MALLI (E), respectively. After completing principal axis factoring, we examined the internal consistency of individual subscales and the overall instrument. All of the resultant Cronbach's Alpha values are above 0.70, indicating high internal consistency reliabilities.

Table 3 The actual, average, and 95th percentile Eigen value of MALLI (E)

Actual Eigen value	Average Eigen value	95th percentile Eigen value
14.23	1.93	1.91
5.70	1.84	1.82
4.04	1.76	1.75
2.78	1.71	1.70
2.27	1.66	1.65
1.84	1.61	1.60
1.43	1.56	1.55
1.34	1.52	1.51
1.10	1.48	1.47
1.01	1.44	1.44

The new subscale structure has 18 items from MSLQ, 7 out of 8 items of the “TS” subscale from CLCEI and 8 out of 12 items from our self-created “ICT” subscale. After examining the items that constitute individual new subscales, some subscales were renamed to better reflect their respective common themes (see Table 6). The same subscale structure applies to both MALLI (C) and MALLI (E).

Further Analysis on the Questionnaire Data

We performed paired *t* tests between the same set of students' mean responses to individual MALLI (C) subscales and that of the corresponding MALLI (E) subscales. As the two questionnaires were administered to the participating students on two different days, some students were absent from their schools on either one of the days. Therefore, the valid dataset for comparison purpose (perceptions on CL factor versus corresponding EL factor) is narrowed down to $n = 252$. The paired *t* test results are summarized in Table 7.

Table 7 indicates the significant differences between the students' perceptions on CL and EL learning in the aspects of “TS” and “ICT”, but not in the rest of the factors. The findings indicate that the instruments are able to tease out important differences between the learning of CL and EL.

Discussion and Conclusion

We have developed and validated complementary bilingual instruments, MALLI (C) and MALLI (E), for measuring students' perceptions on various factors pertaining to their Chinese or English Language learning. We first combined MSLQ, CLCEI, and self-created English questionnaire items and performed a back translation process to develop

preliminary versions of the bilingual instruments. 318 Secondary 1 students from 4 schools were surveyed. The EFA generated the final versions of MALLI (C) and MALLI (E) with 33 items loaded into 6 subscales, both MALLI (C) and MALLI (E) have high internal consistency reliability.

The validation results and the subscale structure that emerged showed that MALLI (C) and MALLI (E) is likely to be a valid and reliable bilingual instruments for assessing and comparing Singapore secondary school students' perceptions on their goal orientations, SE, self-discipline, TS, and the use of ICT on Chinese and English Language learning. Thus, the MALLI (C) and MALLI (E) contribute to the field of bilingual education as the first set of bilingual instruments. Bilingual education has been emphasized in many countries, especially in view of the globalized economy where multilingual capacities enhance the employability of individuals (Garcia 2009). Motivation and learning strategies, and the associated use of ICT for language learning, are important factors for the cultivation of bilingual or multilingual capacities. How these factors function within the context of learning one language in relation to another could serve as important information in the shaping of language policies and pedagogy.

The merging of intrinsic goal orientation and the task value subscales indicate that the two construct are indistinguishable for the Singaporean students. Indeed, they denote perceive importance of learning the subject matter which leads to willingness to undertake difficult learning task. Crede and Phillips (2011) have indicated that the MSLQ still need further refinement to obtain better factor structure. Our study lends support to their claims. Furthermore, previous MSLQ validation efforts among ethnic Chinese students (e.g., Liu and Lin 2010; Rao and Sachs 1999) have resulted in either both subscales loaded as one factor or the task value subscale being omitted. It is possible that Chinese students may not be able to distinguish the two subscales due to the influence of Confucius teaching that is generally pragmatic, which see useful things as intrinsically important.

The findings from the paired *t* tests are somewhat surprising, as it reflected that the students are almost equally motivated to learn both CL (mean = 2.13) and EL (mean = 2.12), which is perhaps an effect of the government's extended emphasis in bilingualism. This defies the often lamented state of affair among Chinese teachers (likely due to their subjective experience and practice of teaching CL) that Singapore students are not motivated to learn CL (CLCPRC 2004). Teachers holding such belief may give up easier than those who do not. Instead of being influenced by unfounded assumption, we would encourage school to survey the students' motivation of learning CL and based their instructions on the results.

Table 4 The results of the principle axis factoring analysis for MALLI (C)

Items	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5	Factor 6
Factor 1: Intrinsic Value (IV), $\alpha = .75$						
IV1. 在华文课里,我比较喜欢能激起我的好奇心的教学内容,即使它很难学。	0.60					
IV2. 上华文课时,我比较喜欢对我有挑战性的内容,以便能学到新的东西。	0.51					
IV3. 学习华文课的内容,对我而言是非常重要的。	0.46					
Factor 2: EGO, $\alpha = .72$						
EGO1. 目前我最关心的是提高我的学年总平均成绩;所以,上华文课对我而言,最重要就是得到好成绩。		0.89				
EGO2. 我要在华文课里有好的表现,因为向我的家人、朋友或其他人证明我的能力是很重要的。		0.60				
EGO3. 如果可以的话,我希望我的华文成绩比班上大多数同学好。		0.55				
EGO4. 在华文课中争取好成绩,是我目前最满意的事。		0.49				
Factor 3: Self-Efficacy (SE), $\alpha = .93$						
SE1. 我有信心能在华文课业和考试中,取得优异的表现。			0.83			
SE2. 考虑到华文课的难易度、老师的教学和我的技能,我相信我会在这门课里表现优异。			0.80			
SE3. 我相信我能在华文科考到好成绩。			0.80			
SE4. 我有信心我可以了解老师在华文课中所教的最复杂的内容。			0.77			
SE5. 我确定我可以了解华文课中最困难的材料。			0.76			
SE6. 我在华文课里会有好的表现。			0.71			
SE7. 我确信我能掌握华文课所教导的技能。			0.66			
Factor 4: Time and Study Management (TSM), $\alpha = .76$						
TSM1. 我通常在能让我集中注意力的地方温习华文。				0.80		
TSM2. 我会好好利用我的学习时间学华文。				0.68		
TSM3. 我确保自己每周能跟上华文课的学习和作业。				0.54		
TSM4. 我有一个固定的学习华文的地点。				0.50		
Factor 5: Teacher Support (TS), $\alpha = .92$						
TS1. 华文老师会与我交谈。					0.88	
TS2. 华文老师关心我的问题。					0.88	
TS3. 华文老师会顾虑到我的感受。					0.85	
TS4. 华文老师会尽其所能地帮助我。					0.78	
TS5. 华文老师在班上走动,以便走近我并与我说话。					0.74	
TS6. 华文老师关心我。					0.66	
TS7. 当我功课上有困难时,华文老师会帮助我。					0.75	
Factor 6: ICT in Learning (ICT), $\alpha = .92$						
ICT1. 使用资讯科技,我能更有效率地(即速度更快)进行华文学习活动。						0.93
ICT2. 使用资讯科技,我的华文学习活动的效果更好(即学习成果的素质更好)。						0.91
ICT3. 我喜欢用电脑做华文课的家庭作业或习题。						0.83
ICT4. 使用资讯科技,我与其他同学可以更好地合作学习华文。						0.81
ICT5. 我喜欢使用资讯科技学习华文。						0.76
ICT6. 使用资讯科技,我会主动上网搜寻与华文学习相关的内容。						0.63
ICT7. 华文老师使用资讯科技进行教学,加强了我掌握华文课程内容的信心。						0.60
ICT8. 在华文课里使用资讯科技,是麻烦的。						0.57

Overall $\alpha = .91$

Note To match the framework of MALLI, the factors are not reported in the order of their extraction

Another interesting finding is the significant difference in the students' attitudes in the use of ICT in learning the languages. Despite being born and raised in the digital age and having been employing ICT in their school work since

primary school, the students did not exhibit the same level of enthusiasm in the ICT use in both language subjects. One possible contributing factor is the indirect Chinese text input method (mostly via pinyin input—a phonetic-based

Table 5 The results of the principal axis factoring analysis for MALLI (E)

Items	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5	Factor 6
Factor 1: IV, = .79						
IV1. In the English class, I prefer course material that arouses my curiosity, even if it is difficult to learn	0.88					
IV2. In my English class, I prefer course material that really challenges me so I can learn new things	0.69					
IV3. It is important for me to learn the course material in English class	0.42					
Factor 2: EGO, = .75						
EGO1. The most important thing for me right now is improving my overall grade point average/mean subject grade, so my main concern in English class is getting a good grade		0.74				
EGO4. Getting a good grade in English class is the most satisfying thing for me right now		0.71				
EGO2: I want to do well in English class because it is important to show my ability to my family, friends, or others		0.64				
EGO3. If I can, I want to get better grades in English class than most of the other students		0.44				
Factor 3: SE, = .91						
SE4. I'm confident I can understand the most complex material presented by the teacher in English class			0.85			
SE5. I'm certain I can understand the most difficult material presented in the English class			0.80			
SE1. I'm confident I can do an excellent job on the assignments and tests in English class			0.74			
SE3. I believe I will receive an excellent grade in English class			0.71			
SE2. Considering the difficulty of English class, the teacher, and my skills, I think I will do well in this class			0.70			
SE7. I'm certain I can master the skills being taught in English class			0.61			
SE6. I expect to do well in English class			0.56			
Factor 4: TSM, = .75						
TSM2. I make good use of my study time for English course				0.79		
TSM1. I usually study in a place where I can concentrate on my English course work				0.61		
TSM4. I have a regular place set aside for studying English				0.54		
TSM3. I make sure that I keep up with the weekly readings and assignments for English class				0.54		
Factor 5: TS, = .90						
TS4. The English language teacher goes out of his/her way to help me					0.85	
TS3. The English language teacher considers my feelings					0.83	
TS2. The English language teacher is interested in my problems					0.80	
TS7. The English language teacher helps me when I have trouble with the work					0.75	
TS1. The English language teacher talks with me					0.74	
TS6. The English language teacher cares about me					0.63	
TS5. The English language teacher moves about the class to talk with me					0.58	
Factor 6: ICT, = .92						
ICT1. With the use of ICT, I could carry out my English language learning activities more efficiently (faster)						0.90
ICT2. With the use of ICT, my English language learning activities become more effective						0.89
ICT4. With the use of ICT, I collaborate with my classmates better in learning English						0.86
ICT3. I like to do English homework or assignments on the computer						0.82

Table 5 continued

Items	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5	Factor 6
ICT5. I like to use ICT in learning English language.						0.79
ICT6. With the use of ICT, I take initiative to search for English learning content online						0.73
ICT7. The English teacher's use of ICT in his/her instruction has increased my confidence in mastering the subject						0.69
ICT8. The use of ICT in the English class is troublesome						0.50
Overall						.91

Note To match the framework of MALLI, the factors are not reported in the order of their extraction; Item IDs in MALLI (E) are matched to those in MALLI (C)

Table 6 The new subscale structure for MALLI (C) and MALLI (E) after EFA

No. of items	Source of items	Item ID's (Ref. Tables 2, 3)	New naming and rationale (if applicable)
3	Two items from Intrinsic Goal Orientation in MSLQ (two items omitted) One items from task value in MSLQ (four items omitted)	IV1, IV2 IV3	IV: after omitting 3 under-loaded or cross-loaded items from them, the two MSLQ subscales converged as one. This indicates that students could not distinguish between the two subscales
4	All four items from EGO in MSLQ	EGO1, EGO2, EGO3, EGO4	EGO
7	Seven items from SE in MSLQ (one item omitted)	SE1, SE2, SE3, SE4, SE5, SE6, SE7	SE
4	Four items from TSM in MSLQ (one item omitted)	TSM1, TSM2, TSM3, TSM4	TSM
7	Seven items from TS in CLCEI (one item omitted)	TS1, TS2, TS3, TS4, TS5, TS6, TS7	TS
8	Eight items from authors' self-created factor of ICT (four items omitted)	ICT1, ICT2, ICT3, ICT4, ICT5, ICT6, ICT7, ICT8	ICT

Table 7 Summary of paired *t* tests on students' perceptions between CL and EL (*n* = 252)

Subscale	MALLI (C) (mean, SD)	MALLI (E) (mean, SD)	Paired <i>t</i> test between MALLI (C) and MALLI (E) scores <i>t</i> value
IV	3.87 (0.67)	3.88 (0.71)	-.30
EGO	4.05 (0.69)	3.98 (0.69)	1.77
SE	3.38 (0.80)	3.47 (0.73)	-1.33
TSM	3.43 (0.71)	3.47 (0.71)	-0.99
TS	3.60 (0.76)	3.43 (0.68)	3.52**
ICT	3.40 (0.83)	3.50 (0.85)	-2.31*

* $p < 0.05$, ** $p < 0.01$

coding method) (Du and Crestani 2005; Wong et al. 2011a) that is a required skill for ICT-mediated CL learning activities. As most of the Singapore CL students have yet to master the skill (not a mandatory part of the CL curriculum in Singapore), it is not surprising that they are less keen on employing ICT for CL learning than EL learning.

As for the students' stronger perception of teachers support for the EL, this could be associated with the students' need for help in learning the CL. The EL is the dominant language that most Singapore children use today

and it is also a language that demands less cognitive load in comparison with the CL. On the other hand, learning CL requires one to memorize the shape and sound of the words, which constitute problems for many Singaporean Chinese. It is therefore not surprising that the students perceive stronger needs for TS. On the teacher side, the traditional Chinese belief emphasizes that the teacher is someone who pass on the way, the skill and resolve the doubt. Teachers are facilitators for students' learning and hence they are expected culturally to help.

On the other hand, the paired *t* tests have shown that there is no significant difference between the “IV”, “EGO,” “SE” and “TSM” factors in students' CL and EL learning. Indeed, although MSLQ was developed based on the assumption that motivation is dynamic and contextually bound (e.g., varying from subject to subject), the results of various relevant studies (e.g., Rotgans and Schmidt 2010; Vermetten et al. 1999; Wolters and Pintrich 1998) have suggested that the learning context had only minor influence on the use of self-regulated learning constructs.

In short, this paper reports our effort in developing and validating a complementary set of questionnaires to measure and compare various factors pertaining to the learning of CL and EL among bilingual students in Singapore. We then performed paired *t* tests on the pilot data to demonstrate how the two questionnaires can be applied for the stated purpose. It is important to note that our explanations to the *t* test findings warrant separate studies to be qualitatively validated. Nevertheless, with the reported effort, we hope to contribute to the practitioners and policy makers of bilingual education by providing them a set of tools to investigate and verify their presumptions on the students' perceptions and attitudes in the learning of the two languages, which may consequently inform their practice and policy.

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