Teacher Language Awareness and Scaffolded Interaction in CLIL Science Classrooms

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Teacher language awareness (TLA) constitutes the teacher's self-reflective knowledge about the operation of language systems in pedagogical practices. This study focuses on teachers' understanding of learning of language and learning through language in Content and Language Integrated Learning (CLIL) contexts, exploring how teachers proceduralise their knowledge of language to facilitate science learning in Hong Kong. By analysing the reflective relationship between TLA and scaffolding strategies of two teachers (students n=31; 32) during a set of lessons in a secondary school, this paper suggests that it is critical to re-orient the TLA focus from teachers to the act of learning and learners' needs. This expanded conceptual framework of TLA sheds light on how to transform teachers' implicit knowledge of language into explicit awareness of scaffolding in class. The TLA-filtered, scaffolded interactions can therefore promote the use of language not merely for pedagogical purposes but also as a cognitive learning tool.

Keywords: Teacher language awareness, Content and Language Integrated Learning (CLIL), scaffolding strategies, learners' needs, science classrooms

1. Introduction

Content and Language Integrated Learning (CLIL) education aims to achieve competence in both content subject and English language knowledge. Emerging in the 1990s, this "dual focused educational approach in which an additional language is used for the learning and teaching of both content and language" has a worldwide application (Coyle et al., 2010, p. 1; Merino & Lasagabaster, 2017). CLIL has gained increasing prominence particularly in Europe and Asia due to its popular double objectives and design (Graham et al., 2018). It can also be a product of local language policies, for example in Hong Kong which provides a case study for this research.

For a number of years before Hong Kong's return to Chinese sovereignty in 1997, a laissez-faire approach had been adopted regarding the medium of instruction (MOI) in each school. While some secondary schools adopted the students' mother tongue, namely Chinese (Cantonese), as the Medium of Instruction (CMI), the vast majority claimed to be English-medium (EMI). In reality, however, most of the so-called EMI secondary schools employed an ad hoc mixture of Chinese and English ("mixed code") in the teaching of content subjects. While the Government had encouraged teaching through the students' mother tongue, in 1997/98 the Government issued *Medium of Instruction Guidance for Secondary Schools* (which was referred to as "Firm" Guidance): only 114 public-sector secondary schools, amounting to 30% of Hong Kong's total 421 secondary schools, would be EMI (and then only if they fulfilled certain conditions relating to their student intake and their staff); the remaining 70% would be CMI and it was compulsory for them to use CMI at the junior secondary level (Evans, 2013). This well-intentioned attempt to provide clarity and promote mother-tongue teaching proved to be unpopular in many quarters: for instance, among aspirational parents, many of whom who perceived English as having more social and cultural value than Chinese, and among principals and communities of CMI schools, who felt that, given the socio-economic importance of English in the Hong Kong context, being identified as a CMI school was like being labelled "second-class" (Chan, 2016; Choi, 2003). In 2010/11, against this background, the Government started to implement a fine-tuning MOI policy (Education Bureau, 2009). Under this policy, schools would no longer be labelled CMI. Those schools that were previously designated CMI were given greater autonomy to determine the MOI for content subjects. One of the Government's key objectives was to provide students in former CMI schools with greater exposure to English. As a result of this change, there has been a marked increase in the teaching of content subjects (especially Science and Mathematics) through English, though the teaching modes vary considerably, i.e. in practice, the same subject can be

conducted primarily in Chinese and sometimes in English for certain units of the subject in some schools whereas in some others, the subject can be taught entirely in English (or in Chinese). The fine-tuned MOI policy may have been politically expedient, allaying the concerns of many parents and principals, but it has also created challenges for the teachers of content subjects (many of whom had little or no previous experience of teaching through EMI) and for their students (Fung & Yip, 2014).

In CLIL programs, language plays a crucial role as both the medium and the object of instruction, which calls for language-aware content teachers (Andrews & Lin, 2017; Liyanage & Bartlett, 2010). Such a need is obvious in Hong Kong, not only because expressing and delivering content knowledge in the classroom is realised through language during the talk-in-interaction between the teacher and students, but also because most CLIL teachers are non-native speakers of English and their command of English language varies (Lasagabaster & Sierra, 2016). It is not the case that native English-speaking teachers (NEST) would definitely outperform non-native English-speaking teachers (NNEST) in CLIL classrooms, because the bilingual skills of NNEST might enable them to perceive the difference between languages and perhaps teach more effectively the content subject in L2. Nevertheless, the question remains as to what levels of language proficiency is required for CLIL teachers to facilitate meaning making in content subject classrooms (Morton, 2018), particularly for those who used to teach their subjects in Chinese but now need to shift to English after the implementation of the fine-tuned MOI policy. Furthermore, while CLIL teachers are expected to enhance students' English competency which constitutes one of the key teaching goals, many teachers identify themselves as content subject teachers only (Koopman, Skeet, & de Graaff, 2014; Lo, 2017; Tan, 2011). A considerable proportion of these teachers are seen to have a weak grasp of language teaching knowledge and professional skills to develop students' English competency (Hoare, 2003). Despite efforts have been made, the language focus in the CLIL classrooms is largely confined to rote learning of technical terms and drilling of language-related exercises (e.g. blank filling exercises and low-level comprehension exercises) in a piecemeal fashion (Lyster, 2007; Regalla, 2012).

2. Teacher Language Awareness

Both "learning language" and "learning through language" are important for the cognitive development of children (Halliday, 1993, p. 93). These two interrelated aspects underline the double objectives of CLIL education. Addressing the significant role of language in the learning/teaching process, the framework of Teacher Language Awareness (TLA) sheds light

on "the interface between what teachers know, or need to know, about language and their pedagogical practice" (Andrews & Svalberg, 2017, p. 220). TLA is believed to affect the effective language input and output in classes (Andrews, 2007). As "an essential attribute of any competent L2 teacher", TLA has received considerable attention in the studies of English-as-Second/Foreign-Language (ESL/EFL) classrooms, providing insight into teacher cognition and knowledge about the operation of language systems in the pedagogical process (Andrews, 2007, p. ix; Thornbury, 1997). TLA is potentially significant in influencing how language is instructed, organised, and learnt in the ESL/EFL classrooms. Studies show that it is equally relevant to CLIL teachers (Andrews & Lin, 2018; García, 2009; Lindahl, Baecher & Tomas, 2013). As such, however, there remains a paucity of empirical study in CLIL contexts on how to enhance the TLA of content subject teachers and thereby improve their pedagogical practices.

According to Andrews, TLA involves three aspects: first, a teacher's L2 language proficiency; second, a teacher's mastery of the specialised language of subject matter; and third, the teacher's knowledge of learners' language proficiency, especially related to subject matter (Andrews, 2007; Andrews & Lin, 2018). Linking TLA to the Pedagogical Content Knowledge (PCK) which is an "amalgam of content and pedagogy" (Shulman, 1987, p.8), Andrews (2007) suggests that TLA forms "a pedagogically related reflective dimension of language proficiency" and "a sub-component of the L2 teacher's PCK, which interacts with the other sub-components" (p.30). In this respect, Andrews (2007) suggests that TLA consists of "declarative and procedural dimensions"; the former designates the teacher's "possession of [language-related] knowledge" and the latter is linked to the pedagogical strategies regarding "the use made of such knowledge" in class (p.31). Both dimensions are interrelated, but there remains a challenge of realising the transference of TLA from teachers' knowledge of language (*declarative* dimension) to the use of knowledge (*procedural* dimension) in classroom interaction (Andrews & Lin, 2018).

It is vital that teachers transform their implicit understanding of language-related knowledge into an explicit awareness that informs pedagogical practices. Building upon the framework proposed by Edge (1988) which highlights L2 teachers' three roles as language *user*, language *analyst*, and language *teacher*, three domains of TLA were further developed in Wright and Bolitho (1993) and in Lindahl (2013; 2016), to address the need of teachers to develop language knowledge and procedural awareness. The three domains are a) the *user* domain, which refers to the teacher's English language proficiency and his/her use of English to communicate with people who speak other dialects of English or other languages; b) the *analyst* domain, which consists of the teacher's understanding of grammars and rules by which

language works in the subject-specific, academic contexts; and c) the *teacher* domain, which refers to the pedagogical knowledge of language teaching (Andrews & Lin, 2018; Lindahl & Watkins, 2015). This theory sheds light on how TLA can be enhanced as the teacher shifts across different identities as users, analysts and teachers of language. But a salient question raised by Andrews and Lin (2018) highlights the connection between TLA and learning: "How might a language-aware teacher be better equipped to enact the curriculum in ways that support student learning?" (p.60). While the three domains of TLA place a spotlight on how teachers consider their treatment of language, more attention need to be paid to their understanding of learners, the learning process, and contextual factors related to the language in class, which are critical to guide the teacher's language teaching (Andrews & Lin, 2018; Lindahl & Watkins, 2015). Teaching and learning are always integrated. The interface between Teaching and learning underlines the transformation between the teacher's declarative knowledge and the corresponding procedural knowledge of language. In other words, learning of language as understood by teachers can direct them to provide effective, targeted scaffolding for students in the classroom learning process. It is worthwhile to examine how teachers understand the use of language from the perspectives of learners and learning (Andrews & Lin, 2018). The enactment of TLA can thereby facilitate students' learning of language in CLIL programs.

It is acknowledged that TLA influences various aspects of pedagogical practices (Andrews, 2007). In a sense, TLA affects nearly "every decision that the L2 teacher makes in relation to the language made available for learning" (Andrews & Lin, 2018, p.60). TLA serves as a "filter" which guides and monitors the classroom talk, identifies learning gaps, and intervenes with appropriate scaffolding and mediation strategies (Andrews, 2007, p.38). While the impact of TLA upon pedagogical practices is never straightforward because multiple factors including teachers' preparation, classroom organisations and students responses would intervene in the operation of TLA (Andrews, 2007), it is meaningful to elucidate the intersections between TLA and scaffolded interactions. Given that cognition and awareness can be elusive and difficult to judge and assess, a mapped-out connection between the procedural TLA in cognition and scaffolding strategies in practice provides insight into teacher professional development.

To this end, this study focuses on teachers' understanding of learning of language and through language in CLIL science classrooms, with a purpose of exploring how teachers proceduralise their knowledge of language to facilitate learning. Here, learning of language refers to the English language (L2) learning in CLIL contexts. Learning through language means the learning of content-related, specialised language with an aim of expressing scientific

ideas, reasoning and solving problems. Both aspects of language learning—the L2 and the language of content subject—are integral in CLIL programs. The study reported in this paper provides implications for teachers' pre-service and in-service training of language awareness. It will shed light on how TLA informs pedagogical practices and is conducive to the learning of and through language in CLIL contexts.

3. Methodology

This study sits within a wider research context and project investigating the role of English language in EMI content subject lessons in Hong Kong. The primary research questions are:

1. What is teachers' awareness of language-related issues in the CLIL learning of science?
2. What strategies of scaffolding are employed by teachers to facilitate students' language learning in the classrooms?

This paper reports the findings of teacher language awareness and scaffolded strategies of two teachers in a set of consecutive lessons to conduct a mini-science project "Building a Frame Structure" among two classes of Form 1 (Grade 7) students. In the observed science project, two classes of students were guided to design and build a frame structure with drinking straws and adhesive tapes. In each class, students were divided into 8 groups (3–4 pupils in each group) and the group that built the frame structure which could hold the largest amount of weight per gram of its own weight was deemed the winner of the competition. Table 1 presents the observed lessons and two classes participating in this mini-science project. The purpose of choosing a set of project-based lessons for this study is out of the consideration to maintain consistency and coherence of teaching contents, useful for the holistic analysis of classroom interactions (see Gibbons, 2003, p. 255).

Table 1:

Mini Science Project	Class A (TA)	Class B (TB)
Number of lessons (45 minutes per lesson)	6	8
Number of students	31	32

Participants

Both teachers are from one school, classified as Band 1 (representing the top tier in the three-tier system of Hong Kong secondary schools). Table 2 details the two participant teachers' profiles.

Table 2:

	Teacher A (TA)	Teacher B (TB)

Qualifications	Bachelor of Science – Chemistry & The Postgraduate Diploma in Education (PGDE)	Bachelor of Science – Animal and Plant Biotechnology
Years of experience	10 Years	8 Years
Medium of Instruction	EMI	EMI

Students from both classes are not streamed, which means that they were not distributed to classes because of their academic ability. When data was collected, these students had only spent one semester in the secondary school. Researchers did not observe considerable difference in the academic abilities across the two classes. Teachers and students participating in this study are ethnically Chinese, which reflects the make-up of local Hong Kong classes. As this study is aimed at examining teachers' language awareness and its interrelations with scaffolding practices, it is not our intention to compare two teachers or two classes, but to have more than one teacher/class enlarges our database and presents a more balanced view of the CLIL situations in Hong Kong.

To understand the learners' perspectives of language learning, which provides a basis for researchers to examine teachers' knowledge of learners, a survey of two classes of students (n=31; 32) was conducted through a questionnaire. Seven questions in the student questionnaire cover different aspects related to their language learning, including their mother tongue, language(s) spoken at home, language(s) used in primary schools, the difficulty of learning science in English, and their language preference when studying science. As the result of questionnaire shows, Cantonese is the mother tongue and home language of the majority students in both classes. In terms of the language used in the lessons of General Studies (the subject content of which involves science) in their primary schools, Cantonese rates above 90% and only three students in two classes had English as MOI in General Studies. For the question, "At this stage, do you have any difficulty learning science in English?", 23.3% students in Class A and 22.6% students in Class B respectively report that they have difficulty in general. As for the question which asks students to identify which aspect(s) of science learning in English is deemed most difficult (multiple choices), the highest response rate was awarded to the item "understanding scientific terms and/or concepts in English" which amounts to 78.6% and 76.9% of students in Class A and B, respectively. For students in Class A, over 30% of students find it difficult to ask and to answer questions in English in science lessons, and to engage discussions with classmates in English. For students in Class B, 42.3% students believe it difficult to understand science teachers' instructions in English in class. Answering questions

in English is also deemed difficult for nearly 50% of students in Class B. When being asked "if you have a choice, which language would you prefer to use when learning science in secondary school", 73.3% students in Class A choose "mainly English with some Cantonese" and this choice is also the most popular among students (45.2%) in Class B. Using purely English only amounts to 10% and 19.4% in Class A and B, respectively. Over one third of students in Class B would like to use "mainly Cantonese with some English" in learning science.

The similarity of statistics from these two classes reveal that most of the observed students have encountered various difficulties in learning science in English as they adapt to an EMI learning environment in the secondary school. Students' learning needs and difficulties related to the use of language call for language-aware content teachers who not only have sufficient content subject knowledge and English proficiency but also understand the language learning from learners' perspectives and the nature of language learning in CLIL contexts.

Procedures

Semi-structured interviews with two teachers centre on the teachers' views on the role of language in CLIL learning, the language learning among their students, and the language policy of the school and the Education Bureau. Since TLA is arguably within the cognitive realm, to avoid teachers modifying their thoughts and awareness for the sake of answering the questions, the term TLA was not given to the two teachers during the interviews. The interviews were conducted in Cantonese (the teachers' mother tongue) and an interview protocol was followed to ensure consistency across two teachers and researchers. The excerpted interview data in this paper were translated by the researchers and then member checked by the two teachers so as to ensure the translated texts conveyed their original meaning. The lessons were video-recorded and transcribed verbatim for analysis.

Analysis

This study adopts a grounded approach to code teachers' awareness of language use in interview transcripts and scaffolding strategies emerging from the lessons. Coding was done by a research team of 5 individuals who conducted an iterative process of data checking across cases. Agreement was across the team as each member was familiar with the separate contexts and then read by the PIs and consultant advisor in her role as Chair Professor. The teachers' interview transcripts were first coded according to the relevance to the awareness of language-related issues. Then as the themes emerged which were related to learning of and through

language and to the relations between learners and language, the codes were refined. The interview transcripts were then re-examined after the codes were finalised.

To facilitate the analysis of scaffolding in the classroom discourse, Sinclair and Coulthard's IRF model (1975), which comprises teacher initiation (I), pupil response (R), and teacher feedback or follow-up (F), was used to examine the interactive patterns between teacher and students. The codes of scaffolding strategies were drawn from the model of mediation by Gibbons (2003) between oral, everyday language and academic, specialist languages: 1) recasting to shift modes, 2) enabling students to reformulate, 3) requesting clarification, and 4) evoking personal knowledge, together with other recurring, salient themes identified in the co-construction of knowledge in the observed lessons. Besides, this paper draws on Holton and Clarke's construct of scaffolding (2006), which is categorised into different agents: expert scaffolding (teachers), reciprocal scaffolding (peers) and self-scaffolding (learners themselves), and two domains: conceptual and heuristic scaffoldings. An act of scaffolding often synthesises both aspects to facilitate problem-solving processes. It should be noted that this paper does not discuss the heuristic scaffoldings provided to solve the technical aspects of building a frame structure. It focuses on the language use, primarily via conceptual scaffoldings, to achieve co-construction of knowledge. When the codes were refined, the researchers went through the lessons transcripts to ensure the consistency and accuracy of codes.

4. Findings

With a focus on the teacher's understanding of learning of language and through language in CLIL science classrooms, the findings consist of the teachers' awareness of language from the perspectives of learners and learning, and their scaffolding practices in the classroom talk-in-interaction. The following sections include data and verbatim quotes from teachers' interviews and classroom transcripts.

4.1 L2 Science Teachers' Awareness of Language from the Perspectives of Learners and Learning in CLIL Contexts

The findings on teachers' language awareness in CLIL contexts include three interrelated aspects: the teacher's understanding of learning through language, of students' L2 language proficiency and language of subject matter, and of the impact of language policies on students' learning motivation and outcomes.

4.1.1 Teachers' understanding of learning content subjects through language

According to social constructivist theories of learning, there is a strong relationship between social interaction via the use of semiotic tools and individual acquisition of knowledge, skills and values (Vygotsky, 1978). Learning takes place in a social, dialogic environment of education where learners of different backgrounds engage in meaningful and collaborative activities. It is important to recognise the intricate relations between language and mental cognition. Language is instrumental in the cognitive construction of knowledge and experience, not only because one disseminates knowledge by using a language, but also because language forms the way in which one construes an experience and internalises it as knowledge. As Halliday argues, "language is the essential condition of knowing, the process by which experience becomes knowledge" (1993, p. 94). Reflecting on the central role of language in the learning process epitomises the meta-linguistic nature of TLA (Andrews, 2007, p. 29), concerning how language is used by students to express scientific ideas, to engage in tasks and activities, and to make meanings related to the subject of science. The meta-cognitive awareness reflects teacher's thinking of student-oriented approach in planning and implementing classroom talk. This is demonstrated by Teacher A's comments on the importance of group discussions in enhancing students' scientific understanding:

> *1. (TA) Students have different views. Group discussions give them a chance to express their ideas, compare one's own view with others, critique each other's views so as to reach a most acceptable solution, etc. Discussions are a self-reflective thinking process for students, which may help them enhance their understanding of scientific knowledge.*

4.1.2 Teachers' knowledge about learners' English language proficiency and their cognitive knowledge of subject matter

This involves the teacher's understanding of i) the curriculum required levels and ii) the actual levels of a) students' L2 language proficiency and b) their cognitive knowledge of subject matter. The gaps between the required and the actual levels reveal the need for teachers' scaffolding. The teacher's awareness in this regard helps to identify at what stage and in what way s/he assists learners from diverse academic and language backgrounds to master the content subject knowledge and related English language expressions.

In this regard, Teacher B is keenly aware of the subtle differences between scientific terms, because when such terms appear the same in Chinese, confusion may arise among students. The accurate use of scientific terms matters in student's learning of science, while knowing "when" students can grasp different degrees of meaning at different learning stages is also important. In the interview, he gives examples of the progressive approach to teaching "weight" and "mass" (see quote 2). He also relates this awareness of subject matter knowledge, such as the difference between "secrete" and "release", to his professional training of biology (see quote 3). It is evident that students' knowledge, in terms of their conceptual understanding of science and the possible intervention of their mother tongue, informs the teacher when and how to impart his scientific knowledge to students.

> 2. (TB) *I tell Form 1 students to "measure the weight". Technically, it is not the "weight", but "mass". But students may not understand this during their first year of secondary school. It is good for them to have a general idea first; in their second year, I will then elaborate on the concept of "mass" and then let them know that the term "mass" is scientifically correct in this context. I think this [progressive] approach is easier for students to understand scientific concepts.*

> 3. (TB) *I am aware of the use of subject and verbs. Biology is my major for Bachelor's degree and we do need to pay attention to the subtle difference in the meaning of scientific terms. One word would make a big difference. For example, "secrete" and "release" are different. In Chinese they all mean "放", but in English they refer to different ways of "放". "Secrete" means producing and discharging a substance, whereas "release" refers to the discharging process yet does not emphasise where the substance is produced.*

The teacher's awareness of learners' language-related knowledge also includes their understanding of learners' difficulties in expressing scientific ideas in English. While the teaching of subject matter is often isolated from the teaching of language skills in content subject classrooms, the challenges for students are not only the conceptual understanding of subject contents, but also the representational demand for using appropriate language to articulate specific ideas (Seah, Clarke, & Hart, 2015). Besides, the L2 linguistic competency of students is also of considerable concerns in CLIL classrooms.

Considering both scientific language and English language as essential objectives in CLIL learning, Teacher A and B acknowledge that students encounter the duel challenges to speak up in science classes: first, the linguistic difficulty, namely to express scientific ideas in English, due to their limited English vocabulary and grammatical structures; second, the representational difficulty of describing and explaining scientific phenomena and causative relations by using accurate scientific terms:

> 4. (TA) *I often find it difficult for them to express scientific ideas in English due to their limited vocabulary. Even if they have rememorised the key terms in English, but how to link them together becomes a considerable difficulty, such as expressing the causative links between X and Y.*
>
> 5. (TB) *It is fine for them to use their own words to describe the conversion of the three states of matter. But they will have problems if they are required to employ scientific terms. They may not be able to describe the scientific phenomena correctly. Or when they try to describe, they cannot satisfactorily state the causative relations.*

The comments by both Teacher A and B suggest that students' linguistic and representational difficulty can be intertwined. Moreover, these two aspects would exacerbate their difficulty of grasping content knowledge (or vice versa). This manifests the challenges of learning and teaching in the CLIL programs.

4.1.3 Teachers' understanding of the impact of MOI policy on learner's motivation and learning outcomes

The language policy of the school that participated in this study states that the school adopts English as MOI and yet attaches importance to bilingual and trilingual education among their students. As most students from the examined two classes graduated from CMI primary schools, to adapt to the EMI environment amounts to a challenge for them. Teacher A and B are aware that they are supposed to teach content subjects in English in accordance with the requirements of the Education Bureau. Students are encouraged, but not strictly required, to speak in English. In practice, teachers have the flexibility to use English and Cantonese. As shown by the quotes 6–8, both teachers comment on the positive aspects of English as MOI, which helps students pave the way for learning science-related subjects in English in senior forms and at the university level. However, they raise concerns about the negativity of implementing the EMI policy in a rigid

fashion, which leads inevitably to a slower teaching pace, reduced efficacy in giving instructions, and compromising students' scientific interests and willingness to speak in class.

> 6. (TA) *This is an EMI school. In the long term, studying science in English from Form 1 can help them lay a good foundation.*
>
> 7. (TA) *To be honest, for junior form students, they used Chinese in their primary school and it is natural for them to use the language they feel comfortable with when they complete a specific group task, especially when they need to communicate and discuss with other students to solve a problem. I understand that. But are they not supposed to speak in English for this is an EMI school? ... Students insert Chinese words and phrases during the group work... They use English when speaking to the teacher.*
>
> 8. (TB) *The school emphases the use of English. I try my best to teach in English, except when it comes to things like safety instructions, which I will use Chinse to remind students.*

Both Teacher A and B are aware that the choice of language would affect students' **motivation** of learning. They believe that forcing students to use English in science class would diminish students' learning interests (see quotes 9, 10).

> 9. (TA) *It takes time to get familiar with learning science in English. ... If they are required to learn this subject in 100% English and no Chinese at all, their learning interests would be compromised and the learning pace would be slowed down.*
>
> 10. (TB) *Students respond more actively if I use Cantonese to ask questions in class. I am sure. If they have to use English, their enthusiasm may be compromised. They can use Chinese freely to elaborate what they mean.*

Both teachers are aware that the choice of language would affect students' **learning outcomes**. Teacher B acknowledges that using English as MOI can improve students' English language skills (see quote 11). His terse response also demonstrates his belief that the exposure to an English learning environment would generate positive outcome of students' English language level.

> 11. (TB) *Their English would be better. This is quite obvious.*

However, Teacher A raises her concerns (see quotes 12, 13) about the choice of language would exert negative impact upon students' exam results of the science

subject, because it remains challenging, especially for students who are weak in comprehension, to take written tests in English.

12. (TA) *If the exam questions contain a long descriptive paragraph, students may not follow easily. Some students are weak in comprehension. ... English language considerably affects their performance in the exams.*

13. (TA) *It may be quicker [if students use Chinese] to understand the scientific knowledge.*

4.2 Conceptual Scaffoldings

The scaffolding strategies in the observed sequence of lessons can be classified into six categories:

1) **Mediation**: The teacher recasts to change the registers, with a purpose of helping students make changes between the everyday, oral language and the specialist, academic language. Mediation between everyday and specialist language is a two-way process. Registers and modes of utterance can be shifted in accordance with the target of the exercises.

2) **Probing for Expansion**: The teacher usually asks why/what/how questions to solicit higher order thinking among students and expand the conversation. Students can further elaborate, clarify and cite personal or everyday examples to resolve problems.

3) **Translating**: The teacher makes use of Chinese (Cantonese), which is students' mother tongue. Sometimes, the teacher would translate directly a term into Chinese and even further explain it in Chinese, if it is deemed difficult for students. At times, the teacher would speak the term in Cantonese and ask students to translate it into English.

4) **Evoking Discussions among Students**: The teacher organises the group discussions among students. With a clearly-defined goal of completing a certain task, students' discussion can be productive through reciprocal scaffolding.

5) **Encouraging Students' Self-Scaffolding through Presenting and Re-presenting**: The teacher signals to students the need to reformulate their utterances. In doing so, the teacher offers a chance for students to articulate and reformulate their expression of ideas.

6) **Withholding the Scaffolding:** The teacher stimulates students' scientific interests and self-scaffolding by withholding the scaffolding.

The following excerpts present one or more scaffolding strategies used by Teacher A and B.

Episode 1:

Line	T/S	Moves	Classroom Talk	Codes of Conceptual Scaffoldings
			Teacher-Guided Group Discussion	
1	TA	I	(20:13) [to Group 6] Give one or two examples [of frame structures] in your group form. But then you try to think why they got different names? You can look at this.	*Evoking Discussion among Students* *Probing for Expansion*
2	Charles	R	Japanese model.	
3	TA	F	Nice, yes. Japanese got good designed structures.	
4	TA	Re-I	This is because what reasons? They must develop good frame structure. Why?	*Probing for Expansion*
5	Ben	R	Because of the cold weather?	
6	TA	F	Not really.	
7	Harry	R	Keep the building safe.	
8	TA	Re-I	Why?	*Probing for Expansion*
9	Harry	R	Because it is…	
10	James	R	Earthquake.	*reciprocal scaffolding*
			Later in this lesson the teacher recaps and revisits the above group conversation in front of the whole class	
11	TA	I	(40:20) [to the class] Actually the use of frame structure is to support the weight. Very important. Okay, prevent the building from deformation. "變形". And then, Charles just gave me a very, a country which is good in designing the frame structure. Can you show to your classmates? [to Charles] Which country?	*Translating*
12	Charles	R	Japan.	
13	TA	I	Why? Why Japan need to have a good frame structure?	*Probing for Expansion*
14	Harry	R	Because they always have…Because there are many earthquakes in Japan.	*Encouraging Students' Self-Scaffolding through Presenting and Re-Presenting*
15	TA	F	Yes, therefore they must have some good frame structures to prevent the buildings from deformation. Okay, to make it safe and stable in some critical, very dangerous conditions, just like the earthquake.	

In this episode, Teacher A organises group discussion and asks students to give examples of different frame structures. In the Initiation-Response-Feedback (IRF) exchange between Teacher A and Group 6, the teacher keeps re-initiating questions about the rationale behind the Japanese model (see line 4, 8). In probing students' higher-order thinking by asking the "why" questions and giving them time to respond, the teacher opens up the learning space. In the second round of Re-Initiation, Harry articulates a half sentence "Because it is…" (line 9). Maybe he has already got the idea, but he fails to come up with the word "earthquake". James then gave the right word (see line 10), which can be seen as a reciprocal scaffolding. When Teacher A revisits the Japanese model in front of the whole class, Harry shouts out the correct answer. It is noteworthy that Harry modifies the sentence from the subject-led sentence structure "Because they always have", which appears somewhat colloquial, to a "there-be" structure to articulate a factual statement (line 14). This linguistic shift is enabled through Harry's self-scaffolding agency. From these two-connected dialogues, it is evident that Teacher A attempts to encourage students to have classroom talk, and allows them to reason, to collaborate and to self-correct in the process of presenting and re-presenting ideas.

Episode 2:

Line	T/S	Moves	Classroom Talk	Codes of Conceptual Scaffoldings
Group Work: Students search on-line information to answer questions				
1	TA	I	(18:03) [to Group 3] Could you tell me what is the use of frame structures?	
2	Lili	R	[Lili looks at the tablet] It is used to overcome the large moments developing…	
3	TA	I	Where, where, which one?	
4	Lili	R	This one.	
5	TA	F	"Developing." "Moments." Ah yes, actually, means, this sentence is quite difficult for Form 1 students. This means, "loading", "loading" means the weight. Weight means the mass, just like the kg, the gram, or sometimes in VC called the Newton. Okay, so actually it is to support, support the weight.	*Mediation*
6	Lili	R	Use the structures to support.	
7	TA	F	Yes, very good. You got the answer already and then you can type [in the form]. Okay.	

This episode is a conversation between Teacher A and Group 3 during the task of searching online information related to the frame structures. Group 3 are browsing through a website. To answer the teacher's question, Lili intends to read aloud a sentence about the function of frame structures but encounters difficulty (see line 2). Knowing that Lili may not understand what "loading" means, Teacher A recasts to shift the register by using a series of relatively more commonplace concepts: loading → weight → mass (kg; g) → Newton (see line 5). Upon the teacher's exposition, Lili is able to reformulate her answer, instead of copying the original text with a limited degree of comprehension (see line 6). Lili's answer marks an important moment of practising trans-languaging, in which Teacher A's mediation helps her bridge the gap between the specialist, academic language and the one that is more familiar, everyday, and accessible. In this process, the teacher's mediation as a scaffolding is transformed into the student's learning of language across different registers.

Episode 3:

Line	T/S	Moves	Classroom Talk	Codes of Conceptual Scaffoldings
1	TB	I	[To the whole class] Some students, your design, I saw it, is trying to hold it from sideway. Trying to hold the container from the side. [Non-verbal: TB holding a container from sideways with both hands] You have to think, whether hold it by side can provide more supporting force, or you hold it by this can provide more supporting force. [Non-verbal: TB placing the container on his palm] Okay, trying to estimate, Okay? You think it yourself. Of course, I won't tell you the answer.	*Withholding the Scaffolding*
2	S	R	[Non-verbal: returning to their group work]	

Teacher B draws all students' attention in the middle of their hands-on activity. He inspires students to think about the structural capacity of carrying weight, yet without giving away the answer. By withholding the further scaffolding, the teacher also makes his intentions explicit,

namely to stimulate the students' interests and independent thinking to explore the answer. In doing so, the teacher encourages self-scaffolding.

5. Discussion

Teacher language awareness constitutes the teacher's self-reflective knowledge about language input and output in the classroom. This study specifies three salient aspects of teachers' knowledge of how language mediates learning in a specific CLIL context. These aspects address the distinct and interrelated roles of language: (1) as a condition of learning, (2) as an object of learning, and (3) as an institutional and contextual factor that affects learning. Teachers' awareness of the relationship between language and learning is of vital importance, impacting not only on their own using and analysing language, but also on their ways of teaching language in the CLIL classroom. This study calls attention to the very act of learning and learners' needs in the conceptualisation of teachers' language awareness. The shift from teachers to learners expands the framework of TLA and provides insight into what TLA should embody and how it can improve the flow of language in the CLIL classroom.

By orienting the focus of TLA on learning, this study sheds light on the transformation of teachers' implicit knowledge of language into the explicit awareness of how to procedualise language teaching. Although teachers' choices of scaffolding strategies during the talk-in-interaction are contingent upon various factors in practice (Andrews, 2007), the intervention of the teacher's language awareness in the act of scaffolding is discernible. TLA underlines teachers' decision of how to provide conceptual scaffolding related to language learning in CLIL contexts and whether to withhold scaffolding in a strategic manner.

Meanwhile, scaffolding choices also reflect the teachers' awareness of language use in science classrooms. The strategies (1) *mediation* (between colloquial, common language and more specialist, academic language) and (2) *probing for expansion of learning space* are the outcomes of teachers' understanding of learners' language levels, especially related to the content subject. The strategy (3) *translating* addresses teachers' awareness about students' linguistic difficulties under the EMI language policy. These scaffolding strategies align with the students' concerns and the CLIL learning objectives as understood by teachers. In other words, the teachers' awareness of language from the perspectives of learners and learning can direct teachers to optimise how, when and to whom scaffolding is provided. In this sense, the reflective relationship between TLA and scaffolding strategies revolves around the needs of learners and learning.

Notably the strategies (4) *evoking students' discussions*, (5) *encouraging students' reformulation of expressions* and (6) *withholding scaffolding*, manifest teachers' meta-linguistic awareness or consciousness of learning through language, highlighting the necessity of students' engagement in classroom talk and the importance of encouraging students' reciprocal scaffolding and self-scaffolding agency. In doing so, students can be empowered to be competent learners and speakers of the language of science. As Holton and Clarke (2006) remind us, to promote a better construction of knowledge and independent learning for the long-term interest of learners, it is meaningful to realise "the progressive devolution of the role of scaffolding agent from teacher to learner" (p.141). The TLA-filtered and scaffolded interactions thereby promote the use of language not only for pedagogical purposes but as a cognitive learning tool for students.

It is necessary to add that a scaffolding strategy can be the operation of one or more aspects of TLA in relation to learning of and through language. Although the reflective relationships between scaffolding and TLA can be criss-cross, it is vital to place great emphasis on the teachers' knowledge of learners and learning process in the operation of TLA to facilitate scaffolded dialogues in the CLIL classroom.

6. Conclusion

This study suggests that teachers' awareness of language in CLIL contexts should incorporate the thinking of language in learning and language for learners. Raising content teachers' TLA from the perspectives of learners and learning can effectively enhance teachers' scaffolding role in CLIL science classrooms. There is a definite (if not deterministic) relationship between teachers' awareness of language learning and their scaffolding strategies, especially when both are geared to the needs of learners and learning. This connection between TLA and scaffolding provides a useful guide for teachers and teacher educators to concretise teachers' awareness of language use in the attempts to engage and enable their students in the classroom talk-in-interaction. Further research is required to investigate the ways in which students' needs affect and modify teachers' awareness of language in the CLIL classroom.

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