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RECONCEPTUALISING SPACE IN ACADEMIC LECTURES: FACE-TO-FACE, BLENDED AND ONLINE LECTURER DISCOURSE IN THE CONTEXT OF ENGLISH-MEDIUM INSTRUCTION

Abstract

Spatial deixis (SD) is critical to students' comprehension as it allows the lecturer to direct students' attention towards purposeful objects in the classroom space in order to clarify meanings. Facilitating student comprehension has long been a concern for English-Medium Instruction (EMI) lecturers. However, the recent shift to online teaching has further challenged them, while EMI in online settings is still largely unexplored. Focusing on variations in lecturer's use of lexical SD in face-to-face (F2F), online and blended learning settings, this study investigates EMI lecturer discourse from a multimodal perspective. A corpus of six EMI lectures delivered by the same lecturer – two for each lecture modality – was used to investigate how patterns of lexical SD co-occurring with gestures and technology-mediated actions are deployed to accomplish specific communicative functions in different lecture modalities. Findings showed that although the lecturer preferred the proximal SD *this* and *here* in all teaching modalities, in F2F they often co-occurred with pointing gestures, whereas in synchronous video lecture (SVL) they were more frequently accompanied by a wider range of technology-mediated actions. Furthermore, in SVL these actional multimodal SD patterns often co-occurred with visual words for introducing specialized vocabulary, which is likely to facilitate students' comprehension. Findings lend support to the integration of pedagogy, language and ICT tools in EMI lecturer training programmes.

Key words

English-medium instruction (EMI), synchronous video lecture (SVL), classroom discourse, multimodality, spatial deixis.

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1. INTRODUCTION

In the current post-pandemic era, we are witnessing a sudden and rapid intersection of two trends in higher education: innovative online instructional technologies, and the rise of English-Medium Instruction (EMI) (Querol-Julián & Crawford Camiciottoli, 2019). Although much research attention still focuses on classroom practices in the conventional on-campus EMI classroom (see, among others, Doiz & Lasagabaster, 2022; Rose et al., 2020; Sah, 2022), more recent studies have been investigating how EMI classroom interaction unfolds in online instructional settings conducted through video-conferencing platforms (Hong, 2022; Querol-Julián, 2021a, 2021b, 2023). These scholars have encouraged EMI researchers to consider the role played by the teaching medium in contributing to meaning-making in EMI classroom communication. Furthermore, they have emphasized the need to include a multimodal perspective into the investigation of communication practices in EMI. In this respect, while "the linguistic composition of EMI lectures" (Siegel, 2020: 73) continues to be a focal point in EMI research, restricting the analysis to the speech-only dimension risks perpetuating a deficit paradigm towards both EMI lecturers' and students' English language competence. Conversely, a multimodal approach to the study of EMI classroom communication has the potential to show how both embodied communicative modes (e.g., speech and gestures) and disembodied communicative modes, i.e., objects and technologies (Scollon, 1998), may contribute to facilitating or hindering comprehension in the EMI classroom.

Students' comprehension has long been a concern for EMI lecturers (Lasagabaster & Doiz, 2021) but the recent shift to online teaching has posed further challenges for them (Cicillini & Giacosa, 2020a, 2020b). One of the most obvious consequences of the shift to the online teaching framework lies in the physical disjunction between the lecturer and the students. Linguistically, human beings express their proximity or distance through specific linguistic devices which are highly context-dependent: spatial deictic markers. Spatial deixis (SD) is critical for students' comprehension as it allows the lecturer to direct students' attention towards purposeful objects in the space of the classroom in order to create and clarify meanings (Bamford, 2004; Friginal et al., 2017; Peeters et al., 2015). Furthermore, when co-occurring with gestures, SD markers tend to facilitate comprehension even further, as they are clearer, culture-general and require less processing (Bamford, 2004). Despite a long-standing research interest in lecture comprehension in EMI settings, it is therefore surprising that no previous research study has investigated EMI lecturers' use of SD, particularly following the shift to online teaching.

The study presented in this paper aims to fill this gap by comparing EMI lecturer discourse in face-to-face (F2F), blended and online learning, from a multimodal perspective. More specifically, this study aims to examine how patterns of lexical SD co-occurring with communication modes other than speech – i.e., gestures and "actional resources" (O'Halloran et al., 2014: 251) related to the use of

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technological tools, including mouse movements – are deployed to accomplish specific communicative functions in lecturers' discourse across different lecture modalities.

This paper begins with a review of theoretical background and previous research relevant to EMI lectures in online settings. It provides a foundation for the present study, which adopts a case study framework and considers the relationship between contextual factors – i.e., affordances and constraints of each teaching/learning environment – and lecturers' discursive practices. Data collection and methodology are then presented, followed by a summary of findings, leading to a discussion which highlights the potentials of integrating innovative technology into teaching methods to improve EMI lecturers' communicative effectiveness and facilitate students' comprehension in the EMI classroom. Finally, some conclusions are offered.

2. BACKGROUND

2.1. The Covid-19 pandemic and the digitalization of the learning space in HE

A university has always been conceived of as a physical place. However, the Covid-19 pandemic and the abrupt shift to online education in the attempt to ensure learning continuity during the lockdown period has radically altered this view. In this respect, while educational digital solutions "such as Learning Management Systems (LMS), MOOCs, course websites, and library systems" (Bygstad et al., 2022: 2) have gradually been implemented since the early 2000s, the Covid-19 pandemic seems to have affected the education sector at a much deeper level, with the increasing offer of distance learning courses delivered online being only the most apparent legacy (Kathpalia et al., 2020). In the digital learning space, a "geographically non-located" "sub-space" (Bygstad et al., 2022: 3), the physical and the digital space interact to allow students to learn in an integrated environment where the "discursive, cognitive, existential, and material" spaces (Ellis & Goodyear, 2016) of the two dimensions are interwoven. Thus, for example, what makes it possible to see and hear in a synchronous online lecture is a set of material components that mediate between software and the human senses – e.g., LCD screens and speakers, camera and microphones.

2.2. EMI in digital settings

The rapid digitalization of teaching and learning has crossed paths with another ongoing trend in Higher Education (HE) – i.e., the worldwide spread of EMI. The

number of online EMI courses ballooned following the Covid-19 pandemic outbreak. However, few studies have focused on the impact of the shift to online and/or blended instruction on lecture comprehension and interaction in the EMI classroom, such that EMI in online settings is still an "unexplored academic instructional digital genre" (Querol-Julián, 2021a: 297).

Among the few studies conducted on EMI in online settings, Cicillini and Giacosa's (2020a) survey-based research showed that EMI lecturers particularly complained about a lack of interaction in the online classroom, which would also prevent them from getting immediate feedback about students' comprehension. Although issues of students' comprehension and interaction were already a concern for EMI lecturers before the pandemic (Lasagabaster & Doiz, 2021), the transition to the digital learning space led to a shift in emphasis "from the transmission of knowledge to students' engagement" (Cicillini & Giacosa, 2020b: 183) and pushed them to experiment new ways of teaching. Their pedagogical experimentation also included the use of a wider variety of digital tools to accomplish their communicative purposes and maximise students' engagement, what Cicillini and Giacosa (2020b: 183) referred to as "multimodal approach". For example, EMI lecturers reported: (1) asking students to turn their microphone on and/or to write comments and questions in the chat; (2) calling them by name, as many video conferencing platforms allow users to see the name of the attendees, in the attempt to compensate for the physical distance and 'connect' with them through emotional proximity; (3) carrying out class activities (e.g., group work, class discussions) to a greater extent than in the F2F classroom, also benefitting from the advantages of using breakout rooms; (4) providing students with educational material both in synchronous mode, i.e., delivering online live classes – and in asynchronous mode – e.g., uploading lecture audio/video recordings on their institutional webpage, and exploiting new interactional channels, such as the online classroom forum.

In this last regard, Xia (2020: 153) points out that "[t]he development of digital technologies allows the utilization of multiple semiotic resources in the construction of digital–multimodal genres" and that in consideration of the challenges raised by digitality and multimodality, researchers need to devise "theoretical and methodological toolkits" (Xia, 2020: 142) that might address the changes brought about by the digital era.

Querol-Julián (2021a), for example, adopted a multimodal approach to investigate how interaction unfolds in a large EMI online lecture, by focusing in particular on EMI lecturers' communicative functions. She showed that in online settings, "teacher discourse functions were built up by chains of non-linguistic modes that interact with linguistic mode", and that "some embodied modes were crucial in the construction of interaction, structuring, focusing and intensifying discourse, playing interpersonal functions and showing epistemic stance" (Querol-Julián, 2021a: 311). Nevertheless, students may find it difficult to understand "the relationship between verbal and nonverbal cues that combine to co-construct

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meaning within a range of academic listening situations (e.g., lectures, webinars and massive online open courses" (Siegel, 2020: 70).

In a more recent publication, Querol-Julián (2023) adopted a multimodal interaction analysis (MIA) approach to investigate how EMI lecturers engage students in live online classes. She found that students did not often turn on their cameras, such that the lecturer could not rely on their facial and postural expressions to assess their comprehension and engagement. In such a context, the author strongly emphasises the lecturer's ability to effectively employ both discourse strategies – e.g., extended waiting time, integrating student contributions and giving extensive feedback – and multimodal discourse strategies – e.g., gaze shifts from the chat to the camera, welcoming facial expressions, and gestures. Furthermore, Querol-Julián's study also showed that EMI lecturers' scaffolding practices mainly focused on the disciplinary content in the online classroom, and that they rarely provided students with language-specific support. However, as Querol-Julián (2023: 29) pointed out, "scaffolding language is a feature of the EMI classroom where the content subject is taught in English as a lingua franca. Therefore, lecturers should integrate it as a strategy to ensure students' comprehension of key terms and support interaction".

Chien et al. (2022) examined both verbal and non-verbal teaching materials used by EMI lecturers in online courses. Verbal teaching materials included lecturers' speech, textbooks, slides and whiteboard. Non-verbal teaching materials included images projected on the screen or drawn on the whiteboard as well as teachers' body movements, including the way they interacted with the teaching objects (e.g., the whiteboard) in the classroom. Findings from this study support the pivotal role played by multimodal competence in achieving "educational effectiveness" (Siegel, 2020: 76). In this regard, the authors also acknowledged that, in the online classroom, the components which made up lecturers' multimodal competence included their ability to effectively interact with computer systems and objects in the physical world.

As the literature review reveals, the shift to online teaching has brought about: (1) a reconceptualization of the learning space where interactions between students and lecturers, between students and their peers, as well as between students and teaching materials, are mediated by technology; (2) a substantial loss of non-linguistic and para-linguistic cues used by EMI lecturers in the traditional on-campus classroom to secure students' attention and comprehension; (3) a subsequent rethinking of pedagogical practices and strategies.

Thus, the main research question underlying this study focuses on how EMI lecturers direct students' attention towards purposeful objects in the online classroom to create and clarify meanings (Bamford, 2004; Friginal et al., 2017; Peeters et al., 2015). And more specifically, which embodied communicative modes (e.g., speech and gestures) and disembodied modes (e.g., objects and technologies, Scollon, 1998) they employ to direct students' attention towards the immediate

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context of the classroom in the attempt to facilitate their comprehension in the EMI e-classroom.

Finally, we investigate whether and how these multimodal ensembles fulfilling spatial deictic functions vary across different lecture modalities.

Our main analytical focus is on variations occurring in one Italian L1 lecturer's use of SD when teaching the same Engineering course in English delivered over three academic years – from 2019 to 2022 – in three different lecture modalities – F2F, blended (BLEND) and online synchronous video lecture (SVL).

Before describing in detail the methodology employed in this study, the following section reviews current literature on SD in lecture discourse.

2.3. Spatial deixis

Deictic markers are essentially pointing words whose meanings derive from the situational context of utterance. They show the relationship between language and context. Despite variations in the ways deixis is realized in different languages, "it is a feature of all languages because of its significance in connecting the interaction to its context" (Friginal et al., 2017: 115).

In English, spatial deixis is primarily expressed through devices such as demonstrative determiners and pronouns *this/these* and *that/those* and locative adverbs *here/there*.

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Furthermore, English speakers divide space in binary ways, with *here*, *this*, and *these* marking something proximal (or close) while *there*, *that*, and *those* indicate entities distal (or distant) in relation to the speaker's point of reference, whether the referent is physically or psychologically close or distant (Cairns, 1991). In fact, as Cairns (1991) points out, speakers' use of SD does not only reflect the concrete physical distance from the speaker or addressee, but it also creates a psychological distance from a proposition to express attitude. In this regard, of particular interest are examples (1) and (2). In example (1) from Friginal et al. (2017) the teacher (T) points to a typing mistake that a student identified. Notice that when the teacher points out the mistake, she uses *that*, but uses *this* when indicating what is correct.

(1) T: yeah, oh **that is** wrong, yeah it's wrong you were right it is wrong. yeah, I have to, now **this is** correct actually that's a good thing you pointed that out Diep now see Diep, was a, a teacher. (L2CD-T-13) (Friginal et al. 2017: 124)

Example (2) is an excerpt from the F2F EMI lecture (LE) in our corpus. The lecturer was standing in front of the classroom blackboard where he was working out mathematical formulas:

(2) LE: so basically you get a value for the benefit for the design flow x and multiplied by 0.7. then you have to assign a number to impact to society in the

same range 0-1 [...] so, you give a number to **that**, you multiply it by 0.1, a number to the fluvial ecosystem and you multiply it by 0.2 and **this** is for x [...] (LE_F2F_1077)

In this excerpt, the lecturer first used the distal demonstrative pronoun *that* to refer to "scriptural" – i.e., text – and "numerical" elements (Rowley-Jolivet, 2002: 27) – i.e., a number [...] in the same range 0-1 – although these elements were physically closer to him. However, in the following utterance, he made a straightforward reformulation, using the proximal demonstrative pronoun *this*. It might be argued that the demonstrative *that* rather referred to the previous sentence (i.e., a value [...] for the design flow x and multiplied by 0.7) in the same way as *this* might have referred back to the overall procedure he had just shown, thus working as anaphoric references or discourse deixis[1] rather than SD. However, the co-occurrence of these lexical items with a chain of pointing gestures suggests that the demonstratives *that* and *this* were rather used to refer to the text and formulas written on the classroom blackboard. Figure (1) illustrates how speech and gestures co-occur in the excerpt provided in example (2).
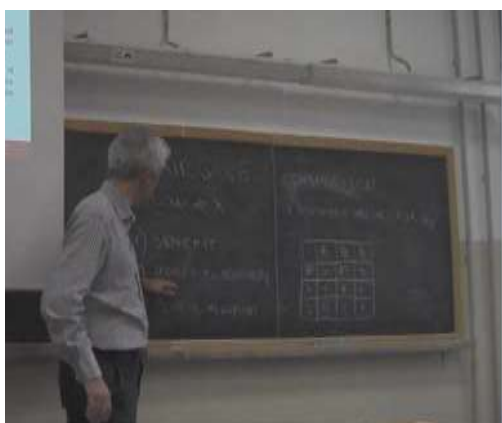
"so you give a number to **that**"   "and **this** is for x"

Figure 1. Speech and gestures co-occurring in lecturer's discourse in the F2F classroom

Furthermore, with this reformulation the lecturer discursively replaced "distance" with "proximity" transferring the object from the speaker's position (i.e., his own) to the addressee's perspective (i.e., his students). As such, the lecturer's alternation between proximal and distal SD worked as a kind of negotiation between his students and his own point of reference.

In lecture discourse SD is of critical importance (Fillmore, 1997; Levinson, 1983). It allows the lecturer to anchor students in the physical space of the

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[1] Exploring the differences between anaphoric reference and discourse deixis goes beyond the purpose of this study, so we will henceforth generically refer to anaphora. For further reading on this see, e.g., Cornish (2007).

classroom (Friginal et al., 2017) and "to establish a joint focus of attention on a referent" (Peeters et al., 2015: 64) to ensure students' comprehension and participation (Hyland, 2005). However, despite their importance in F2F interactions, few studies have specifically examined SD in classroom discourse.

Bamford (2004) observed that university lecturers made greater use of gestural *here* to make reference to visuals and to highlight "the common spatial context" of the lecturer and students (Bamford, 2004: 135) as a demonstration of social proximity. Friginal et al. (2017) particularly focused on SD in the EAP classroom. They found that teachers shift from proximal to distal SD equally, thus directing learners' attention to entities proximally and distally from their own speaker territory, which is also reflective of higher contextualized and interactive classrooms. They also showed that the frequency of *here* is higher in EAP classrooms than in university lectures, which may be attributed to the greater need to physically contextualize lesson content and activities in EAP classrooms than in university lectures.

Finally, elsewhere I explored language variations occurring in the use of lexical SD in three Engineering EMI lecturers' talk as a consequence of the shift to online teaching (Picciuolo, in press). Findings from this study showed that in SVLs, EMI lecturers tended to interact linguistically more often with visuals projected and shared through digital tools, as indicated by the higher occurrence of SD in SVL. This, in turn, was likely to facilitate students' comprehension in the EMI classroom, as the referent – even where it was mispronounced, for example, or weakly stressed by the lecturer, or unknown to the students – was indicated verbally by the lecturer, while being displayed on the screen. However, since it focused on lecturers' speech alone, this study was unable to provide a comprehensive account of how different communicative modes beyond speech can accomplish SD functions in lecturers' discourse.

3. METHODOLOGY

To examine and compare EMI lecturers' discourse across the three lecture modalities, we extracted six lectures from the EmiBo corpus (Johnson & Picciuolo, 2022) to build up three comparable sub-corpora of the same lecturer giving his EMI classes in three different teaching modalities (F2F, BLEND and SVL). The following sections describe the study setting and the participants, as well as the data collection tools and methods. Finally, lecturer's demographic data were collected in 2018 as part of the initial stage of a wider project carried out at the targeted University.[2] Demographics were collected by means of surveys and interviews of EMI lecturers (Picciuolo & Johnson, 2020).

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3.1. Participants and study settings

One EMI lecturer at a university in northern Italy volunteered to take part in the project. He taught in EMI Master's degree courses at the department of Engineering. When this research was carried out, he had been teaching in EMI classes for more than five years. He is an L1 Italian user and speaks English as an L2, with a self-declared English language level of C1 of the Common European Framework of Reference (CEFR). Furthermore, he is over the age of 65.

The same lecturer was observed when teaching in three different lecture modalities. F2F lectures were recorded by the lecturer himself with his personal camera framing him while teaching in a brick-and-mortar classroom at the faculty of Engineering. The camera captured the lecturer, the desk and the lecturer interacting with his laptop, the blackboard and the projector, which showed the lecturer making online searches, or showing PowerPoint presentations. BLEND and SVL lectures were filmed through a laptop integrated camera and then recorded and shared through the video-conferencing platform Microsoft Teams. However, while in SVL the lecturer made use of different online tools – e.g., Wikipedia, Google, besides software packages installed in his laptop, e.g., GIMP, PowerPoint, Excel – in BLEND lectures the lecturer relied more on online tools when the majority of the students were attending online, whereas he preferred traditional classroom tools if most students were physically present in the classroom.

The number of students attending his MA lectures was generally fewer than 25, with little difference between the three lecture modalities, but the exact number of students attending each teaching modality was unfortunately unavailable to the researcher. Finally, the lecturer stated that international students attending his classes accounted for 50-75% of the total.

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3.2. Data collection and analysis procedures

The material for this study was a small corpus of six EMI Engineering lectures delivered by the same Italian L1 lecturer in three different lecture modalities (F2F, BLEND and SVL) over three academic years – from 2019 to 2022. Data referring to duration and word counts of the six lectures analysed in this study are shown in greater detail in Table 1.

	VIDEO-RECORDINGS	YEAR	DURATION (MIN)	WORD COUNT
F2F	1	2019	84	9,727
	2	2019	91	11,460

SVL	3	2020	134	14,957
	4	2020	144	17,567
BLEND	5	2021	145	15,429
	6	2022	89	11,581
Total	**6**		**687 (11h 45 min)**	80,721

Table 1. Duration and word count of each lecture in the three sub-corpora

To examine lexical SD, this analysis was limited to demonstrative adjectives and pronouns (*this*/*these* and *that*/*those*), and locative adverbs (*here*/*there*) with spatial deictic references, as shown in Table 2.

| LEXICAL SPATIAL DEIXIS		
	PROXIMAL close to the *speaker*	**DISTAL** close to the *addressee*
Demonstratives (adjectives and pronouns)	*this*/*these*	*that*/*those*
Locative adverbs	*here*	*there*

Table 2. Demonstrative and locative spatial deictic words analysed in this study

Since this study also aimed at investigating how other communicative modes – i.e., gestures and technology-mediated actions – co-occur with speech in lecturer's multimodal discourse to fulfill spatial deictic functions, gestures and actions co-occurring with lexical SD were first identified and then annotated using the ELAN (2022) software. Table 3 illustrates gestures and computer-mediated actions identified in this study.

	GESTURES	ACTIONAL RESOURCES
1	FINGER pointing	
2	Writing/drawing BLACKBOARD	
3		MOUSE pointing
4		Writing/drawing PC
5		Scrolling
6		Toggling between windows
7		Zooming
8		Highlighting

Table 3. Gestures and actional resources employed by the lecturer to fulfill SD function in the corpus

Lectures were transcribed manually using the ELAN (2022) software. Then, since SD were first identified on a lexical level, a corpus driven research was carried out using the corpus tool Sketch Engine (Kilgarriff et al., 2004) to automatically select occurrences of lexical SD. Annotation of SD was added manually. Next, gestural and actional resources were identified, labelled and annotated using the ELAN (2022) software. Figure 2 provides a screenshot of the ELAN (2022) multimodal annotation software.
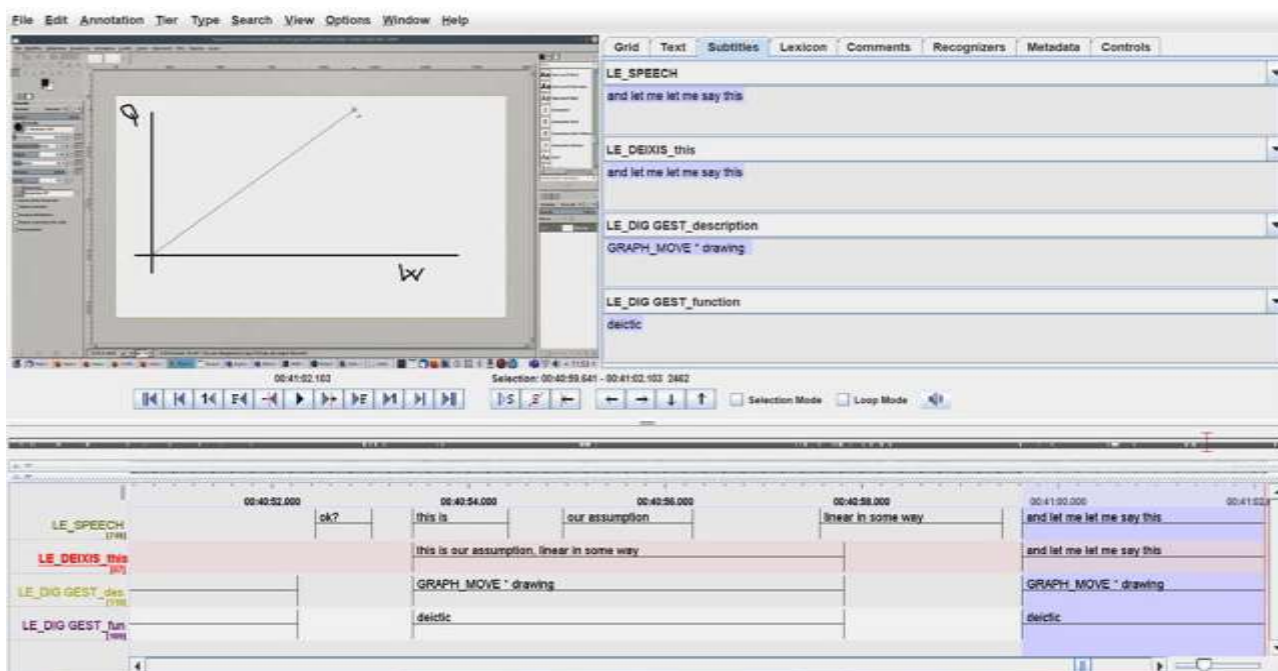
Figure 2. Example of the multimodal transcription and annotation of gestures and actional resources co-occurring with lexical SD in our corpus using the ELAN (2022) multimodal annotation software

Patterns of lexical deictics co-occurring with gestures and computer-mediated actions were first identified and then compared, both qualitatively and quantitatively, across lecture modalities and lectures. Occurrences of gestures and actions fulfilling SD functions were then manually counted, and findings were entered into Microsoft Excel. We then focused on the referent of these gesture- and action-anchored SD. In order to do this, we first relied on ELAN (2022) to check which occurrences of lexical SD co-occurred with gestures and actions. We then further manually annotated the txt files using the SKEMA annotation tool of Sketch Engine (Kilgarriff et al., 2004) to mark co-occurrence of lexical SD with the gesture or actional resource labels shown in Table 3.

Finally, we ran a collocation analysis to reveal lexical collocation of the most frequent patterns of multimodal spatial deictics for each lecture modality.

4. RESULTS

4.1. Lexical SD

As not all the instances of demonstratives and locatives acted as SD, manual analysis was necessary. Table 4 shows that out of nearly 4,000 lexical items, only about 800 were found to function as SD markers.

WORD frequency	F2F		SVL		BLEND		TOTAL	
	raw	SD	raw	SD	raw	SD	raw	SD
that	468	1	701	0	609	0	1778	1
this	279	127	405	183	392	119	1076	429
there	128	2	250	3	205	1	583	6
here	71	69	168	159	77	68	316	296
these	60	33	73	15	65	32	198	80
those	2	0	0	0	5	0	7	0
Total	**1008**	**232**	**1597**	**360**	**1353**	**220**	**3958**	**812**
		(23% of tot. items)		(23% of tot. items)		(16% of tot. items)		(21% of tot. items)

Table 4. Total number of occurrences of demonstratives and locatives identified in our corpus (*raw*), and the number of occurrences of these demonstratives and locatives acting as SD markers

The following examples show when the demonstrative *this* functioned as SD (example 3), and when it was not SD (example 4), but rather functioned as anaphoric reference (A):

(3) SD: What is not trivial, as I said, it's to translate **this** graphic representation into a model, into technical solutions (F2F)

(4) A: but you understand that if we have to design an innovative technical project **this** is something for the engineer because we have the background for doing **that** (BLEND)

Table 5 shows the distribution and normalized frequency (per thousand words – ptw) of proximal, distal and total SD used in the three sub-corpora.

	F2F	ptw	SVL	ptw	BLEND	ptw
Proximal deixis	229	10.80	357	10.97	219	8.11
Distal deixis	3	0.14	3	0.10	1	0.04
Total	**232**	**10.94**	**360**	**11.07**	**220**	**8.15**

Table 5. Normalized frequency (ptw) of proximal and distal SD in F2F, BLEND and SVL

As can be seen, both in F2F, SVL, and BLEND the lecturer overwhelmingly preferred proximal to distal deictics, signalling that he tended to perceive space within the speaker's territory (i.e., his own). This may be partially explained by the fact that the three sub-corpora consisted primarily of whole class talk where the teacher did most of the talking.

Table 6 shows that the normalized frequency of SD in F2F is almost identical as in SVL, with the lecturer using 1 SD every 10.95 words in F2F, and 11.07 in SVL. Conversely, normalized frequency of SD in BLEND is lower, with the lecturer using 1 SD every 8.15 words. Closer investigation of normalized occurrences of each lexical SD across the three lecture modalities shows that *this* occurs slightly more frequently in F2F while *here* is more frequent in SVL, as shown in Table 6.

	F2F		SVL		BLEND	
	raw	*ptw*	*raw*	*ptw*	*raw*	*ptw*
this	127	**5.99**	183	5.63	119	4.41
these	33	1.56	15	0.46	32	1.18
that	1	0.05	0	0.00	0	0.00
those	0	0.00	0	0.00	0	0.00
here	69	3.26	159	**4.89**	68	2.52
there	2	0.09	3	0.09	1	0.04
TOTAL	**232**	**10.95**	**360**	**11.07**	**220**	**8.15**

Table 6. Normalized frequency (ptw) of SD words across lecture modalities

However, by comparing normalized occurrences of lexical SD across lectures, we can observe some differences which suggest that the degree of referentiality does not depend upon the lecture modality.

	F2F		SVL		BLEND	
	(1)	(2)	(1)	(2)	(1)	(2)
this	**8.94**	**3.49**	**6.55**	**4.84**	**4.54**	**4.23**
these	2.36	0.87	0.40	0.51	0.91	1.55
that	0.00	0.09	0.00	0.00	0.00	0.00
those	0.00	0.00	0.00	0.00	0.00	0.00
here	**5.04**	**1.75**	**4.88**	**4.90**	**3.05**	**1.81**
there	0.21	0.00	0.20	0.00	0.00	0.09
TOTAL	**16.55**	**6.20**	**12.03**	**10.25**	**8.50**	**7.68**

Table 7. Normalized frequency (ptw) of SD words across lectures

As shown in Table 7, *this* and *here* were the most frequent SD in our corpus, with the F2F lecture (1) showing the highest rate, followed by SVL (1) and (2), then by BLEND (l) and (2), with the F2F lecture (2) presenting the lowest rate of occurrence of the lexical SD investigated. By looking at these figures in greater detail, in the two lectures delivered in SVL the lecturer used SD words at a similar frequency (12.03 and 10.25 SD ptw). Similarly, in BLEND the lecturer used 8.50 SD ptw in lecture (1) and 7.68 in lecture (2). Conversely, in F2F the total number of occurrences ptw of SD is almost three times higher in lecture (1) than in lecture (2). This suggests that the extent to which the lecturer directs students' attention towards relevant pedagogical objects and information in the learning environment is not determined by the instructional medium. In this regard, it is worth noting that in lecture F2F (1) – which presents the highest frequency of SD ptw – the lecturer spent about ten minutes of the whole lecture showing students pictures of technical instruments related to their disciplinary field, while standing before the classroom projector and interacting with the visuals using pointing gestures. This, in turn, would also provide an interpretation of the highest occurrences of the proximal SD *this* and, particularly *here* in the same F2F (1) lecture. Previous research has shown that the archetypal use of *here* is, in fact, as a verbal pointer, and indeed it is often accompanied by a pointing gesture (Bamford, 2004). In this regard, in SVL the frequency of occurrence of the SD *here* is closer to the F2F (1) and, interestingly, in SVL (1) and (2) *here* occurs at a similar rate. This, in turn, seems to suggest that, although the frequency of occurrence of SD is not determined by the lecture modality, the online digital environment would provide the lecturer with more visual cues such that he would need to resort to SD to a greater extent than in F2F lecture in the attempt to help students identify relevant learning objects in the digital learning environment.

In order to further explore these findings, we extended our analysis to include other communicative modes – i.e., gestures and "actional resources" (O'Halloran et al., 2014: 251) – co-occurring with lexical SD in lecturer's discourse.

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4.2. Gestural and actional SD

In order to include gestural and actional SD in our analysis, video lectures were manually transcribed and annotated using the multimodal annotation software ELAN (2022) which allows the user to add multiple tiers that can be displayed synchronously in order to identify recurring patterns in language usage. As shown in Table 8 below, nine tiers were established for the purpose of this study.

TIERS	DESCRIPTION
LE_SPEECH	Lecturer's speech
LE_DEIXIS_this	signalling occurrences of demonstratives and locatives in lecturer's discourse when functioning as SD words
LE_DEIXIS_that	
LE_DEIXIS_these	
LE_DEIXIS_those	
LE_DEIXIS_here	
LE_DEIXIS_there	
LE_DIG GEST_des	signalling the gesture or action performed by the lecturer in co-occurrence with SD words
LE_DIG GEST_fun	signalling if the gesture or action actually fulfilled SD functions (i.e., deictic or 0)

Table 8. Description of the tiers employed in ELAN (2022) for the transcription and annotation of gestures and actions in lecturer's discourse

As previously shown in Table 3, we particularly identified two embodied communicative modes (i.e., FINGER pointing, and writing/drawing BLACKBOARD) and six disembodied communicative modes or computer-mediated actions (i.e., MOUSE pointing, writing/drawing PC, zooming, highlighting, toggling between windows, scrolling) co-occurring with SD words and fulfilling SD functions.

To compare their frequency across lecture modalities, we then normalized their occurrences per hour, as shown in detail in Table 9 below.

In F2F lexical SD co-occurring with gestures are more frequent than action-anchored SD in SVL, and to an even greater extent than in BLEND. However, while in F2F SD markers are mostly gesturally anchored, in SVL and BLEND the lecturer seems to compensate for the lack of physical proximity with his students by anchoring lexical SD to a wider range of actional resources.

	Gestures-actions	F2F	SVL	BLEND
1	FINGER pointing	55.63		16.78
2	writing/drawing BLACKBOARD	9.92		
3	MOUSE pointing		21.14	6.34
4	writing/drawing PC		8.23	
5	scrolling		7.78	7.26
6	toggling between windows		4.77	3.90
7	zooming		4.32	1.78
8	highlighting		3.81	0.41
TOTAL gestures-actions/h		**65.55**	**50.05**	**36.47**

Table 9. Comparison of occurrences of gestural and actional SD across lecture modalities normalized per hour

This frequent intermingling of lexical and actional resources performing as SD in SVL testifies to the lecturer's need to organize the talk with maximal recipient design, that is to provide students with clear descriptions and explanation by exploiting the semiotic resources available to the lecturer in the digital learning environment.

However, when comparing the frequency of these multimodal SD patterns (i.e., speech, gestures, actions) across lectures, some interesting differences arise.

By looking at the frequency of multimodal SD patterns across lectures, we notice that F2F (1) presents the highest occurrence of multimodal SD, almost twice as frequent as F2F (2). We already mentioned that in F2F (1) the lecturer interacted with the visuals displayed on the projector using pointing gestures for more than ten minutes, while in F2F (2) the lecturer mainly sat at the desk while projecting mathematical formulas and slideshows. Similarly, the two BLEND lectures show a different frequency of occurrences, with BLEND (1) showing the lowest number of occurrences of multimodal SD per hour. Conversely, the two SVLs present similar occurrences of multimodal SD.

Table 10 shows the frequency of occurrence of each multimodal SD across lectures. We note that while in SVL the lecturer used each multimodal SD at a similar rate, in F2F and BLEND there is a much greater variability.

	F2F (1)	F2F (2)	SVL (1)	SVL (2)	BLEND (1)	BLEND (2)
MOUSE pointing			20.62	21.66	12.00	0.67
scrolling			8.07	7.50	11.17	3.36
toggling between windows			5.38	4.16	5.79	2.01

zooming			4.48	4.16	2.90	0.67
highlighting			1.79	5.83	0.83	
writing/drawing PC			8.97	7.50		
FINGER pointing	72.37	38.88				33.56
writing/drawing BLACKBOARD	17.20	2.64				
Total per lecture	89.57	41.52	49.31	50.81	32.69	40.27
Total per lecture modality	65.54		50.06		36.48	

Table 10. Frequency of multimodal patterns of SD (i.e., speech, gestures, actions) normalized per hour across lecture modalities

This seems to suggest that in F2F and BLEND the lecturer tends to make more effort to organize and manage the wider range of communicative resources (both physical and digital) available in the classroom. Furthermore, in BLEND settings this wider range of available tools seems to cause even more effort to the lecturer, given that he had to communicate to students located in both the physical and the online space.

4.3. Multimodal SD: lexical SD co-occurring with gestures and actional resources

We then investigated which lexical SD co-occur more frequently with gestures and actions in our corpus. As shown in Table 11, the lexical SD *this* and *here* are the most frequent gesture- and action-anchored SD markers in our corpus. Subsequently, we investigated which gestures and actions occur more frequently with these two SD markers. In order to better compare findings, Table 11 only reports findings occurring at a rate higher than 3.5. Furthermore, given that contextual variations in F2F and BLEND lectures substantially affected results, Table 11 compares the frequency of multimodal SD patterns across individual lectures.

	F2F (1)	F2F (2)	SVL (1)	SVL (2)	BLEND (1)	BLEND (2)
this + FINGER pointing	37.97	21.75				16.78
this + MOUSE pointing			9.41	9.58	4.97	
this + writing/drawing BLACKBOARD	10.03	1.32				
this + writing/drawing PC			6.28	4.16		
here + FINGER pointing	20.78	10.54				10.07

| *here* + MOUSE pointing | | | 9.86 | 10 | 5.79 | |
| *here* + scrolling | | | 5.38 | 3.75 | 4.55 | |

Table 11. Frequency of multimodal SD normalized per hour across lectures

As shown in detail in Table 11, in F2F (1) multimodal SD patterns occur at the highest rate, with *this* and *here* + with finger pointing showing the highest frequency overall. F2F (2) shows similar findings, though *this* and *here* + finger pointing occur at a rate almost 2 times lower than in F2F (1). Interestingly, BLEND (2) shows findings similar to F2F (2). As previously mentioned, this would be explained by the fact that BLEND (2) is fundamentally an F2F classroom, with most students attending the lecture in person. The two SVLs also show similar findings, with *this* and *here* + mouse pointing occurring at the highest rate. Furthermore, although multimodal SD patterns in the two SVLs show lower rates than in the other lecture modalities, we can notice that these two SD markers tend to occur with a wider range of computer-mediated actions (i.e., writing/drawing on the computer, scrolling, and highlighting).

4.4. Multimodal SD: lexical collocation

Once the most frequent multimodal SD patterns were identified and compared across lecture modalities and lectures, we then looked for the lexical collocations of these multimodal SD patterns. Their frequency was then analysed and compared in order to investigate any differences in the semantic associations of these multimodal patterns across lecture modalities and individual lectures.

In the two F2F lectures from our corpus, gesture-anchored *this* and *here* often co-occur with technical terms related to the specialised discourse of Engineering, as well as with process verbs, as shown in Example (5):

(5) so you have *water flowing* over this *grid* with *priority* because it's a at a lower level and therefore water is erm *withdrawn* through **this** *priority grid*. there is no *environmental flow* near **here** (F2F [1])

Conversely, in SVL, the action-anchored *this* often co-occurs with: (1) words related to visuals – e.g., *graph*, *picture*, *figure*, *image*; (2) verbs and nouns related to the digital context – e.g., *zoom*, *click*, *link*, *copy*, *select*; and (3) verbs of seeing – e.g., *see*, *look*. Similarly, the action-anchored *here* often co-occurs with (1) visuals – e.g., *map*, *figure*; (2) verbs of seeing; (3) but also with adjectives and adverbs of direction and position – e.g., *upper*, *right*, *side*, *next* – as shown in Example (6):

(6) you have an increasing frequency the increasing frequency you *see* **this** *picture* **here** and *look* at the *upper part* G stands for global while NH is northern hemisphere (SVL [2])

Finally, as regards the BLEND lecture modality, the collocational analysis reflected the discrepancies previously mentioned between the two BLEND lectures as regards the context of delivery, and particularly the audience, given that in BLEND (1) most students were attending online, while in BLEND (2) most students were attending in person. In fact, in BLEND (1) the pattern *this + mouse pointing* still co-occurs with words explicitly referring to visuals – e.g., *figure* and *picture*. Conversely, in BLEND (2) the SD *this* often co-occurs with pointing gestures. Furthermore, the gesture-anchored *this* often co-occurs with technical terms related to the specialized discourse of Engineering. Examples (7) and (8) provide an excerpt from BLEND (1) and (2) respectively, showing this collocational behaviour:

(7) so I will refer to **this** *webpage*, and I will, in particular refer to the *figures* and what I want to do today is to provide you an outline, (BLEND [1])

(8) what does it mean virtual water trade? it means that as I said water means food water consumption water scarcity means food scarcity an alternative to moving water is moving food or moving goods that need a lot of water to be produced. **This** is the virtual water trade. (BLEND [2])

However, it is interesting to notice that also in BLEND (2) the lecturer often refers to visuals (e.g., *slide*, *figure*) although these visuals are not signalled by the lecturer through lexical SD markers, as shown in Example (9).

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(9) now the virtual water trade erm water footprint. **This** slide I think it is really nice I'm sorry that you can't really see it but let me let me just show single parts of it. Okay I expand *the slide* on the screen and I show single part of it because I think it is really interesting it is nothing for your exam but still I mean it is very very interesting okay first of all *the figure* gives a lot of information really a lot (BLEND [2])

Furthermore, given that BLEND (2) lecture was delivered right at the end of the emergency period the lecturer's greater reliance on visual information when delivering his lecture might also be a legacy of the teaching experience in pandemic times.

5. DISCUSSION

As Bygstad et al. (2022) pointed out, the digitalization of the HE has affected, at a much deeper level, the way we represent knowledge and, subsequently, the way we learn, through two key affordances: visualization and interactivity. This paper has shown that higher data visualization and interactivity in the online learning space are reflected in the EMI lecturer's discourse with a higher occurrence and variety of multimodal ensembles fulfilling SD functions in the SVL classroom.

On a lexical level, findings have shown that both in F2F, SVL, and BLEND the lecturer overwhelmingly preferred proximal deictics, signalling that he tended to perceive the classroom space within his own territory. This, in turn, is indicative of the monologic teaching style he used in class, regardless of the lecture modality. However, given that in the online classroom both the lecturer and the students interact with the teaching objects through their computers, what the lecturer perceives as close to him is also likely to be perceived as proximal by the students.

The higher visual prominence of data and information in the online classroom is also indicated by the higher frequency of *here* in SVL (Bamford, 2004).

Furthermore, the high frequency of *here* in the lecturer's discourse in SVL also shows his greater reliance on the spatial learning context which, in turn, fulfills a scaffolding function in students' learning, as was also found in the EAP classroom (Friginal et al., 2017). Although we found discrepancies in the frequency of SD words across lectures, such that the way the lecturer directs students' attention towards relevant pedagogical objects and information in the learning environment would not be determined by the instructional medium, figures from our analysis of SD frequency in SVL showed less variability. This would suggest that the online teaching framework, would affect lecturer's discourse by anchoring it to the learning context – i.e., classroom activities and pedagogical objects – to a greater extent than the F2F and BLEND teaching frameworks.

The SD words *this* and *here* were also found to be more often gesture- and action-anchored in all three settings. However, the frequency of multimodal SD (i.e., patterns of words + gestures/actions fulfilling SD functions) was found to be relatively higher in SVL. In this regard, in F2F we identified only two gestures fulfilling SD functions – i.e., finger pointing and writing/drawing on the blackboard – while in SVL we identified six actions – i.e., mouse pointing, writing/drawing on the PC, scrolling, toggling between windows, zooming, highlighting. On the one hand, the higher density of actions fulfilling SD function seems to indicate that, in SVL, the lecturer would perceive a greater need to anchor his speech to the learning space than in F2F, possibly in the attempt to compensate for the physical distance. On the other hand, the learning infrastructure of the online classroom would provide him with a wider range of actions (e.g., highlighting, zooming) that he exploited to further scaffold students' comprehension.

Finally, in F2F lectures the most frequent multimodal SD pattern – i.e., *this*/*here* + finger pointing – co-occurs with specialized terms (e.g., *environmental flow*, *priority grid*) and process verbs.

Although the co-occurrence of gesture-anchored lexical SD with unfamiliar technical words in F2F lectures shows the lecturer's need to make them more accessible to the audience, the "naked introduction of such terms" (Farkas, 2020: 110) might create uncertainty among students, requiring more time for processing, and, ultimately, hamper comprehension. Conversely, in SVL and BLEND lectures the multimodal SD *this*/*here* + mouse pointing/ finger pointing often co-occurs with words related to visuals (e.g., *picture*, *graph*), verbs and nouns related to the digital

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context (e.g., *link*, *click*, *zoom*), and adjectives and adverbs of direction (e.g., *the upper part*). These visual word-first multimodal constructions are likely to prevent students' disorientation when dealing with unfamiliar vocabulary, helping them better identify the referent through reiteration and cross-modal association, and thus facilitate comprehension.

6. CONCLUSIONS

Findings from this study have showed that the lecturer overwhelmingly preferred the proximal SD *this* and *here* in all three teaching modalities, and that the frequency of these SD words varied greatly across lectures, regardless of the instructional medium, though in SVL figures showed less variability. However, while in F2F *this* and *here* more often co-occurred with finger-pointing gestures, in SVL they were found to be more frequently accompanied by a wider range of technology-mediated actions. Additionally, in SVL these actional multimodal SD patterns often co-occurred with visual words for introducing specialized vocabulary. Hence, our findings suggest that the frequent interplay between embodied and disembodied communicative modes in the lecturer's production of SD expressions in SVL would be ascribable to the maximization of the shared visual context in the virtual environment. Furthermore, these actional multimodal SD patterns would serve the lecturer to increase the visual salience and accessibility of the referent to the students, particularly when referring to terminological words.

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This study could certainly be further improved as far as the measure, the scale and the scope of the analysis are concerned. Since this study only involved one lecturer, findings and discussion cannot be generalized, and further research is needed to compare variations occurring in different lecturers' discourse across different teaching modalities. In fact, the way lecturers interact with digital tools might also differ according to their teaching style, as well as their age, and/or their acquaintance with new technology. Furthermore, future research is needed to investigate other communicative modes beyond gestures and actions – e.g., gaze, spatial positioning – when performing SD functions. Similarly, although this study only focused on gesture- and action-anchored lexical SD markers, it must be emphasised that, by contrast, gestures and actions are not necessarily speech-anchored, such that they might perform 'freestanding' SD functions that this study did not detect.

Furthermore, this study suffers from two methodological biases: (1) since annotation was done by the author alone, inter-rater agreement could not be assessed; and (2) occurrences of multimodal ensembles fulfilling SD functions were counted manually, without relying on any particular software – e.g., Multimodal Analysis-Video (MMA-Video, O'Halloran et al., 2012). Finally, students should be involved at a later stage to test these preliminary observations. In this regard, the

potential of technologies, such as eye-tracking, should be exploited to detect how students' visual and cognitive attention changes across different teaching modalities.

Despite these limitations, this study was intended to raise awareness among lecturers and students, as well as researchers and educational policy makers, on the potential benefits of implementing the digitalization of the learning space in onsite EMI teaching as part of the faculty strategy to facilitate students' comprehension of EMI lectures. As such, our findings also lend support to the integration of pedagogy, language and ICT tools in EMI lecturer training programmes.

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