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A longitudinal study on students' self-regulated listening during transition to an English-medium transnational university in China

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Abstract

Listening to academic content in English medium instruction (EMI) classrooms at university can be a demanding task for students who transition from first language (L1) instructed secondary schools. This longitudinal mixed methods study analyzes data from 316 students collected at the beginning, midterm, and the end of their first semester after entering an EMI transnational university in southeast China. The analysis of questionnaire responses revealed significant variations in students' listening strategies over time, with a significant decrease in deep processing cognitive strategies at the midterm when content difficulty increased. Conversely, two types of metacognitive strategies (problem solving, plan evaluation) increased significantly during the second half of the semester. Informed by Zimmerman's (2000) social cognitive self-regulated learning (SRL) model, thematic analysis of semi-structured interviews with 34 participants revealed that students generally developed a more top-down listening approach focusing on content learning over the semester and became more selective in their strategic and self-regulatory processes after the midterm "watershed" moment. Results highlight the importance of structured topic

knowledge in EMI curriculum design and the necessity of strategy training in language support programs.

Keywords: English medium instruction; listening; self-regulation; transition; China

1. Introduction

The exponential growth of English medium instruction (EMI) has become an established phenomenon in the higher education sector worldwide (Macaro et al., 2018; Rose et al., 2019). In China, EMI programs have expanded rapidly over the last two decades in lockstep with the internationalization of universities (Rose et al., 2019; Zhou et al., 2021). However, warnings revolving around issues of learning quality have emerged (Hu et al., 2014), casting doubt on whether students are capable of sufficiently processing subject knowledge via an unfamiliar second language (L2) in class. In particular, for students who transition from secondary schools where instruction is provided in the first language (L1), listening to academic content in EMI university classrooms poses tremendous challenges. Students may need to strategically regulate their listening to survive and thrive amid the challenges. Though transitional learning difficulties of students have been well documented in EMI research (e.g., Aizawa & Rose, 2020; Evans & Morrison, 2016), their strategic and self-regulated learning in the face of these difficulties remains relatively underexplored. Researchers have recently suggested that students develop strong autonomy and engage in diverse strategic undertakings to regulate their learning at transition (e.g., Ding & Stapleton, 2016; Macaro et al., 2019), and this period is considered to drive and reflect radical changes in learning (Ding & Stapleton, 2016; Evans & Morrison, 2011). However, few studies have adopted a self-regulated learning (SRL) framework to investigate the issue, and variations in students' strategic choices have rarely been explored through a longitudinal lens.

The current study addresses these gaps by adopting a longitudinal mixed methods design to examine Chinese students' strategic and self-regulated listening during their first semester at an EMI transnational university in southeast China. It draws on questionnaire and interview data collected at the beginning, midterm and the end of students' first semester, to offer a more comprehensive and detailed picture of students' listening experience during the transition period.

2. Literature review

2.1. Conceptualizing self-regulated listening

Self-regulation first made inroads into L2 research at the turn of the century (Dörnyei & Ryan, 2015) and has received significant attention in the learning of

vocabulary and writing (e.g., Rose & Harbon, 2013; Teng & Zhang, 2016; Tseng et al., 2006). Listening, however, as noted by Teng and Zhang (2021), has received less coverage in L2 self-regulation research.

Recent research within the field of L2 learning has integrated learner strategies within self-regulation frameworks (e.g., Oxford, 2011; Teng & Zhang, 2016; Zeng & Goh, 2018). Zimmerman's social cognitive self-regulated learning (SRL) model (see Zimmerman, 2000) has been adopted (see Teng & Zhang, 2016) as it emphasizes a cyclical nature from which learners can monitor, evaluate, and then adjust their strategies as they pursue learning goals. In other words, self-regulated learning can be defined as "the processes whereby learners personally activate and sustain cognitions, affects, and behaviors that are systematically oriented toward the attainment of personal goals" (Zimmerman & Schunk, 2011, p. 1). Zimmerman's (2000) three-phase cyclical model includes *forethought*, *performance*, and *self-reflection*. In the forethought phase, learners analyze the task, set goals and strategically plan to achieve the goals via appropriate methods. After that, learners enter the performance (or volitional control) phase, in which they avail of a range of general or task-specific strategies to maintain learning effort and motivation, while monitoring or recording their learning processes. Finally, learners evaluate their performance, conduct causal attribution, and adjust their learning in the self-reflection phase before the subsequent learning cycle. As Panadero (2017) has explained, an advantage of this framework is that it encapsulates a complete version of different sub-phases of SRL. Indeed, compared to Tseng et al.'s (2006) widely cited volitional framework that seems to correspond to the performance phase (Ziegler, 2014), Zimmerman's SRL model also highlights self-regulatory processes such as goal setting and self-reflection surrounding the performance. Given that students' listening in EMI classes (performance) might be closely associated with their learning before (forethought) and after class (self-reflection) (see Zhou & Rose, 2021), such a model allows for a more holistic and contextualized understanding of their strategic learning at an EMI university context.

Educational psychologists have long recognized metacognition as integral to self-regulation, and research on self-regulated listening has incorporated measures of metacognition (e.g., Zeng & Goh, 2018), often employing the *Metacognitive Awareness Listening Questionnaire* (MALQ) developed by Vandergrift et al. (2006). The MALQ measures L2 listeners' metacognitive awareness of four strategies (directed attention, problem solving, planning-evaluation, and mental translation) and knowledge of themselves (person knowledge). More recently, Zhang and Zhang (2019) referred to evidence from a confirmatory factor analysis (see Teng & Zhang, 2016) and conceptualized self-regulation as an overarching construct inclusive of a metacognitive aspect. In line with this conceptualization, the present study adopts

Zimmerman's SRL model as an overall framework to investigate students' self-regulated listening while including the MALQ as a measure of their metacognitive awareness of strategy use while listening in EMI classes (performance phase).

In addition to metacognitive strategies, some researchers have also highlighted deep processing strategies as a key part of self-regulated learning (e.g., Panadero et al., 2021; Pintrich, 2004). The present study views deep processing strategies as important task-specific cognitive strategies of students' self-regulated listening in class (i.e., the performance phase). In contrast to surface strategies (e.g., rote memorization), deep processing strategies are "directed towards the intentional content of the learning material (what is signified)" (Marton & Säljö, 1976, p. 7), and aim to establish meaningful connections between new and prior knowledge. Students' attempts to make these connections, as Panadero et al. (2021) note, "are usually cognitively demanding" but "they benefit the students significantly" (p. 12), and hence include strategies associated with these deep processes into their development of a deep learning self-regulation strategy scale. Similarly, Pintrich (2004) also pinpointed the close relationship between deep processing strategies and an intrinsic goal orientation, and included three such cognitive strategies, namely, elaboration, organization, and critical thinking in the development of the *Motivated Strategies for Learning Questionnaire* (MSLQ) (Pintrich et al., 1991). In the field of L2 learning, Oxford (2011) included deep processing strategies into the Strategic Self-Regulation (S^2R) Model, and argued that learners who frequently adopt these strategies show higher abilities to regulate their learning. Whereas in an EFL/ESL listening classroom topic knowledge is usually graded in the materials to tailor to different listeners' proficiency levels (Macaro, 2018), new professional subject knowledge is delivered in EMI classes regardless of the heterogeneity of students' language competence. This poses a question of whether students are able to engage in some deep processing of content knowledge when listening to EMI lectures, and if so, what additional learning is required to afford the process. The MSLQ developed by Pintrich et al. (1991) was adapted to measure this construct given its shared socio-cognitive underpinning with Zimmerman's SRL framework (see Pintrich, 2004).

2.2. Listening in EMI higher education during the transition period

Listening to the lengthy lectures typical of university learning through English can be demanding for first-year students who transition from an L1-mediated secondary schools (Aizawa & Rose, 2020). This is because such students are confronted with not only an unfamiliar instructional language but also more professional subject knowledge (Macaro, 2018). They may minimally interact with the teacher (Dafouz & García, 2013), and only process the information superficially

(Kırkgöz, 2005). They also often struggle to cope with the academic and specialist vocabulary featured in teacher talk (Aizawa & Rose, 2020; Evans & Morrison, 2016), which frequently interrupts their comprehension in EMI classes.

In response to these challenges, studies that explored students' autonomous and strategic learning during the critical transition period have burgeoned across different contexts in recent years (e.g., Ding & Stapleton, 2016; Macaro et al., 2019; Soruç & Griffiths, 2018; Yang, 2017). Among them, mainland China remains an under-explored area despite the rapid expansion of EMI programs in its tertiary sector (Rose et al., 2019). Studies have found that students' autonomous learning extends beyond the classroom (Zhou & Rose, 2021), where they industriously previewed textbooks before class for vocabulary troubleshooting (Ding & Stapleton, 2016), and reviewed their class notes after class (Macaro et al., 2019). Additionally, students were reported to employ a range of strategies when learning via EMI (e.g., Eser & Dikilitaş, 2017; Soruç & Griffiths, 2018; Zhou & Rose, 2021). However, findings remain rather inconsistent. In the study of Eser and Dikilitaş (2017) from the Middle East, students reportedly relied heavily on the use of surface strategies such as translation and memorization to process course content with a noted absence of metacognitive strategies for "arranging, planning and evaluation of a learning process" (p. 127). In contrast, Zhou and Rose (2021) discovered that Chinese students, upon their arrival at an EMI university, reportedly engaged in some meaningful processing of subject matter while listening to EMI lectures after sufficient preview before class. Similar to Soruç and Griffiths' (2018) study in Turkey, Zhou and Rose (2021) also revealed that students applied metacognitive strategies to selectively direct their attention in class according to speech features of the teacher (e.g., stress, repetition, pause) and rhetorical functions (e.g., introduction, explanation, exemplification). Given this inconsistency in findings, more research is needed to explore students' strategic listening in EMI university classes during transition, taking into account the restraints and affordances associated with each learning context.

While marked changes are believed to take place during the critical transition period (Ding & Stapleton, 2016; Evans & Morrison, 2011), longitudinal research to capture such changes remains in severe paucity. Findings from the limited number of such studies indicate that students become self-regulated learners during the transition period, resorting to "unremitting practice and peer support" to adapt to the new learning environment (Evans & Morrison, 2011, p. 204). Ding and Stapleton (2016) also suggested that students' adaptation might shift from *reactively* coping with the transitional challenges to *proactively* directing and managing their own learning. However, each of these studies mainly drew on qualitative data with relatively small sample sizes (N = 9 in Ding & Stapleton, 2016; N = 28 in Evans & Morrison, 2011), and are limited by a lack of

triangulation between the qualitative and quantitative data to provide a full overview of students' strategy development over time. To address these limitations, the current study adopts a longitudinal mixed methods design, collecting both quantitative questionnaire data from a total of 316 respondents and qualitative interview data of 34 participants three times throughout the semester.

In summary, despite blossoming research into self-regulation within the field of language learning, listening remains an underexplored area. Further, within the specific field of EMI research, studies in recent years have begun exploring students' strategic and autonomous learning during the transition period, whereas mainland China, regardless of its rapidly growing EMI provisions, remains an under-researched context. Finally, existing research has hitherto yielded inconsistent findings about students' strategy use in EMI classes, and lacks longitudinal studies using mixed methods to capture their learning development over time. The present research therefore addresses these gaps in the literature by exploring the self-regulated listening of students during their first semester at an EMI transnational university in China. This study examines the following research questions:

1. What strategies do students reportedly use in listening to EMI lectures during their first semester transitioning into a transnational university?
2. Are there changes in students' use of listening strategies during the first semester?
3. How do students self-regulate their learning in relation to listening over time?

3. Method

The study adopts a longitudinal mixed methods design, collecting questionnaire and interview data at the beginning (Time 1/T1, Week 2 & 3), halfway (Time 2/T2, Week 8 & 9), and the end (Time 3/T3, Week 13 & 14) of the first term to investigate students' strategic and self-regulatory listening processes. Following what Flick et al. (2012) described as a strong form of triangulation, quantitative and qualitative data were analyzed independently drawing on its own framework, and only joined together in the interpretation stage to "extend knowledge potential, rather than to confirm results derived from one method" (p. 100). The two sources of data also complement each other to "expand the explanatory power" (Riazi & Candlin, 2014, p. 145), allowing for an understanding of students' strategic learning at different layers.

3.1. Setting and participants

Data were collected at an EMI transnational university located in southeast China. At entry, students completed the Oxford Online Placement Test (OOPT), which

measures their listening proficiency against the *Common European Framework of Reference for Languages* (CEFR). All Chinese students enrolled in the (1) business and (2) humanities and social sciences faculty courses of communications and linguistics were invited to participate in the study.

An initial sample of 412 students completed the questionnaire at T1, and a total of 316 students filled the questionnaire at all three time points, yielding an attrition rate of 23.3%. Results from a Pearson Chi-Square test indicated no significant differences between those continuing to T3 and those withdrawing from the study in terms of gender, age, major, EAP class level, years of English learning, or study abroad experience. This suggests that the sample stayed relatively stable over time despite the inevitable attrition common to longitudinal research. All of the participants came from secondary schools with subject matter instructed through their mother tongue of Mandarin Chinese, and the large majority (86%) had never studied or lived abroad. A sub-cohort of 35 respondents agreed to participate in semi-structured interviews. Following a maximum variation sampling strategy (Dörnyei, 2007), the interviewees were invited to account for a range in gender, major, and listening proficiency. A total of 34 students completed all three interviews; one female business major withdrew at T2. Table 1 introduces the questionnaire and interview participants.

Table 1 Questionnaire and interview participants

Variable	Groups	Questionnaire			Interview
		T1 (*N* = 412)	T2 (*N* = 344)	T3 (*N* = 316)	T1 (*N* = 35)
Gender	Female	313	269	246	25
	Male	99	75	70	10
Major	Business	267	230	209	12
	Humanities & Social Sciences	145	114	107	23
English listening proficiency*	A1	7	6	6	1
	A2	89	76	67	8
	B1	176	148	138	15
	B2	87	69	63	5
	C1	50	42	39	5
	C2	3	3	3	1
Years of English learning	More than 9 years	268	218	204	19
	6-9 years	113	99	90	15
	Less than 6 years	31	27	22	1

Note. *Based on OOPT score for the listening section collected prior to T1

3.2. Instruments

The present study included the following sets of data, which were collected at three time points during the first semester:

- two questionnaires to measure students' (1) metacognitive awareness of listening strategies and (2) deep processing listening strategies;
- semi-structured interviews to explore the self-regulated learning of students in relation to listening in EMI classes.

The metacognitive awareness of listening strategies questionnaire was adapted from Vandergrift et al.'s (2006) *Metacognitive Awareness Listening Questionnaire*, adopting a 6-point Likert scale (1 = *totally disagree*; 6 = *totally agree*) to report listening strategy usage. Exploratory factor analysis (EFA) with direct oblimin rotation was used to check the robustness of the adapted questionnaire. As two out of the three items of the *person knowledge* factor were found to have low communality values (< 0.30), this factor was excluded from the questionnaire. The revised 18-item questionnaire (see Appendix A) produced a factor structure that aligned with the MALQ, including strategies of *directed attention*, *plan-evaluation*, *problem solving*, and *mental translation*. The overall questionnaire had strong reliability with a Cronbach's α of .84, and the individual subscales were acceptable to very good, with Cronbach's α of .83 (problem solving), .80 (directed attention), .74 (plan-evaluation), and .66 (mental translation).

The 15-item questionnaire for deep processing listening strategies was adapted from the *Motivated Strategies for Learning Questionnaire* developed by Pintrich et al. (1991) with a 6-point Likert scale. The questionnaire used items from three factors of the MSLQ related to cognitive strategies, namely *elaboration*, *organization*, and *critical thinking*, which, according to Oxford's (2011) definition, are the key strategies for making meaningful associations between prior and new content knowledge. The overall questionnaire (see Appendix B) had strong reliability with Cronbach's α of .91 (Cronbach's α for the subscales of elaboration, organization, and critical thinking was .84, .82, and .87 respectively), and the EFA results identified the same factor structure as that of the MSLQ.

The semi-structured interviews were designed based on Zimmerman's three-phase cyclical SRL framework, exploring students' perceptions, feelings, and learning behaviors before, during, and after listening to EMI classes. All questions were delivered in an open-ended format to minimize the potential interference to students' natural courses of behaviors, while probes were used to encourage further discussions when interesting themes were tapped upon. Due to university restrictions on audio- and video-recording EMI classes, stimulated recall interviews which might more accurately capture students' situated strategic processes within EMI classrooms could not be used, and this limitation is duly noted.

3.3. Procedures and analyses

At each time point (T1, T2, T3), participants completed the two questionnaires via an online survey platform immediately after they finished EMI lectures. In the following week, students were interviewed on an individual basis in Chinese for 30 to 60 minutes. Interviews were audio-recorded for data analysis purposes.

To address Research Question 1 (RQ1), descriptive statistics were calculated to present an overview of students' listening strategy use in EMI classes during the transition term. Regarding Research Question 2 (RQ2), repeated measures MANOVA was conducted to examine whether students' (1) metacognitive awareness of listening strategies and (2) deep processing listening strategies varied over time. This was followed by a series of univariate repeated measures ANOVA to examine changes for each sub-category of strategy.

Thematic analysis following Kuckartz's (2014) guidelines was used to analyze the interview data, using primary categories related to Zimmerman's (2000) three-phase cyclical model of *forethought*, *performance*, and *self-reflection*. Sub-categories were identified inductively from the dataset. The *matrix coding* query function of NVivo 11.0 was used to extract all passages coded under distinct time points and a summary of longitudinal patterns was developed to address Research Question 3 (RQ3). The coded themes will be presented in the Findings section with representative excerpts referring to participant number and listening proficiency (e.g., S1, A2).

4. Findings

4.1. Students' use of listening strategies during the first semester

Table 2 presents descriptive statistics for students' reported use of listening strategies in EMI classes at the beginning (T1), midterm (T2), and the end (T3) of the first semester (illustrated visually in Figure 1). Upon arrival (T1), the metacognitive strategy of directed attention (M_{T1} = 4.48, SD = 0.80) and the deep processing cognitive strategy of elaboration (M_{T1} = 4.42, SD = 0.70) were most heavily adopted. At the midterm (T2), however, the reported use of problem solving (M_{T2} = 4.23, SD = 0.59) surpassed directed attention and became a popular strategy alongside elaboration. This suggests that at the midterm, students engaged heavily in processes such as inferencing the meaning of unknown expressions, and comparing their understanding with what they knew about the topic to verify the inferences. These two strategies remained highest at the end of term (problem solving: M_{T3} = 4.32, SD = 0.67; elaboration: M_{T3} = 4.29, SD = 0.66). Interestingly, across all time points, the reported use of mental translation, which is believed to hinder effective listening (Vandergrift et al., 2006), remained consistently low compared to others (M_{T1} = 3.59, M_{T2} = 3.62, M_{T3} = 3.62).

Table 2 Descriptive statistics for students' listening strategies at T1, T2 and T3

Variable	Time	*N*	*M*	*SD*	Min	Max
	Metacognitive awareness of listening strategies					
Directed attention	T1	305	4.48	0.80	2.25	6.00
	T2	303	4.12	0.76	1.25	6.00
	T3	315	4.14	0.82	1.00	6.00
Problem solving	T1	305	4.29	0.70	2.17	6.00
	T2	303	4.23	0.59	2.17	6.00
	T3	315	4.32	0.62	2.67	6.00
Plan-evaluation	T1	305	3.84	0.77	1.20	6.00
	T2	303	3.76	0.71	1.20	5.80
	T3	315	3.87	0.72	2.20	6.00
Mental translation	T1	305	3.59	0.90	1.00	6.00
	T2	303	3.62	0.81	1.00	5.67
	T3	315	3.62	0.81	1.00	6.00
	Deep processing listening strategies					
Elaboration	T1	291	4.42	0.70	2.00	6.00
	T2	295	4.30	0.67	1.00	6.00
	T3	314	4.29	0.66	2.00	6.00
Organization	T1	291	3.99	0.91	1.25	6.00
	T2	295	3.82	0.88	1.00	6.00
	T3	314	3.87	0.92	1.00	6.00
Critical thinking	T1	291	4.01	0.81	1.00	6.00
	T2	295	3.87	0.80	1.00	6.00
	T3	314	3.91	0.76	1.00	6.00

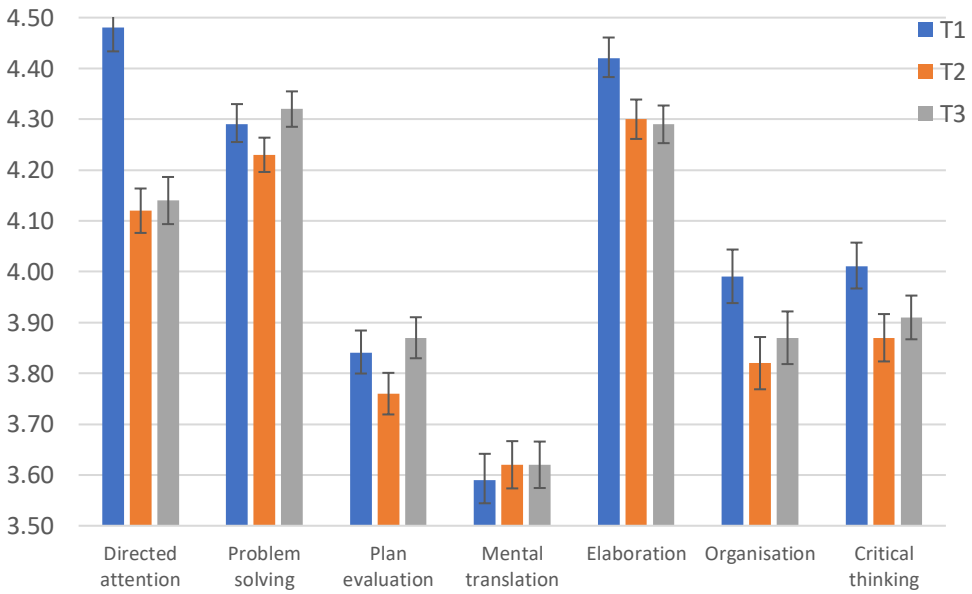

Figure 1 Means for students' use of listening strategies in EMI classes at T1, T2 and T3

4.2. Longitudinal development of listening strategies

To address RQ2, repeated measures MANOVA was conducted to examine whether the two sets of strategies (metacognitive awareness of listening, deep processing) varied significantly over time during the first semester. Assumptions were confirmed (multivariate normality, linearity, absence of multicollinearity between dependent variables). As Table 3 illustrates, a significant main effect of time was detected using Wilk's Lambda on the combined four components of metacognitive awareness of listening strategies ($\Lambda = 0.84$, $F_{[8, 1158]} = 13.56$, $p < .001$, $\eta_p^2 = .086$) as a group, and on the three deep processing listening strategies collectively ($\Lambda = 0.96$, $F_{[6, 1084]} = 3.54$, $p = .002$, $\eta_p^2 = .019$). This suggests that these two aspects of strategic listening demonstrated some changes over the first semester. To further explore these variations, univariate repeated measures ANOVA was conducted for each type of strategy (see Table 4), followed by post-hoc Bonferroni analysis to indicate change between each pair of time points.

Table 3 MANOVA for the effect of time on listening strategies

Dependent variable	Wilk's lambda	*f*	Hypothesis *df*	Error *df*	*p*	Partial ETA squared (η_p^2)
Metacognitive awareness of listening strategies	0.84	13.56	8.00	1158.00	.000	0.086
Deep processing listening strategies	0.96	3.54	6.00	1084.00	.002	0.019

Table 4 Univariate repeated measures ANOVA for the effect of time on listening strategies

Dependent variable	Type III sum of squares	*df*	*Mean²*	*F*	*p*	Partial ETA squared (η_p^2)
Metacognitive awareness of listening strategies						
Directed attention	23.019	1.844	12.485	46.018	.000	0.137
Problem solving	1.099	1.865	0.589	2.983	.055	0.010
Plan-evaluation	1.659	1.889	0.878	3.555	.032	0.012
Mental translation	0.361	1.891	0.191	0.680	.499	0.002
Deep processing listening strategies						
Elaboration	2.667	2.000	1.333	6.271	.002	0.023
Organization	3.631	2.000	1.815	5.308	.005	0.019
Critical thinking	3.168	2.000	1.584	6.179	.002	0.022

Among the metacognitive awareness strategies, directed attention ($F_{[1.84, 536.52]} = 46.02$, $p < .001$, $\eta_p^2 = .137$) and plan-evaluation ($F_{[1.89, 549.66]} = 3.56$, $p = .032$, $\eta_p^2 = .012$) varied significantly over time. The reported use of directed attention dropped significantly at the midterm ($M_{T1} = 4.48$, $M_{T2} = 4.12$, $p < .001$), indicating that students seemed less persistent in controlling for the loss of their

attention in class. In contrast, their reported use of plan-evaluation declined slightly at the midterm (M_{T1} = 3.84, M_{T2} = 3.76, p = .542), then escalated significantly during the second half of the term (M_{T2} = 3.76, M_{T3} = 3.87, p = .036), indicating that students might have become more goal-directed and evaluative in listening after a semester of learning through EMI. Similarly, the increase in the problem solving strategy also reached a significant level in the latter half of the term (M_{T2} = 4.23, M_{T3} = 4.32, p = .011). This suggests that students enhanced their usage of strategies to draw on topical, contextual and linguistic cues to handle comprehension breakdowns.

In terms of deep processing listening strategies, results reveal significant changes over time for all three strategies, namely, elaboration ($F_{[2, 544]}$ = 6.27, p = .002, η_p^2 = .023), organization ($F_{[2, 544]}$ = 5.31, p = .005, η_p^2 = .019), and critical thinking ($F_{[2, 544]}$ = 6.18, p = .002, η_p^2 = .022). Results from the post-hoc Bonferroni analysis show that the most notable changes took place during the first half of the semester, when the reported use of all strategies decreased significantly at the midterm (elaboration: M_{T1} = 4.42, M_{T2} = 4.30, p = .007; organization: M_{T1} = 3.99, M_{T2} = 3.82, p = .005; critical thinking, M_{T1} = 4.01, M_{T2} = 3.87, p = .002). In other words, this trend suggests that students at the midterm were less inclined to process information in an in-depth manner such as associating new information with prior knowledge, or organizing and critically evaluating new knowledge taught in class. Due to the increased depth and density of subject knowledge taught at the midterm, it might be that listening by then consumed additional working memory, hence restraining the use of higher-order cognitive strategies (O'Malley & Chamot, 1990).

4.3. Self-regulated learning in relation to listening during transition

Thematic analysis of interview data (N = 34) explored how students self-regulated their learning before (forethought), during (performance) and after (self-reflection) listening to EMI classes. Themes are referred to using *italic text* with frequency counts presented in parentheses to outline the prevalence of each in the data, and illustrated via representative excerpts labelled with the participant's identifier, listening proficiency, and the time point when the comment was made (e.g., S1, A2, T1).

4.3.1. Forethought

The overall trend was that students' goals of listening seemed to shift from *understanding the literal meaning of teacher talk* (T1: N = 12) to *achieving a sufficient understanding of the subject content* (T2: N = 12; T3: N= 8). At term start, students focused on language-related challenges to achieve basic understanding. Especially for lower proficiency students, decoding acoustic input from the teacher consumed excessive cognitive capacity, making the digestion of content

knowledge a far-fetched goal: "I think it's hard to combine listening and comprehending together. I need to listen first, and then comprehend [the content] but now listening itself is difficult enough for me" (S32, A2, T1). However, from the midterm, students shifted in their listening goal to more thoroughly understand content and to establish connections between key concepts, as described by participant 13:

> *I would hope that I can digest the knowledge points. That is to say, I don't merely understand, but I can retain the information in my memory and develop my own opinions. I wouldn't have this requirement at the beginning of the term – then, I just hoped to understand what he [teacher] was talking about. (S13, B1, T2)*

Changes appeared in students' *preview of courses materials* prior to EMI classes, a commonly undertaken self-regulatory process at semester start (T1: *N* = 26). The primary change was *reducing looking up unknown words* during preview (T2: *N* = 14). Forsaking searching the meaning of new words seemed to set free attention to focus on the content:

> *At the beginning [of the term], whenever there was a new word, I would look it up. But after all I may never know all the words, so now I look up fewer. It's less time-consuming and I have more time to attend to the content. (S14, B1, T2)*

Students at the midterm were more inclined to extrapolate meaning during preview, ignore words with minor impact on overall comprehension, and circle words to look up later. As students became more familiar with the diverse teaching styles of instructors, they appeared more selective and skillful in preview. For example, a student described how she decided to skip certain sections of preview materials: "It's unnecessary to read explanations because the teacher would explain these in class anyway" (S19, B1, T2).

4.3.2. Performance

The key trend reported during the performance phase during the first term was the development of a more "top-down" listening approach, that is, students increasingly applied topic knowledge to build meaning from the incoming teacher talk. Compared with arrival, many students at midterm reflected *an improvement in inferring meaning of words or sentences* to handle unfamiliar expressions (T2: *N* = 6; T3: *N* = 5), owing to their expanded repertoire of relevant field-specific subject knowledge:

> *After the midterm revision, I kind of feel a surge in the ability to connect and compare the knowledge currently learned in class to the knowledge learned in previous lessons. I start to form clearer images in my mind when the teacher touches on certain points,*

> *and some examples will pop up from earlier lessons. This makes it easier to guess when I find something difficult to understand – sort of like doing gap filling of information in my mind. (S32, A2, T3)*

Some low-proficiency listeners also indicated an awareness to *monitor their comprehension*, a strategy typically adopted by more proficient L2 listeners (Vandergrift, 2003). Such real-time monitoring of comprehension triggered verification and rectification of meaning building, as a student commented: "When there was something that our teacher talked about and it differed from what I thought, I would then look at the PowerPoint to see if there were explanations on that point" (S33, A2, T3).

A *midterm fatigue* was noted among many students (T2: *N* = 15), who reportedly lost attention due to diminishing interest in the more theoretical and challenging course content. To cope, some students restrained certain strategy use to save working memory for comprehension in class. A typical behavior was *reducing note taking to prioritize listening to the teachers* (T1: *N* = 11; T2: *N* = 19; T3: *N* = 26). Discussing notetaking as "hand-functioning" instead of "brain-functioning" (S24, A2, T2), some students suggested that it might consume attention which could be otherwise used for digesting content knowledge. Similarly, although many students actively engaged in *organizing knowledge structures* while listening to introductory content early in the semester (T1: *N* = 8), this was less prevalent by midterm as they preferred to follow the teacher's unfolding speech then engage in systematic review and structuring knowledge after class.

4.3.3. Self-reflection

Students carried out evaluation and review activities after listening to EMI classes, with two noted peaks of evaluative occasions during the first term. One self-evaluative peak appeared at the beginning of the term, when students struggled amid difficulties from a new instructional language, leading to *reflection upon the degree of understanding* (T1: *N* = 16). Students appeared to critically assess potential causes, as described by the student below:

> *If there was a moment I didn't understand in class, after class I would think back to that moment on what caused the breakdown – was it that I wasn't focused enough or just a matter of my proficiency? (S32, A2, T1)*

Following such reflection, students expressed willingness for adaptative measures such as maintaining concentration in class to more closely follow the teacher (T1: *N* = 5), adjusting notetaking to prioritize comprehension (T1: *N* = 7), and practicing listening and enlarging vocabulary after class (T1: *N* = 6). The midterm

exam catalyzed another flux of self-evaluation, when students *inspected their listening methods against their performance in the exams* (T2: *N* = 7). Some spotted a mismatch between effort and instructional focus, as a participant reflected: "I used to look at the slides a lot but after the midterm exam I realized that most of the key points tested were actually talked about by the teacher and less so with the PowerPoint" (S32, A2, T2). Echoing this evaluation, 19 of 34 students at midterm reportedly shifted their focus from reading the slides to primarily listening to the teacher.

Changes also emerged in students' review activities after class. Compared to the term start when the majority engaged in the review of lesson content (T1: *N* = 27), many admitted a *shrinkage in time invested in review* at midterm due to busier university life (T2: *N* = 12). The students who persisted in review seemed to become more selective in what to focus upon. Compared to the detail-oriented review activities at the beginning of the term, where students "read through the slides carefully and word by word" (S31, B1, T1), briefer *browsing through slides or notes* to summarize key information became a popular strategy at midterm (T2: *N* = 11), followed by a focus on *developing an overall knowledge structure* at the end of the term (T3: *N* = 9). This seemed to facilitate a more goal-directed review:

> *I started doing mind maps from the midterm and since then almost every two lessons I would draw one. Now I've started to combine them into a large one. This makes it faster to review because when I see this map, I know immediately where this knowledge point is located. (S31, B1, T3)*

To sum up, students during the transition semester engaged in dynamically evolving self-regulated learning activities for listening. They seemed to develop a more "top-down" listening focus, drawing on their expanding subject knowledge to handle linguistic barriers, and became more selective in their strategic learning activities after the midterm "watershed" moment in correspondence to their changing needs of listening.

5. Discussion

This study highlights students' adaptation to EMI study during the transition semester. Various strategies were employed, and midterm seemed to be a "watershed" moment as students became more skillful and selective in their self-regulatory activities and use of different strategies. Both our first and second research question explored students' use of listening strategies in EMI classes during the transition term. Findings show that as content knowledge became more intense from the midterm, students selectively used strategies while listening in class. The use of strategies requires cognitive resources (O'Malley & Chamot, 1990),

and quantitative findings illustrate a decrease, at the midterm, in certain deep processing cognitive activities such as organizing and critically evaluating knowledge. However, qualitative findings reveal that the restricted use of some strategies in class could be a conscious decision by students to free up attention for the incoming teacher speech stream. Similar to Soruç and Griffiths' study (2018), students in this study reduced note taking to prioritize comprehension. Recognizing that real-time structuring of knowledge was less effective in class, they delivered more systematic organization of knowledge *after* class. Given the reported lack of higher-order cognitive strategies in EMI classes (e.g., Eser & Dikilitaş, 2017), our findings suggest a necessity to interpret students' strategic processes in class against the broader self-regulatory processes of learning before and after class to better understand their contextualized decision-making process (Zhou & Rose, 2021).

Our third research question addressed the development of the broader self-regulated learning behaviors of students in relation to listening during their transition to EMI studies. Our findings highlight that students placed an increasing priority on mastering subject content via the use of a "top-down" listening approach over time. A similar trend was noted in Yang (2017), where students in an EMI program in Taiwan shifted from decoding English in discrete pieces to using it holistically for comprehension, as content learning became the "top priority" and language only as "the medium to master the content" (p. 13). In the present study, the priority of subject matter appeared consistent in strategic and self-regulatory processes surrounding listening, including goal setting and preview before EMI classes, as well as meaning inferencing and monitoring comprehension in class. Students seemed to develop their strategic competence to extrapolate the meaning for unfamiliar expressions while listening, echoing Macaro et al.'s (2019) transition-year study in Italy. Findings reveal that such change was underpinned by an expanded repertoire of disciplinary knowledge. Research into L2 listening recognizes the role of relevant topic knowledge in facilitating a top-down listening approach (Macaro et al., 2005). However, different from an EFL/ESL course where topic knowledge is usually independent between lessons, an EMI course is field-specific and usually structured interrelatedly throughout the course. Therefore, progression through an EMI course involves acquiring more knowledge related to a given field of study. This repertoire of subject knowledge may serve as an "advance organizer" (Herron et al., 1998), offering relevant schematic knowledge for meaning inferencing and elaboration. For less proficient listeners, a more "top-down" listening approach may free up their attention from bottom-up decoding to monitor, verify and rectify comprehension in an EMI class – a strategy usually employed by effective L2 listeners to reduce misunderstanding resulting from inappropriate meaning inferencing (Graham & Macaro, 2008).

Finally, this study highlights dynamic changes in regulatory behaviors, as demonstrated by the reflective activities that students carried out at the beginning and after the midterm exam. Upon arrival, the transition from an L1 mediated secondary school to an EMI university exposed students to dual challenges of an unfamiliar instructional language and more professional subject knowledge. When students' cognitive capacity fell short of coping with both, the situation required metacognition to leverage personal and strategic knowledge to meet task demands (Flavell, 1979). In our study, the self-evaluation that the students engaged in after class by then might therefore serve as an opportunity to seek more appropriate listening strategies suitable to their current ability and objectives. Since the metacognitive knowledge system is dynamic and constantly "revised because of the feedback loop effects of metacognitive regulation and metacognitive experiences" (Zhang & Zhang, 2019, p. 886), the adjustment of strategies fueled by self-reflection could strengthen students' understanding of themselves, and presumably result in more critical and personalized use of listening strategies (Goh & Hu, 2014). After the midterm, our findings reveal another flux of reflective activities. Students diagnosed shortfalls in their listening strategies from evaluating their exam results. As illustrated above, students attended to the teacher instead of the slides after reflecting on the effectiveness of previous listening behaviors. This finding has highlighted the role of post-assessment reflection in helping learners monitor and identify the problems in their current learning methods. When students perceive assessment feedback as a source for enhanced self-regulation instead of an end point, it may catalyze adaptive measures for more effective learning in the subsequent SRL cycle, as educational studies have suggested (Zimmerman & Moylan, 2009).

6. Conclusion

This longitudinal mixed methods study explored students' strategy use and self-regulated listening during their transition to EMI university study. Findings suggest significant variations in the strategies used by students over their first semester as they dynamically adjusted to the new environment. The study also indicates that strategy adjustment in EMI classes may differ from an EFL/ESL context due to the distinct role of how topic knowledge is structured, attained, and used by students (see Macaro, 2018). This study demonstrates that students' strategic decisions in EMI classes are interrelated with their self-regulated learning before and after class, offering empirical support to the synergy between learner strategy and self-regulation (Oxford, 2011; Rose, 2012). Results indicate expanded metacognitive knowledge based on self-initiated reflection, attesting to the validity of integrating metacognition with self-regulation (see Teng & Zhang, 2016).

Findings have pedagogical implications for EMI practice in higher education settings. Given the important role of topic knowledge, content experts could strengthen the connection between topics within an EMI course to help students build a network of key disciplinary concepts and develop their "top-down" processing strategies in listening. Meanwhile, language specialists could offer language strategy training (e.g., comprehension monitoring) to cultivate students' ability to use strategies more effectively (Graham & Macaro, 2008). This study points to the importance of credit-bearing summative assessments in catalyzing students' reflections on their learning. As such assessment may trigger serious evaluation on listening methods and knowledge attainment, instructors can embed post-assessment reflective tutorials in an EMI curriculum to scaffold students towards more constructive use of feedback from the assessment. Finally, this study highlights an increasing focus on content rather than language during the transition period. While this trend aligns with the content-oriented nature of EMI (Macaro et al., 2018; Zhou et al., 2021), it also raises concerns about the sustainability of language gains once students meet the basic needs to comprehend EMI classes (see Gao, 2008). EMI program designers in higher education may need to specify language-related learning goals (in addition to content) with respect to students' future professional development needs. If such goals require language competence that exceeds the basic "survival needs" of students in understanding EMI lessons, language support programs should consider how to select language materials to sustain students' intrinsic motivation for self-directed learning in the long run.

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APPENDIX A

Metacognitive Awareness of Listening Strategies Questionnaire (for EFA analysis, see Zhou & Rose, 2021)

Directed attention

- When my mind wanders in EMI classes, I recover my concentration right away
- I try to get back on track when I lose concentration
- I focus harder on what the teacher talks when I have trouble understanding
- When I have difficulty understanding what I hear, I (don't) give up and stop listening

Problem solving

- When I guess the meaning of the word, I think back to what I have heard to see if my guess makes sense
- I use the general idea of the lesson to help me guess the words I don't understand
- I use the words I understand to guess the meaning of the words I don't understand
- I use my experience and knowledge to help me understand
- Before I listen to EMI classes, I think of similar topics I have listened to
- As I listen to EMI classes, I compare what I understand with what I know about the topic

Plan-evaluate

- I have a goal in mind as I listen to EMI classes.
- As I listen to EMI classes, I periodically ask myself if I am satisfied with my level of comprehension.
- After listening, I think back to how I listened and what I might do differently next time.
- Before I start to listen, I have a plan in my head for how I am going to listen.
- As I listen to EMI classes, I quickly adjust my interpretation if I realize that it is not correct.

Mental translation

- I translate in my head as I listen to EMI classes
- I translate word by word as I listen to EMI classes
- I translate key words as I listen

APPENDIX B

Deep Processing Listening Strategies Questionnaire (for EFA analysis, see Zhou & Rose, 2021)

Elaboration

- When I listen, I try to relate what the teacher says to what I already know
- When I listen, I try to understand the concepts in this class by making connections with what I read before the class
- When I listen, I pull together information from different sources to help me understand, such as pre-reading materials, slides, etc.
- When I listen, I try to relate ideas in this lesson to those in other lessons whenever possible
- When I listen, I write brief summaries of the main ideas of what teacher talks
- I try to apply ideas I listened in the class in other class activities such as discussion

Organization

- After the class, I go over my class notes and make an outline of important concepts
- After the class, I go through my class notes and try to find the most important ideas
- As I listen, I make simple charts, diagrams, or tables to help me organize what I hear in class
- As I listen, I outline key points to help me organize my thoughts

Critical Thinking

- Whenever I hear an assertion or conclusion in this class, I think about possible alternatives
- When a theory, interpretation, or conclusion is presented in class, I try to decide if there is good supporting evidence
- I treat what I hear in class as a starting point and try to develop my own ideas about it
- I often find myself questioning things I hear in this course to decide if I find them convincing
- I try to play around with ideas of my own related to what I hear from the teacher