



## Teacher Scaffolding in English-Medium Content-Based Instruction: Modes of Classroom Interaction

Zahra Kamrani <sup>1</sup> , Zia Tajeddin <sup>2\*</sup> , Minoo Alemi <sup>3</sup> 

<sup>1</sup> PhD Candidate, Department of English Language Teaching, Islamic Azad University, West Tehran Branch, Tehran, Iran

<sup>2</sup> Professor, Department of English Language Teaching, Faculty of Humanities, Tarbiat Modares University, Tehran, Iran

<sup>3</sup> Professor, Department of English Language Teaching, Islamic Azad University, West Tehran Branch, Tehran, Iran

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**Abstract:** The provision of scaffolding entails contingent assistance given to learners. Despite the proliferation of research on scaffolding, scant attention has been devoted to studying the modes of classroom interaction in fulfilling various scaffolding intentions in content-based instruction (CBI). To narrow the gaps, the present qualitative study embarked on an investigation of science teachers' scaffolding in four modes proposed by Walsh (2006), namely managerial, classroom context, skills and systems, and materials modes. Four science teachers participated in this qualitative study, and 12 sessions of science classes were observed and analyzed deductively based on four classroom modes through conversation analysis (CA). The content analysis of the videotaped recordings indicated that managerial and materials modes were frequently used to enhance students' comprehension and develop classroom interaction. The findings evidenced that pedagogical objectives were mostly related to cognitive structuring, contingency management, and direction maintenance requirements. Furthermore, the findings revealed that students' engagement and involvement through recruiting interest was the only scaffolding intention employed in all four modes to involve students in the learning process. The findings can provide insights to teachers and teacher educators in the realization of distinct scaffolding intentions in various classroom modes by delineating the interrelationship between language use and teaching purpose.

**Keywords:** Scaffolding; Classroom Modes; Content-Based Instruction (CBI); Science Classes; Conversation Analysis (CA).

\* Corresponding Author.

Authors' Email Address:

<sup>1</sup> Zahra Kamrani (z.kamrani65@gmail.com), <sup>2</sup> Zia Tajeddin (tajeddinz@modares.ac.ir), <sup>3</sup> Minoo Alemi (minooalemi2000@yahoo.com)



## Introduction

Interaction in the classroom is a two-way process that creates opportunities for students' participation and fosters the quality of the learning process. The primary purpose of this indispensable component of the instruction process is to elaborate the pedagogical goals related to the learning activity. Therefore, classroom modes could investigate classroom discourse to delineate the pedagogical goals through interactional processes. The term 'mode' encompasses the interrelatedness of distinctive interactional features as well as pedagogical aims, which are mostly determined by the teachers' use of language (McCarthy & Walsh, 2003; Walsh, 2006). Scaffolding is one of the pedagogical goals employed through various interactional features and patterns due to its variation, inconsistency, and even conflict in conceptualizations in diverse contexts (e.g., Hamidi & Bagherzadeh, 2018; Kamrani et al., 2023; Mahan, 2020; Tajeddin et al., 2020; van Kampen et al., 2018). Therefore, the issue worth noting is that divergent descriptions, characterizations, and categories of scaffolding have made researchers scrutinize this concept in various contexts (e.g., Azir & Sriyanto, 2021; Doo et al., 2020; Mahan, 2020; Song & Kim, 2020; van Kampen et al., 2018).

Content-based instruction (CBI) has received great attention as one of the instructional methodologies in the instruction of both language skills and content knowledge through a non-L1 medium of instruction (Cammarata et al., 2016). Following the ecological perspective, this study considered scaffolding in terms of the interactions between teachers and students rather than trying to understand processes that take place in the heads of teachers. Given the dearth of deep insights into the interactional features of scaffolding in CBI, this study set out to explore the realization of teachers' scaffolding intentions in the various classroom modes of CBI. Therefore, it addresses this gap by illustrating teachers' scaffolding strategies and interactional patterns in the different modes of science classes in CBI by applying Walsh's (2006) framework.

## Literature Review

### *Scaffolding*

Scaffolding is defined as the specific dialogic interaction between an expert and a novice person to enable the less knowledgeable peer to act beyond their current abilities, leading to students' deeper learning, motivation, and independence (Omoniyi & Torru, 2018; Walsh, 2011). Scaffolding has become associated strongly with teachers' support to open, widen, and deepen dialogic space, reduce barriers, foster metacognitive strategies or thinking skills, and facilitate the construction of a students' knowledge that cannot be accomplished without

assistance (Jarvis & Baloyi, 2020; Lascotte, 2018; van de Pol et al., 2019). There are growing appeals for studying scaffolding in diverse contexts to facilitate students' learning and teacher development. Teachers' calibrated and adaptive support could develop learners' metacognitive abilities and cognitive activities and foster their engagement. Consistent with Wood et al. (1976), van de Pol et al. (2010) and Walqui (2006) also defined the term scaffolding as a supportive behavior that is contingent, collaborative, and interactive. As the literature reveals, scaffolding has gained widespread popularity in a variety of research (Cammarata et al., 2016; Echevarría et al., 2017; Gibbons, 2015; Koole & Elbers, 2014; Morton, 2020; Nikula et al., 2016; Reynolds, 2017; Smagorinsky, 2018; Tajeddin & Kamali, 2020; Troyan, 2021; van de Pol et al., 2010). A seminal study by van de Pol et al. (2010) combined and modified the classifications of Wood et al. (1976) and Tharp and Gallimore (1988) and suggested six scaffolding means and five scaffolding intentions. Scaffolding means (giving feedback, hint, instructing, explaining, modeling, and questioning) indicate how scaffolding is taking place, while scaffolding intentions, including recruitment, reduction of degrees of freedom, direction maintenance, marking of critical features, and frustration control, refer to underlying reasons for scaffolding the means (van de Pol et al., 2010).

### ***Classroom Modes***

Educational interaction and class management have a direct bearing on students' learning. Thus, there is a need for a closer understanding of the relationship between language use and pedagogic goals (Seedhouse, 2004), which cannot be separated from each other (Walsh, 2011). Teachers' interactional awareness would be a central idea in the employment of pedagogical goals and is defined as "teachers' sensitivity to their role in a particular stage of a lesson" (Walsh, 2011, p. 142). Walsh (2006) designed SETT (Self-Evaluation of Teacher Talk) to "help teachers describe both classroom interaction and foster an understanding of interactional processes" (p. 62). According to Walsh (2013), the term "mode encompasses the interrelatedness of language use and teaching purpose" (p. 73). That is, each mode is aligned with a set of pedagogical goals and distinctive interactional features primarily determined by a teacher's utterance. The SETT framework has been encoded around three principal parts, including teaching modes, pedagogical aims, and interactional features. These modes, the micro-contexts, delineate the interface between the actions and words, instructional activities, and discourse (Seedhouse, 1996). Teachers use classroom interaction to achieve the pedagogical goals related to teaching modes. Therefore, Walsh's framework would help

teachers and researchers develop a fine-grained understanding of classroom interaction and extend an understanding of the interactional processes operating in diverse educational contexts.

The first mode is the managerial mode, which is concerned with the organization of the teaching and learning process. The managerial mode is mostly depicted by teachers' extended turn and a lack of student involvement. It mostly happens at the beginning of lessons and is demonstrated through transition markers and an absence of student involvement. Therefore, the managerial mode aims to manage the physical conditions for learning, the transition of information and changes from one mode of learning to another, and the initiation or termination of activities. This mode, which supports the other three modes, would be added to teachers' disciplining aims. Its principal pedagogic purpose is the management of learning, including organizing the settings of the learning process, considering specific materials, introducing an activity, and moving to and from alternative forms of learning (Walsh, 2006).

The materials mode has pedagogical goals centered on the materials that largely determine who may speak, when, and what they say. In the materials mode, the management and patterns of turns and interactions are determined by the materials that mainly regulate the speaker, time, and what the teacher may not say. The space and flow of interaction and the nature and types of activity are dependent on the materials at hand. Therefore, student-teacher interaction develops while doing a piece of materials such as tasks, activities, etc. Its principal pedagogic goals are providing language practice, getting learner responses in relation to the materials, evaluating answers, checking learner contributions, and outspreading learner contributions (Walsh, 2006).

The skills and systems mode aims at a specific language system or sub-skill. Therefore, the focus is basically on language practice concerning grammar, phonology, vocabulary, and discourse. In addition, this mode aims to provide language practice and feedback to enable students to use correct forms and systems (Walsh, 2006). The pedagogic objective behind the interactional features is to develop students' accuracy rather than fluency. The last mode is called the classroom context mode, which aims for natural, rather than forced, communication with the least focus on linguistic knowledge. In the classroom context mode, pedagogic goals are mostly related to providing opportunities for genuine communication through the teachers' focus on the oral fluency of students and student-extended turns and minimal repair. Thus, this mode has respective purposes of enabling students to express themselves clearly, consequently promoting students' oral fluency and limiting teacher turn (Walsh, 2006). The key pedagogic goals in the classroom context mode can be classified as learners' ability to express their

feelings, viewpoints, and personal experiences and improve their fluency and oral production (Supakorn, 2020; Walsh, 2006).

As the literature reveals, several studies have documented the pedagogical goals related to learning activities in various classroom modes. For instance, Yauwangsa and Wijaya (2016) examined teachers' pedagogic goals and interactional features in L2 classroom modes. This study tried to identify the pedagogical goals and classroom modes by recording two meetings taught by senior teachers to English language students. The result showed that the managerial mode mostly appeared in those classes but the skills and systems mode was the least enacted one. In a large-corpus-based study, Şimşek and Gönen (2020) collected data to scrutinize teachers' questioning and pedagogical goals in various classroom modes through semi-structured interviews, stimulated recalls, and classroom observations. The data interpretation indicated that various types of questioning in different modes are employed such as referential questions in the classroom context mode and display questions in the materials mode. Alsaadi and Atar (2019) conducted a study to look more precisely into the effectiveness of student reaction wait time in two micro contexts. The results showed that extended wait time enhances the learning opportunity in the materials mode. Similarly, Soraya (2017) explored classroom interactional competence in ELT classes addressing pedagogic goals and classroom modes. In this regard, the recording of 10 English classes in Jakarta was studied through content analysis. Soraya found that materials and managerial modes were mostly applied, but classroom context and skills and systems modes were the least apparent classroom modes.

Furthermore, Radia and Nadia (2019) investigated teachers' attitudes and practices in the Algerian context. Three university instructors were observed and interviewed regarding their attempts to create learning interaction. Data analysis showed that managerial and materials modes were far more enacted than the others. Moreover, Raharj (2020) conducted a qualitative study on patterns of teacher-student interaction through observation in high school. The findings indicated that the participants executed 20 patterns of interaction in their classroom interaction while few scaffolding strategies were used. In another empirical study, Valentika and Yulia (2020) aimed to analyze the teachers' classroom interaction with various interactional features, such as scaffolding. They collected the data through classroom observation in the form of discourse analysis. The results of their study showed that scaffolding was one of the least frequent interactional features among others in all four classroom modes. Some empirical studies have investigated student-teacher interaction patterns by focusing on one or two of the classroom modes. For instance, Korkut and Ertaş (2017) conducted a study

on interactional features during the materials mode in Turkey. This study was qualitative, drawing on the observation of two groups of participants: teachers, and trainees. The findings revealed that most interactional features of the materials mode matched those defined in SETT. Nevertheless, there was dissimilarity attributed to cultural and local practices.

### *Content-Based Instruction*

CBI is becoming increasingly popular in educational contexts across the world (Cammarata & Ceallaigh, 2018). It is a pedagogical framework that pays considerable attention to language as a means of understanding content and subject matters (Hammou & Kesbai, 2021; Miller et al., 2020; Sato et al., 2017; Stoller & Fitzsimmons-Doolan, 2017; Troyan et al., 2017). Some studies have shown the detrimental challenges of CBI/CLIL in educational contexts (e.g., Ní Chróinín et al., 2016). Other studies have revealed that it is usually an ill-posed problem in the case of learning both the content and language simultaneously (Cummins & Early, 2015; Mahan, 2020). Challenging problems that arise in this domain are also teachers' qualifications, curriculum, the priority of language or content knowledge, and assessment (Awan & Sipra, 2018; Stoller & Fitzsimmons-Doolan, 2017). Although studies on CBI/CLIL have been burgeoning in recent decades, there are still many open questions about teachers' scaffolding in CBI/CLIL classroom modes (Kamrani et al., 2023; Lindahl et al., 2013; Lyster & Ballinger, 2011; Mahan, 2020; Tajeddin et al., 2020). Therefore, to provide insights into teachers' scaffolding, this study aimed to explore the scaffolding intentions of various classroom modes employed by science teachers in CBI classrooms. To meet the purposes of the study, the following research question was raised:

**RQ.** In which modes of classroom interaction (managerial, classroom context, skills and systems, and materials modes) are scaffolding intentions employed by science teachers in English-medium content-based instruction in science courses?

## **Methods**

### *Participants and Setting*

The teachers participating in the study were female teachers having 11-17 years of continued experience instructing science in an international school. They consisted of four science teachers ranging in age from 36 to 43 and holding either B.A., M.A., or Ph.D. in English teaching, and translation. The students were bilingual females with a variety of native languages studying in an international primary school in Tehran, between 10-12 years old, and fifth and sixth graders. All four teachers taught the science course and were chosen through

convenience sampling as they were chosen from available schools and voluntarily due to international schools' limitations and regulations. The international school aimed to promote education in an international context and used international curricula different from those of the host country to qualify learners for higher education and occupations in other countries. International schools inspire learners to continue their education at the world's prestigious universities and employment worldwide through an inquiry-based learning environment of total immersion in multiple languages and cultures. International school students are mostly taught according to one of the educational systems such as International Baccalaureate, Edexcel, Cambridge Assessment International Education, or International Primary Curriculum. The textbook titled *Oxford International Primary Science* (Hudson et al., 2014), which takes an inquiry-based approach to learning, was taught in that international school. Before collecting data, consent forms were signed by students' parents, teachers, and the school administrator. For anonymity and confidentiality, T1 to T4 were used (Table 1).

**Table 1.** Science Teachers' Demographic Characteristics

Pseudonym	Age	Education level	Teaching experience	Gender
(T1)	36	BA of English Translation	11 Years	Female
(T2)	43	PhD of English Teaching	17 years	Female
(T3)	41	MA of English Teaching	14 years	Female
(T4)	38	MA of English Teaching	17Years	Female

### ***Data Collection and Analysis***

As a descriptive qualitative study, this study aimed to provide rich and subtle details about the participants and their activities through observation of four teachers' instruction in science classrooms three times a month. Therefore, three sessions with the same class were observed and video recorded for each of the science teachers, resulting in a total of 12 sessions. To illustrate the modes of classroom interaction in which teachers' scaffolding in English-medium content-based education is realized, deductive coding was done based on managerial, classroom context, skills and systems, and materials modes proposed by Walsh (2006). The teachers' scaffolding strategies, as suggested in Van de Pol et al.'s (2010) classification, were analyzed in different classroom modes qualitatively through conversation analysis (CA). van de Pol et al.'s (2010) framework (adapted from Tharp & Gallimore, 1988; Wood et al., 1976) classified scaffolding intentions, namely direction maintenance, cognitive structuring,

recruitment, contingency management, and reduction of degrees of freedom. To observe the codes of ethics, permission was taken from students' parents and the school principal to video record the science classes. After the analysis, due to the importance of intercoder reliability, double coding was conducted and an agreement index of .81 was achieved, which indicated a high degree of agreement between the coders. Further, a meeting was arranged with the inter-coder, a well-informed CBI coordinator, to discuss all divergences to make some adaptations, and an in-depth discussion took place to redefine the coding. Data excerpts were transcribed using Jenks' (2011) transcription conventions (see the Appendix).

### **Instruments**

In this study, classroom observations were principally centered on video recording. As a valuable instrument, video recording is used to observe participants' gestures and non-verbal and multimodal actions, deconstruct qualities of teaching, and share data beyond speech across different contexts (Goodwin & Cekaite, 2013; Mondada, 2016; van de Pol et al., 2010). Video recording was used for more precise identification of data in this investigation because, as Praetorius (2014) reports, rating videotaped classrooms is an important method to assess teaching quality. Therefore, the use of cameras is essential to capture teachers' non-verbal scaffolding. Additionally, the observation tool of research is a non-participant and uninvolved observation, which can provide rich, subtle details and authentic data (Creswell, 2008). Conversation analysis (CA) is used to elucidate the systematic nature of ordinary talk in the natural setting. Through an emic approach to L2 classroom interaction and organization, some teaching and learning issues such as communicative competence and interactional competence could be elaborated (Huth, 2011).

### **Results**

The results of this qualitative data illuminated the modes of classroom interaction in which teachers' scaffolding in English-medium content-based education was realized. The detailed elucidation of the teachers' scaffolding in various classroom modes is presented below. Table 2 shows the percentage of scaffolding intentions in various classroom modes by science teachers in English medium content-based instruction.



**Table 2.** Percentage of Scaffolding Intentions Implemented by Science Teachers in Various Classroom Modes

	Managerial Mode	Classroom Context Mode	Skills and Systems Mode	Materials Mode
Direction maintenance	18%	22%	22%	15%
Cognitive structuring	37%	12%	51%	34%
Recruitment	35%	57%	3%	27%
Contingency management	5%	5%	21%	12%
Reduction of degrees of freedom	5%	4%	3%	12%

***Managerial Mode***

The managerial mode, which supports the other three modes, aims to enhance students' competence focusing on delivering information and managing the class. This mode is regarded as the most salient interactional feature which extends teacher turns and uses various shifts in class modes to realign teachers' explanations, instruction, and roles. When managing the class, the teachers use various activities that contribute to educational goals and students' performance. One realization of this mode is depicted in excerpt 1:

**Excerpt 1: Managerial Mode**

1 Teacher 3 Everybody (.) Okay, everybody last session (.) I told you: to eheheh (0.3) actually take: video about healthy(.) unhealthy food and have↑ investigation ↓((inaudible)) about: that. >Negin and one of your friends>did an investigation about healthy food and >hard function that we talked >about: that last session. Okay? we watch this video: then again- I will explain it more. First, let's see: Negin's video-(0.4) Ok, (0.3) (let erase the) board: Negin talked about healthy: food (.)unhealthy food:

(Teacher played the video)

2 Teacher 3 Ok(.)Negin said that healthy food: is food which provides NUTRIENT (for us) like vegetables(.) bread::(.) meat:: (.) protein: and unhealthy food:: ((inaudible)) like↑ cola:: (.) sugar(.)chocolate and these things↓. Now (0.5) here we have (.) another video::: about (0.5) healthy food (0.7) this one. Niloofar

*(.) is going to explain how exercise can affect your body, especially your HEART.*

*Okay? When you do exercise:::(.) what is going:: to happen? ok?*

(Teacher played the video)

*3 Teacher 3 ok(.) now(.) answer the following:: questions (.) two by two(.)  
>come on>.*

As the above excerpt demonstrates, T3's main topic of teaching was centered on healthy and unhealthy foods and other influential factors on human health. The teacher tended to check assigned tasks and reviewed the instructed concepts through various activities, so the managerial mode was apparent. As manifested in excerpt 1, as the lesson progressed, the teacher explained the organizational structure of the class and then located the learning through playing videos, and doing tasks, temporally and pedagogically. So, the teacher provided explanations and revisions of lessons, as evidenced by the amount of teacher talk. As various modes characterize it, student involvement was absent. The teacher attempted to employ various activities to involve students and make the concepts comprehensible. It is important to note that in the managerial mode, the teachers attempt to get students involved in the learning experience and lead students towards their ultimate goals.

### ***Classroom Context Mode***

The classroom context mode can be defined as a context created by student-teacher interaction focusing on eliciting students' feelings, emotions, personal ideas, and opinions. In the classroom context mode, pedagogic goals are closely related to providing opportunities for genuine communication by attending to the oral fluency of students, students' extended turns, and minimal repair. In excerpt 2, the classroom context mode was created to extend the student turn and maximize the student role by allowing them to express themselves clearly and take control over the activities. In this excerpt, T1 played the video of different types of stones, and students were asked to do modeling and make posters.

### **Excerpt 2: Classroom Context Mode**

(The video is playing)

*4 Teacher 1 So (.) this is lava (.) OVER the time: (.)the lava <cools down<  
and it makes (.)igneous rocks - look at here (6.0) OK (6.0) OK (.) this is a volcano  
(0.8) do you see this one? this BLACK one? (4.0) this is called MAGMA (.) it's*

very: HOT (.) it's liquid (.) <Magma comes OUT:: < and then we call it (.) LAVA (.) lava cools:: down and over the time it <makes igneous:: rocks< These are igneous:: rocks. They are almost black (0.5) look at ALL these:: rocks are called IGNEOUS rocks. OK (.) Saba (0.4) what are we talking about:? > What was the name of the> rock: we learn today?

- 5 Student Just <I know the name of the fire::<  
 6 Teacher 1 What was the name of the fire:?  
 7 Student You mean: Magma and lava?  
 8 Teacher 1 The name of the rocks::? (6.0) Who knows? Who knows? (9.0) Helin (.) What is the name of the rock? Ronika, (5.0) Ava (5.0) Say: it (.) again?  
 9 Student ((inaudible))  
 10 Teacher 1 You are not saying well (.) Sophie (.) What is the name:? Yes Ronika (.) exactly (3.0) yes Ronika Ahmadi (.) igloo, NO:: (.) who knows((inaudible))- yes Ronika,  
 11 Student You mean: I should say that name:?  
 12 Teacher 1 Yes(.) what was the name of the ROCK?  
 13 Student (Lava and) magma?  
 14 Teacher 1 NO (.) the name of the ROCK (.) <the first type< that you were supposed:: to memorize is IGNEOUS (.)<IGNEOUS<.

In excerpt 2, the teacher creates a supportive and encouraging environment to maximize students' involvement and evoke students' feelings to make posters. The above excerpt demonstrates that students have longer turns, and the teacher has minimum contribution while the students pose the questions by making posters. Also, the teacher provides evaluative comments on students' clarification requests by making posters extensively. Therefore, the teacher's role is to employ appropriate interaction strategies to give students freedom more naturally than the other modes. Generally, it should be noted that teachers' intention in the classroom context mode aims to bring up recruitment and frustration control. In addition, the teacher directed students toward taking responsibility with the intention of direction maintenance.

### *Skills and Systems Mode*

The skills and systems mode aims to present language practice and feedback to enable students to use correct forms and systems. Generally, this mode enables students to produce correct and accurate forms. Essentially, the pedagogical goal was toward students' accuracy rather than fluency. The following excerpt was taken from science class and accounts for language skills and components.

#### **Excerpt 3: Skills and Systems Mode**

- 15 Teacher 4 Do you remember (what) food groups are::? (3.0) We have FOUR main food: groups. Do you remember(.) what they are::? Yes: (.) who remembers:? Raise your hand (4.0) eheheh Let's ask Celina (3.0) Celina(.) what do you remember about: food groups::?
- 16 Student I remember that::: one of them -was:: vi↑tamins:: and minerals↓, that
- 17 Teacher 4 vitamins and minerals:: (.) >very good>.
- 18 Student protein and <carbohydrates<
- 19 Teacher 4 very good(.)Celina (.) please repeat after me (.)protein:
- 20 Student protein
- 21 Teacher 4 carbohydrates
- 22 Student carbohydrates
- 23 Teacher 4 very good: (.) great: (.) thank you so much. Very good OK(.)
- 24 Teacher 4 Celina: (.) would: you tell us (.) four: main food groups:?
- 25 Student tasty (.) salty (.) sweet.
- 26 Teacher 4 Taste (.) no (.) Celina (.) food:: groups?
- 27 Student eheheh
- 28 Teacher 4 We have four main groups (.) fats.
- 29 Student fats(.) protein (.)carbohydrates and minerals.

In Excerpt 3, T4 reviews the food groups to assess students' cognitive learning. One of the students cannot pronounce *carbohydrates* accurately; therefore, the teacher echo and embedded explicit correction result in the extended teacher turn and limited students' turns,

learning opportunities, and interactional space. There is some evidence showing that the pedagogical objectives are required for cognitive structuring, contingency management, and direction maintenance.

### **Materials Mode**

In the materials mode, the management and patterns of turns and interactions were determined by the materials that mainly regulate the speaker, time, and what the teacher may say. The space and flow of interaction and the nature and types of activity were dependent on the materials at hand. In the materials mode, the pedagogic goals were to enable students to provide, clarify, explain, elicit, and evaluate the contents and students' contributions closely related to materials. Excerpt 4 clearly illustrates the accomplishment of this mode while the students did the reviewing part:

#### **Excerpt 4: Materials Mode**

- 30 Teacher 2      *Answer this: question (.) how could you change: the shape of hard metal↑ or -glass:↓?=?*
- 31 Student      *= By cooling,*
- 32 Teacher 2      *what (.) cooling:? It means >that if you have glass and cool it> (.) you can change it:?=*
- 33 Student      *=No (.) heat it.*
- 34 Teacher 2      *If I heat: it(.) >what will happen>?=?*
- 35 Student      *= It will melt ((inaudible))*
- 36 Teacher 2      *Aha(.) so(.) it changes the shape: then=*
- 37 Student      *=and something happens and get another*
- 38 Teacher 2      *So (.) you can change the shape (4.0) we talked about heating: (.)ok, make some examples of heating:? How do we change the materials (shape) by heating:? (5.0) make some↑ examples of heating:↓?=?*
- 39 Student      *=Again.*
- 40 Teacher 2      *We cool it: and we shape it again (.) Now(.) this question (0.3) the example of heating: material, which one:?=*
- 41 Student      *=Cake.*

- 42 Teacher 2      *What can cool down (and make ice)(.) >you can make it into water>. Then (.)*  
    *if you continue heating, it would be::?=(The teacher uses body language).*
- 43 Student      =*Steam.*
- 44 Teacher 2      *this can >be cooled and get back to?>=*
- 45 Student      = *to (0.5) water.*
- 46 Teacher 2      *Excellent*

In excerpt 4, T2 tries to enhance students' active participation and production while doing tasks. At first, she clarifies the tasks and stems of questions to help students provide answers and correct errors. The teacher elaborates the tasks with contingent feedback and clarification questions and turns feedback into clarification requests. Regarding the materials mode, the teacher tries to check the conceptual understanding of scientific knowledge. In general, in line with the scaffolding intentions in the materials mode, the aims of the science teachers were cognitive structuring, recruitment, direction maintenance, reduction of the degree of freedom, and contingency management.

## Discussion

Studies of classroom interaction, as an indispensable component of the learning process, are vast. The purpose of the current study was to investigate the modes of classroom interaction in which teachers' scaffolding in English-medium content-based education is realized and enacted. Different scaffolding intentions were realized in each classroom mode based on various pedagogical goals and interactional patterns. Since each educational context has its own features, analyzing the scaffolding strategies in classroom modes provides insight into scaffolding provided in CBI classes. The findings indicate that science teachers employed various scaffolding strategies and techniques used in the four classroom modes (Walsh, 2006) to contribute to the students' better understanding of scientific concepts and more classroom interaction. The findings show that the nature of the subject and language knowledge, contextual characteristics, pedagogical goals, teachers' pedagogical skills and characteristics, students' characteristics, and classroom interaction were the most imperative factors in applying different scaffolding strategies in these four classroom modes. The findings demonstrated that science teachers mostly provided scaffolding strategies to enhance the students' comprehension and develop classroom interaction in managerial and materials

modes. As to interactional patterns in various classroom modes, Raharj (2020) conducted a qualitative study and found that teachers executed 20 patterns of interaction in their classroom interaction. The findings uncovered that few scaffolding strategies were applied in the four classroom modes among 20 patterns of interaction. Therefore, the findings are incompatible with our study in that the science teachers were inclined to provide various scaffolding strategies. Similar to these findings, Soraya (2017) conducted research to explore classroom interactional competence in ELT classes. In line with our findings, materials and managerial modes were more frequently enacted than the skills and systems mode and the classroom context mode.

As to the materials mode, the focal point is on written or audiovisual materials. As it was found in this study, the teachers aimed to enable students to clarify, explain, elicit, and evaluate the content and language knowledge through various learning activities. Thus, students' contributions were closely related to the materials. Analyzing the materials mode demonstrated the prominent role of all five scaffolding intentions, including the promotion of cognitive structuring, recruitment, direction maintenance, contingent support, and reduction of the degrees of freedom. In the materials mode, the teachers primarily used different means, strategies, and activities, such as verbal hints, audiovisual aids, tasks, laboratory experiments, working in pairs and groups, model making, and laboratory experiments to construct and check students' cognitive structuring. In addition, recruiting interest, which got a student engaged and involved, would be mostly applied through various tasks and activities, audiovisual materials, leading to student learning. Besides, teachers tried to maintain direction by transferring the responsibility to the students while doing tasks or learning something. Teachers intended to gradually reduce cognitive demand, provide contingent support, and develop the activities when materials or activities were too demanding or students failed to learn or do tasks.

Generally, as it could be seen in this study, scaffolding is dependent on materials characterization, cognitive complexity of teaching concepts, contingency of tasks and activities, and teachers' pedagogical decision-making, although teachers' instruction was not constrained only to materials. Similar to these findings, Radia and Nadia (2019) and Şimşek and Gönen (2020) found that teachers' pedagogical goals and practices were directed toward managerial and materials modes. For instance, in a study by Şimşek and Gönen (2020), data interpretation resulted in various types of questioning in different modes. Their study mainly indicated that display questions were a focal point in the materials mode. Moreover, Radia and

Nadia (2019) studied learning interaction in the Algerian context. The findings imply that the materials and educational contexts determine patterns of turns and interactions, which aligns with our study. Also, a study by Korkut and Ertas (2017) revealed that cultural and local practices are extremely worthwhile in the interactional features of the materials mode. Moreover, some studies targeted learning opportunities and influential factors in teacher-student interaction. For instance, in a study by Alsaadi and Atar (2019), the effectiveness of student reaction wait time in two micro-contexts was reported. Data analysis revealed that wait time significantly affected the materials mode to enhance the learning opportunity.

Our findings revealed that some of the teachers' pedagogical goals were targeted at classroom management. Generally, the data showed that in the managerial mode, the dominant pedagogical intention was changing the learning mode to another. That is, this study showed that the science teachers purposefully managed the physical learning environment based on teachers' disciplining aims and contingent on contextual differences and institutional requirements. It was shown that the managerial mode was one of the most dominant modes appearing in the classroom to maintain the ultimate goal, which is students' learning. The findings indicated that the teachers were more preoccupied with students' cognitive structuring, recruitment of their interests, and direction maintenance in the managerial mode. The findings unraveled that scaffolding primarily supports students' cognition, by providing contingent support and diminishing frustration through explanations, visualization, instruction, and contextualization in a demanding situation. Furthermore, it can be argued that the four classroom modes are changed by the alternative forms of learning related to the pedagogical goals, the nature of the content knowledge, the student's age, needs, levels and reciprocity, contextual characteristics, and classroom participation in CBI. The managerial mode mainly appeared through the extensive use of various activities and tasks by searching, projects, modeling, lectures, and experiments. These findings agree with the study by Yauwangsa and Wijaya (2016), who found that the managerial mode mostly appeared in fourth graders' English. Similarly, they reported that the students' age was influential in moving from one mode of learning to another. The finding would imply that due to students' age, teachers tried to engage them and avoid distractions in the teaching process.

The classroom context mode was mostly realized to create a supportive and encouraging environment to extend students' involvement and maximize their roles. Therefore, teachers encouraged students to talk about their feelings, attitudes, experiences, and emotions by recruiting their interest in activities, classroom participation, and diminishing error correction. In line with the classroom context mode, it could be argued that two types of scaffolding



intentions were mainly provided, namely recruiting interest and maintaining the direction, implying that these scaffolding intentions were employed to attract students' attention and transfer the responsibility to the students, which were the ultimate goals. In this mode, fluency had a vital role as the ultimate goal, and the aim was to transfer responsibility to students and extend their turns. These findings are in line with the study by Şimşek and Gönen (2020) in that referential questions were raised to explore the personal views and experiences of students, which was directed in the classroom context mode. They concluded that referential questions functioned to attract students' attention in the learning process. Regarding the nature of referential questions, it should be noted that they could be about the students' ideas or lives.

Generally, in the skills and systems mode, it was found that teachers focused on teaching language skills and language components, which mainly aimed at developing students' cognitive structuring in more than half of the cases. Given SETT, it could be argued that teachers rarely provided language practice concerning a particular language system or skill demonstrated in the IRF pattern. Indeed, it can be argued that the science teachers mostly focused on assessment, verification, or repair in the skills and systems mode. When the data were examined closely, the direction maintenance entails keeping students' learning, which is the ultimate goal. The results of the study showed that contingency and frustration control were enacted in this mode to present contingent teaching within the demands of learning skills and sub-skills as the students were in grades four and five. While there was great dependency on language skills and components in the skills and systems mode, recruiting interest was mostly provided through practicing and producing real-life samples and experiences to produce more accurate and appropriate language, foster students' cognition, and keep students involved in overall learning goals. All in all, the findings indicated that different activities and tasks realigned the pedagogic focus to enable students to produce strings of correct utterances and, in turn, teachers provided contingent support based on students' needs.

The present study unraveled a striking similarity with the result of Yauwangsa and Wijaya's (2016) study, which concluded that the skills and systems mode was the least realized ones. This similarity was found although their study was conducted in an L2 classroom where language systems or skills are the ultimate goals. Moreover, Soraya's (2017) study indicated that the science teachers provided limited scaffolding strategies in classroom context and skills and system modes. This is in line with our findings, which indicated that the teachers rarely reflected on pedagogical goals and interactional patterns in classroom context and skills and systems modes. In science CBI, teachers mostly tried to elicit knowledge and make the

classroom more attractive as interactions in science classes are limited (Mahan, 2020), so the teachers aimed to provide opportunities for genuine communication and to elicit real-life experiences. It helped the students' cognitive development and involved them in learning.

### **Conclusion and Implications**

This study set out to evaluate the realization of scaffolding provided in various classroom modes in English-medium CBI. The results indicated that each classroom mode with pedagogical goals and interactional patterns was mediated through divergent scaffolding intentions. Generally, the pedagogical objectives mostly pertained to cognitive structuring, contingency management, and direction maintenance requirements. The findings divulged that science teachers employed several scaffolding strategies and means to enhance the students' comprehension and develop classroom interaction through managerial and materials modes. As mentioned before, investigating materials and managerial modes revealed that all five scaffolding intentions, including promotion of cognitive structuring, recruitment, direction maintenance, contingent support, and reduction of the degrees of freedom, were mostly employed in these two classroom modes through different scaffolding means and strategies. Furthermore, it could be inferred from the results of this study that teachers recruit students' interest, one of the scaffolding intentions, in all four classroom modes to involve and engage students in the learning process.

The study has several implications. The findings can inform those teachers who would like to improve their practical knowledge of scaffolding strategies in various classroom modes. The next implication is for CBI teachers, including science teachers, by making them aware of scaffolding realization through pedagogical goals in the four classroom modes. In addition, a classroom analysis approach can make teachers more aware of the interactional features of various scaffolding strategies. This can be achieved and improved through workshops or collaborative meetings. Moreover, teachers are expected to be cognizant of the significance of scaffolding realization in various classroom modes through distinct interactional patterns. Furthermore, the findings can encourage CBI teachers to reflect and focus on the least realized classroom modes, namely the classroom context mode and the skills and systems mode, to make classes more interactive and productive.

This study had its own limitations, which should be considered in interpreting the findings in future research. The first limitation came from the gender, subject matters, and teaching experience of the teachers. Given this, more studies are needed to scrutinize the role of teachers' gender, their teaching backgrounds, and subject matters in scaffolding strategies

provided in various classroom modes. Also, the findings can be enriched through the expansion of the scale of the study with a larger group of teachers and students at different levels and ages. Further research could delve into various scaffolding means in fulfilling the scaffolding intention of each classroom mode. In addition, future studies need to develop a fine-grained understanding of teachers' instructional goals and scrutinize teachers' decisions and pedagogical reasoning through field notes or stimulated recall interviews.

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## Appendix

### Transcription Conventions (Jenks, 2011)

[ [ ] ]	Simultaneous utterances – (beginning [ ] and (end[ ]))
[ ]	Overlapping utterances – (beginning [ ] and (end[ ]))
=	Contiguous utterances (or continuation of the same turn)
(0.4)	Represent the tenths of a second between utterances
(.)	Represents a micro-pause (1 tenth of a second or less)
:	Elongation (more colons demonstrate longer stretches of sound)
.	Fall in pitch at the end of an utterance
,	Slight rise in pitch at the end of an utterance
-	An abrupt stop in articulation
?	Rising in pitch at utterance end (not necessarily a question)
CAPTIAL	Loud/forte speech
—	Underline letters/words indicate accentuation
↑ ↓	Marked upstep/downstep in intonation
° °	Surrounds talk that is quieter
Hhh	Exhalations
hhh	Inhalations
he or ha	Laugh particle
(hhh)	Laughter within a word (can also represent audible aspirations)
> >	Surrounds talk that is spoken faster
< <	Surrounds talk that is spoken slower
(( ))	Analyst notes
( )	Approximations of what is heard
\$ \$	Surrounds ‘smile’ voice
*per syllable	Unintelligible syllable