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Jean Choong Peng Lee*

Language and Communication Centre
Nanyang Technological University, Singapore
jccplee@ntu.edu.sg

GAZE AND FACIAL EXPRESSION IN ENGINEERING STUDENT PRESENTATIONS: A COMPARATIVE CASE STUDY OF A HIGH- AND LOW-PERFORMING PRESENTER

Abstract

Gaze and facial expression are non-verbal communicative modes that help presenters to reinforce their verbal messages and perform communicative functions to meet oral presentation goals. However, there are limited studies on how gaze and facial expression are used in engineering student presentations, especially in areas related to their occurrence, frequency, and duration incurred during delivery. This case study used multimodal discourse analysis and coding statistics to compare the ways gaze and facial expression were used by two engineering students who scored the highest and lowest marks in an engineering presentation assessment. The findings showed the high-performing presenter used comparatively lesser gaze fixation shifts and longer durations of direct and sustained gaze at the audience during her delivery when compared to the low-performing presenter. Serious and smiling facial expressions were used predominantly throughout the presentation by the high-performing presenter, as compared to the low-performing presenter who used mostly neutral facial expressions. It was concluded that the high-performing presenter used gaze and facial expression more successfully to perform communicative functions to emphasise co-occurring verbal messages, evaluate and promote her product, foster a competent impression, and establish rapport with the audience.

Key words

gaze, facial expression, engineering student presentation, multimodality, ESP/EAP spoken discourse.

* Corresponding address: Jean C. P. Lee, 48 Nanyang Avenue, SHHK-02-05 (LCC), Singapore 639818, Singapore.

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1. INTRODUCTION

Multimodal discourse analysis argues that all discourse is inherently multimodal, and emphasizes the need to jointly analyse both linguistic and non-linguistic features to achieve a complete understanding of spoken discourse (e.g. Baldry & Thibault, 2006; Kress, 2011; O'Halloran, 2011). Oral presentations are an example of audiovisual performances that involve more than the use of speech. Together with spoken language, non-verbal body language and material are used by effective presenters to express ideational, textual, and interpersonal meaning (Morell, 2015). Indeed, non-verbal communicative modes such as gaze, facial expression, gesture, and intonation enhance meaning-making beyond the use of language in communicative events and social interactions (Kress, 2011; Kress & van Leeuwen, 2001; Scollon & Scollon, 2009). The use of communicative modes and their combinations help speakers to achieve different communicative purposes in the ESP/EAP context as well. This includes (1) enhancing persuasion in conference talks, research/business pitches, and student oral presentations, (2) improving content structure organisation, comprehension and audience engagement in lectures, as well as (3) promoting teaching and learning in classroom activities.

Valeiras-Jurado and Ruiz-Madrid (2019) showed that persuasion in conferences can be attained by interplaying with different communicative modes such as words, gaze, facial expressions, gestures, head movements, and intonation. Further, in research and business pitches, communicative resources were used to signal "rich points" in the discourse, in which "speakers were using words, gestures and intonation to persuasively evaluate their products" (Valeiras-Jurado & Ruiz-Madrid, 2020: 80). Ruiz-Madrid (2021), for example, described how speakers in successful research pitches orchestrated multimodal ensembles such as gaze, head movements and gestures to convey the presentation purposes quickly and effectively in the opening and closing moves of the pitches. Palmer-Silveira (2015) also observed how gaze, gestures, movements, intonation, pace and rhythms were used and combined by business students in their oral presentations to implement meaning and enhance persuasion.

A number of researchers have investigated the importance and use of non-verbal language in lectures. Thus, Crawford Camiciottoli (2015) highlighted how stress, gaze, or gestures were used to facilitate and enhance comprehension in business and humanities lectures. Similarly, using multimodal analysis, Bernad-Mechó (2022) presented quantitative and qualitative data to show how organisational metadiscourse co-occurred with non-verbal communicative modes to connect content in lectures and enhance audience engagement. Being competent in multimodal communication enabled a classroom teacher to synchronise three to four communicative modes (e.g. gaze, gesture, speech) in classroom activities to facilitate learning (Morell, 2018). In this way, communicative modes are orchestrated in ensembles to make meaning in discourse-specific genres such as

conferences, pitches, lectures and student oral presentations, contributing to meeting rhetorical goals in genre-specific discourse in the process (see Xia, 2020).

As far as engineering oral presentations are concerned, they are perceived to be informative in communicative purpose, with many engineers focusing on an Introduction-Methods-Results-Discussion structure to elaborate facts and numerical data (Darling, 2005; Maswana, Kanamaru, & Tajino, 2015; Van De Mieroop, De Jong, & Andeweg, 2008). Mastering oral presentations are essential for engineers to convince potential clients to hire their services or persuade them to invest in a project (Galván-Sánchez et al., 2017). Thus, challenges in engineering oral presentations extend beyond mastering presentation structure and lexical choices to include rhetorical goals like enhancing audience engagement and persuasion (see Galván-Sánchez et al., 2017; Mohamed & Asmawi, 2018; Van De Mieroop et al., 2008). However, there are only a few multimodal studies situated in the context of engineering oral presentations, such as those related to the use of gaze and facial expression to help in expressing rhetorical goals.

Previous research on the use of gaze and facial expressions in human interactions is rooted mainly in psychology, psycho- and neurolinguistics. These studies show that gaze and facial expressions provide clues to signal different emotions in interactions. A gaze aversion is often perceived as conveying negative avoidance-oriented emotions such as embarrassment, grief and revulsion (Argyle & Cook, 1976; Blakemore & Frith, 2004). Contrastingly, a direct gaze in an interaction often signals visual attentiveness (Böckler, van der Wel, & Welsh, 2014; Lyyra, Astikainen, & Hietanen, 2018) and social interest (Argyle, Lefebvre, & Cook, 1974). In social interactions, a direct mutual gaze between two people commonly establishes an openness to one another's communications, enhancing social accessibility and rapport (Tickle-Degnen, 2006).

The interpretation of the meaning of a speaker's direct gaze is a complex process that is often influenced by variables such as the duration, gaze shifts (Mason, Tatkow, & Macrae, 2005), facial expression (Marschner et al., 2015), gender (Conway et al., 2007), dominance (Main et al., 2009), attractiveness (Ewing, Rhodes, & Pellicano, 2010) and context (Hietanen, 2018). The signals produced by gazes are highly context-dependent because any slight changes in other accompanying modes, such as facial expressions that are linked to the gaze can change the social meaning of the gaze and thus its cognitive effect (Hamilton, 2016).

Facial expressions involve movements of parts of the face to different configurations (Ellyson & Dovidio, 1985). Ekman, Friesen, and Ellsworth (1972) highlight, therefore, that the face conveys information on emotions while the body indicates the intensity of the emotions conveyed. An emotion is a momentary and patterned set of changes in physiology, cognitive activity, subjective feelings, and facial expression (Ekman, 2005). Seven emotions have universal facial expressions: anger, fear, disgust, sadness, happiness, contempt, and surprise (Ekman & Keltner, 1997). Hence facial expressions reflect affective states, making it possible to use

facial expressions to predict associated behaviour and attitude change (Lewinski, Fransen, & Tan, 2014).

Facial expressions are used commonly to convey emotion and meaning beyond the use of words in human interactions. For instance, presenters in conferences used facial expressions like smiles as a redressive action to reduce an intrinsically face-threatening act of citing somebody who was physically present in the audience (Fernández Polo, 2014). A smile could also convey interpersonal warmth, though, in the absence of other information, it may decrease the attributions of competence in both men and women (Wang et al., 2017). Neutral faces without any expression have mostly been perceived as negative (Lee et al., 2008), sad (Jaeger, Borod, & Peselow, 1986), and associated with fear (Somerville et al., 2004). Though trait inferences can be deduced from spontaneous facial cues, additional evidence about the expresser is useful to offer further explanations (Gorn, Jiang, & Johar, 2008).

Most research studies on gaze and facial expression situated in psychology, psycho- and neurolinguistics are generally carried out in isolation from the context of oral presentations or the presenters' communicative purposes. There are limited studies on student oral presentations in higher learning despite their widespread applications and importance in preparing students to present effectively to meet future workplace demands (Godó, 2012; Tsang, 2020). There are also limited research studies that focused on the analysis of the type, occurrence, frequency, and duration of gaze fixations and facial expressions used in engineering presentations, as well as how gaze and facial expressions were used to engage the audience.

This study, however, aims to fill these gaps by examining how gaze and facial expression were used by two engineering students in an oral presentation assessment. One presenter scored the highest mark in delivery skills, while the other scored the lowest in the same assessment. Using a comparative case study approach, the presenters' use of gaze and facial expressions were compared and evaluated via coding statistics, focusing on the areas related to their occurrence, frequency, average duration and time ratio incurred during the delivery period. The theoretical framework of multimodal discourse analysis[1] was used to identify, evaluate and compare how the high- and low-performing student presenters used gaze and facial expression in their engineering presentations to create meaning more effectively and engage the audience. This study focused on two research questions:

1. What were the differences between high- and low-performing presenters in their use of gaze and facial expression in terms of frequency, average duration and time ratio?
2. In what ways were gaze and facial expressions used differently by both presenters to fulfil communicative purposes and functions?

[1] Bernad-Mechó (2021: 194) argues that the integration of different approaches and methods is possible to answer research questions and provide "a more complete view of the elements that make up communication" in communicative events.

Insights gained from this study will inform research and pedagogical practices in ESP/EAP spoken discourse and multimodal studies.

2. METHOD

2.1. Background of study and participants

A total of 22 first-year engineering students of a technological university in Singapore took part in this study. Approval from the University's Institutional Review Board was received for the study and informed consent was obtained from all the participants to video-record their oral presentations. Out of the 22 video recordings, only the videos of the highest and lowest-scoring presenters were used for both qualitative and quantitative analyses. The use of gaze and facial expression was coded using a coding scheme and analysed qualitatively using the approach of multimodal discourse analysis. Then, the quantitative data of the occurrence, frequency, average duration, and time ratio of gaze and facial expression were obtained via the coding statistics using the annotating software ELAN (EUDICO Linguistic Annotator).[2] Both qualitative and quantitative data were triangulated to answer the research questions.

The oral presentations were part of an assessment in an engineering communication course. The aim of the oral presentation was for the presenters to convince an audience within 5 minutes to endorse a lifestyle product that they have designed to solve a real-life problem. The participants were told to assume the audience to be angel investors who will finance them in their product development and implementation. In this study, the audience was represented by the assessors, who were two experienced communication skills lecturers.

The weighting of the course assessment tool (see Appendix) focused heavily on the presenters' delivery skills (60%), as compared to content (25%) and visual aids (15%). This was to reflect the assumption that delivery style and skills have the "highest influence" on "business angels' level of investment interest" in similar oral presentations to promote products (Clark, 2008: 257).

Table 1 shows the presentation scores of the highest-scorer Ava (88%) and the lowest-scorer Zoe (58.5) (not their real names). Both assessors unanimously gave Ava the highest score and Zoe the lowest in all the sub-components related to the content, delivery, and visual aids.

[2] ELAN was developed at the Max Planck Institute for Psycholinguistics in the Netherlands and is available online at https://archive.mpi.nl/tla/elan

	Ava		Zoe		Class Mean	
Assessor	One	Two	One	Two	One	Two
Content (25%)	21	23	20	20	17.72	16.36
Delivery (60%)	55	53	25	30	42.72	43.09
Visual aids (15%)	13	11	12	10	10	9.63
Presentation Score (100%): [average of assessors one and two]	88		58.5		69.76	

Table 1. Presentation scores

Both Ava and Zoe are non-native speakers with high proficiency in English. Table 2 shows the details of their oral presentations:

	Ava	Zoe
Oral presentation title	Conquering unpredictable weather with a smart awning	Make-up brush cleaning machine
Product designed	A smart awning that uses sensors to detect raindrops and automatic retractable arms to operate the awning	A machine that uses a rotator mechanism and UV light to wash and sterilize make-up brushes
Total duration of presentation	3.58 minutes	2.56 minutes

Table 2. Oral presentation details

2.2. Data transcription and coding

The speeches of the presenters were transcribed orthographically. The videos of the presenters were watched at least three times to identify the segments where the presenter's speech co-occurred with their gaze and facial expression. The use of gaze and facial expression were identified and coded using a coding scheme (see Table 3) which was adapted from Zhang (2015) and inspired by the work of Norris (2004). The identification and coding of modes were facilitated by observing how the communicative modes were used when they co-occurred with verbal speech to communicate higher-level mediated actions such as explaining how the product worked and its benefits. The presence of a mode assuming a more relevant role or the co-occurrences of many modes in a modally dense situation may indicate a heightened level of presenter's awareness/attention to signal a higher-level mediated action (see Bernad-Mechó, 2022; Norris, 2004).

New codes and descriptions were added to the coding scheme as new findings emerged during data collection (Schwandt, Lincoln, & Guba, 2007), such as the code on "neutral expression", which refers to presenters having no expression on their faces. Using the coding scheme, the use of gaze and facial expression were coded via the professional annotator software ELAN (EUDICO Linguistic Annotator).

Communicative modes	Codes	Descriptions of codes
Gaze fixations	At audience	Presenter looks directly at the audience
	At screen	Presenter looks at the screen
	At notes	Presenter looks at notes
	At the presentation remote control	Presenter looks at the presentation remote that controls the navigation of slides
	At others	The presenter looks at other objects that are not mentioned above
Facial expression	Smile	A pleased or amused expression, with the corners of the mouth turned up
	Serious	A solemn expression that shows concern for what matters
	Upset	An unhappy expression that shows distress or grief
	Frown	Furrowed brows in an expression that shows disapproval, displeasure, or concentration
	Laugh	Making sounds while smiling to show happiness or amusement
	Neutral	No expression on the face

Table 3. Coding scheme for gaze and facial expression in oral presentations

The annotation tool ELAN was used to facilitate the transcription of speeches and coding of data of gaze and facial expression. This tool is particularly useful as it enables researchers to view video recordings and code the occurrences of communicative modes on the same screen (Wittenburg et al., 2006; Zhang, 2015).

The annotation started with uploading the videos onto ELAN to create two "tiers" or sets of annotation, such as "gaze" and "facial expression". Then, the possible values or codes that the annotator used on the tiers were created using the function of "controlled vocabularies", which represent the codes to be used in the annotation process (see ELAN manual at https://www.mpi.nl/corpus/manuals/manual-

elan.pdf). For instance, the "controlled vocabularies" created to describe the types of facial expressions were "smile", "serious", "upset", "frown", "laugh" and "neutral". The coding schemes in Table 3 provided all the "controlled vocabularies" used for describing both the tiers for gaze and facial expression. Figure 1 shows a screenshot of the coding processes on ELAN.

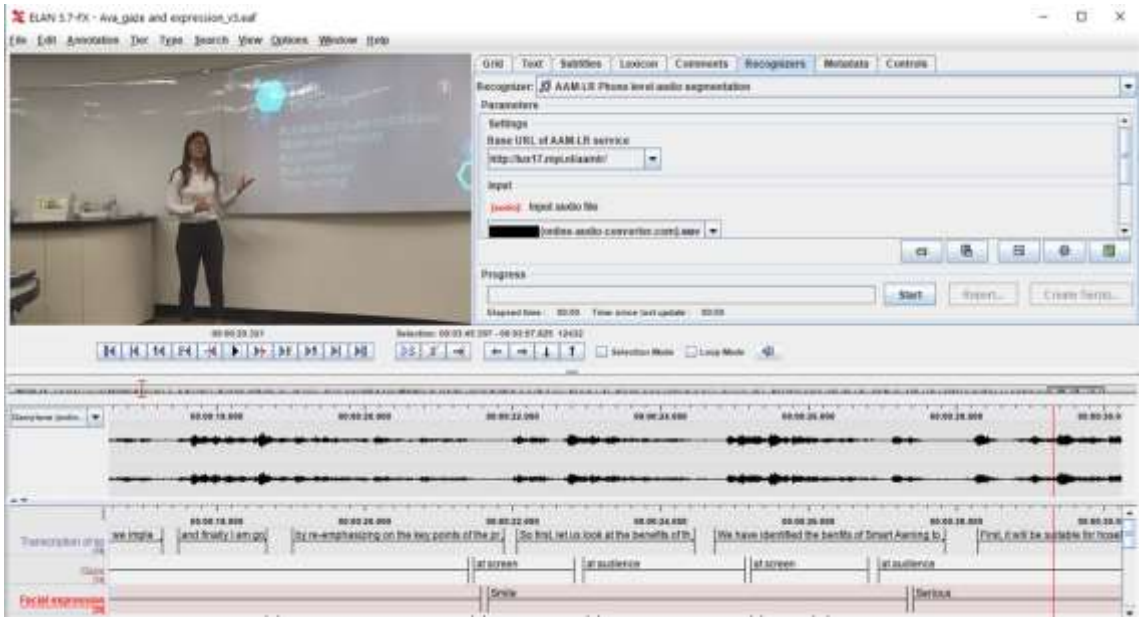

Figure 1. The coding process of presentation using ELAN

To ensure the trustworthiness of the data, two randomly chosen sections of the transcripts which formed about 20 percent of the total transcript length were coded separately and independently by a second coder (see Campbell et al., 2013; O'Connor & Joffe, 2020). Inter-coder reliability was measured using Cohen's kappa statistics in SPSS to assess the level of agreement between the two coders in coding gaze and facial expression that co-occurred with the transcribed utterances. A value of 0.71 was obtained, which indicated a substantial agreement between the first and second coders. Instances of disagreement were discussed between the two coders to reach joint decisions on the final coded data set.

2.3. Data coding statistics

After coding the data, the coding statistics on gaze and facial expression for both presenters were generated via ELAN's annotation statistics for comparative analyses. The annotation statistics analysed the coded data on gaze and facial expression in four main areas of their: 1) occurrence, 2) frequency, 3) average duration, and 4) time ratio. A summary of the areas of analysis and their definitions

is provided in Table 4. The definitions of the areas of analysis were adapted from ELAN (see ELAN manual: https://www.mpi.nl/corpus/html/elan/) specifically for this study.

Areas of analysis	Definitions (adapted from ELAN manual)
Occurrence	The number of occurrences of gaze or facial expressions during the observation period.
Frequency	The number of occurrences divided by the observation period, or the number of occurrences per second.
Average duration	The total duration of the annotations (or codes) with the same value divided by the number of occurrences.
Time ratio	The total duration of the annotations (or codes) containing the same value divided by the observation period.

Table 4. Areas of analysis in coded data

3. FINDINGS

3.1. Statistical analyses of gaze and facial expression

3.1.1. Use of gaze

A total of four gaze fixations were observed in the presentations: audience, screen, notes and the presentation remote control.

Gaze fixations (at)	Ava				Zoe			
	Occurrence	Frequency	Average duration (in sec)	Time ratio	Occurrence	Frequency	Average duration (in sec)	Time ratio
Audience	10	0.04	22.27	0.9	39	0.26	1.28	0.28
Screen	9	0.04	1.17	0.04	29	0.16	1.86	0.3
Notes	0	0	0	0	38	0.21	1.42	0.3
Presentation remote control	0	0	0	0	9	0.05	0.78	0.39
Others	0	0	0	0	0	0	0	0

Table 5. Coding statistics of gaze

Table 5 above provides a comparative overview of the coding statistics on how the different gaze fixations were made in terms of their 1) occurrence, 2) frequency, 3) average duration, and 4) time ratio during the presentations.

As shown in Figure 2, the frequency of gaze for Zoe is much higher than for Ava in all types of gaze fixations (i.e. audience, screen, notes and presentation remote control). This shows that Zoe has made many rapid shifts of gaze fixations throughout her presentation period. Contrastingly, Ava gazed at only the audience and the screen throughout the observation period with minimal gaze shifts.

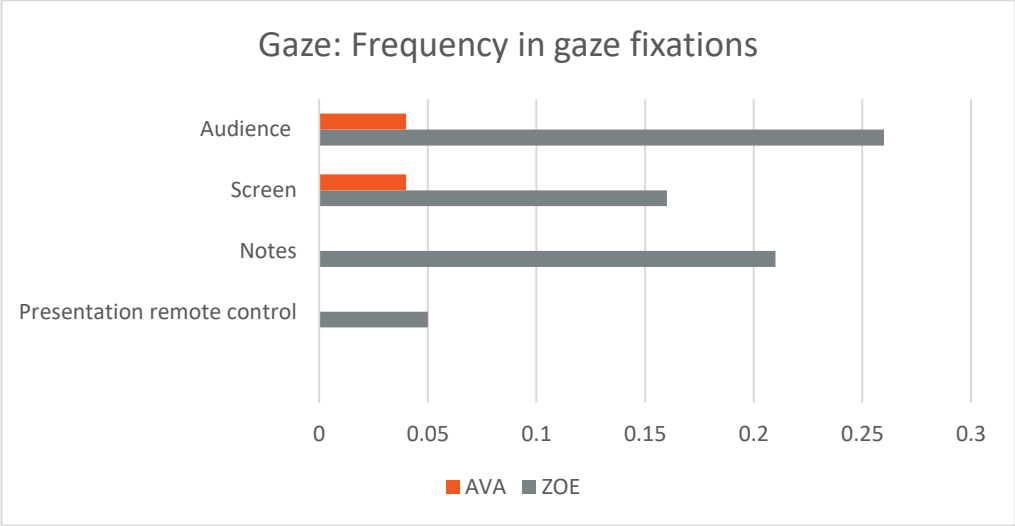

Figure 2. Frequency of gaze

As shown in Figure 3, Ava has a much longer average duration of gaze at the audience compared to Zoe. Ava spent 22.27 sec on average looking at the audience, which is almost 20 times more than Zoe's 1.28 sec. Both presenters also gazed at the screen, though the average duration for Zoe (1.86 sec) is greater than Ava's (1.17 sec). This shows that Zoe's gaze at the screen was sustained for a longer period. Out of the two presenters, only Zoe gazed at the notes, spending an average of 1.42 sec on them and the presentation remote control (0.78 sec). The average duration of Zoe's gaze at inanimate objects such as the screen and the notes was also longer than her gaze at the audience.

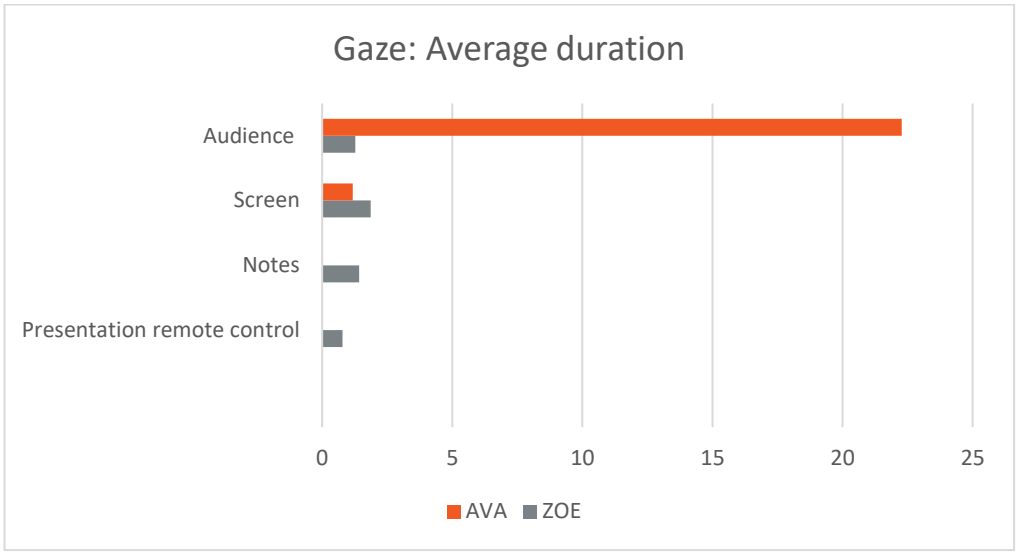

Figure 3. Average duration of gaze

Figure 4 shows the time ratio for the various gaze fixations. Ava spent almost 90% of her presentation time gazing at the audience (0.9), with occasional gazes at the screen (0.04). Comparatively, Zoe spent her presentation time gazing at four different targets: audience (0.28), screen (0.3), notes (0.3) and presentation remote control (0.39). Her gaze at the audience was the lowest at 0.28 compared to all the other three inanimate objects.

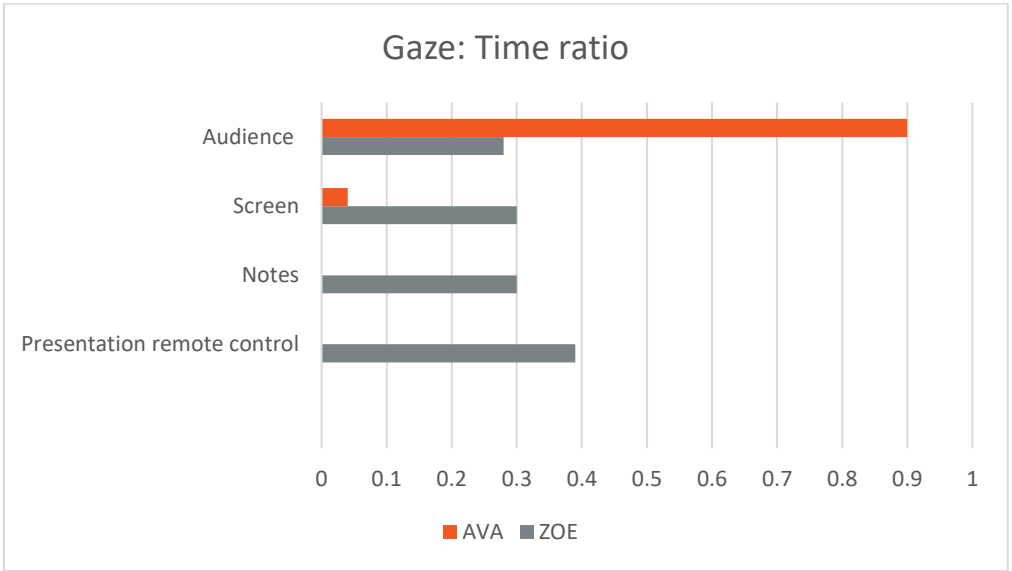

Figure 4. Time ratio of gaze

3.1.2. Use of facial expression

A total of five types of facial expressions were used in the oral presentations: serious, smile, upset, laugh and neutral. Table 6 provides a comparative overview of coding statistics on how facial expressions were used in terms of their 1) occurrence, 2) frequency, 3) average duration, and 4) time ratio during the presentations.

Facial expression	Ava				Zoe			
	Occurrence	Frequency	Ave duration	Time ratio	Occurrence	Frequency	Ave duration	Time ratio
Serious	10	0.04	15.89	0.65	2	0.01	7.53	0.08
Smile	10	0.04	7.03	0.29	4	0.02	0.99	0.02
Upset	1	0.004	4.06	0.014	0	0	0	0
Laugh	0	0	0	0	2	0.01	1.95	0.02
Neutral	1	0	0	0	5	0.03	27.96	0.77

Table 6. Coding statistics of facial expression

Figure 5 shows that Ava's frequency of using the serious (0.04) and smile (0.04) facial expressions was higher than Zoe's, which was at 0.01 (serious) and 0.02 (smile) respectively. Comparatively, Zoe used neutral (0.03) and laugh (0.01) facial expressions, compared to Ava who used neither. Ava used an upset facial expression (0.004) while Zoe did not.

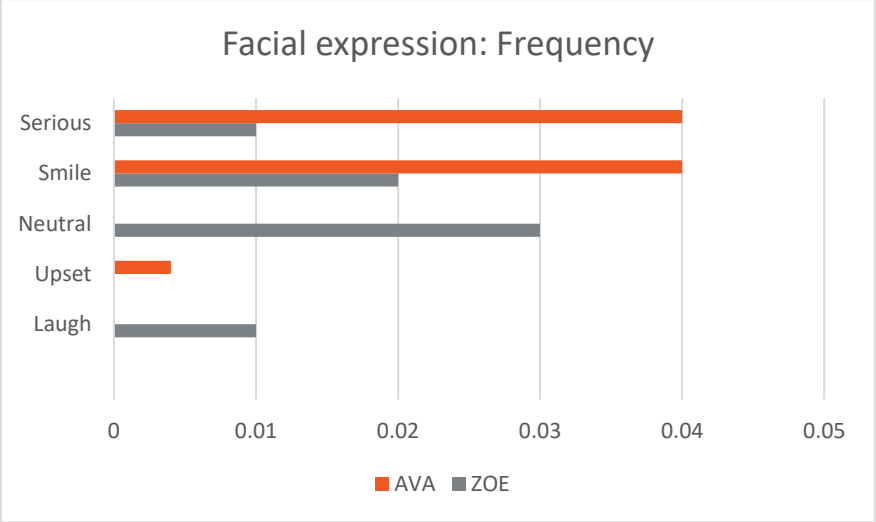

Figure 5. Frequency of facial expression

As seen in Figure 6, Ave's average duration of facial expression serious (15.89 sec) and smile (7.03 sec) was much longer than Zoe's use of facial expression serious (7.53 sec) and smile (0.99 sec) respectively. Contrastingly, Zoe's use of neutral facial expressions (27.96 sec) was much higher than Ava's (0).

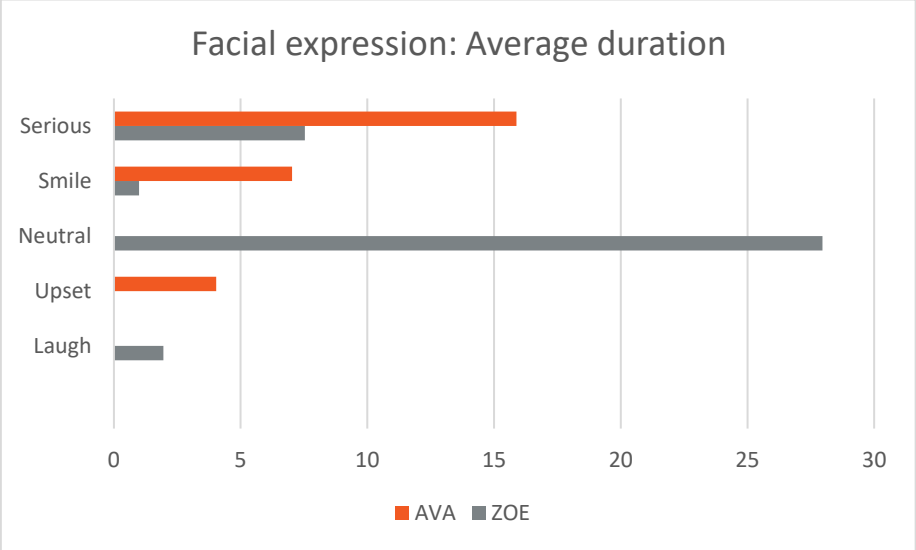

Figure 6. Average duration of facial expression

Figure 7 shows the time ratio of different facial expressions being used. Ava spent about 65% of her presentation time on facial expressions serious (0.65) and about 29% of her time on smile (0.29). In contrast, Zoe spent about 77% of her presentation time using neutral facial expressions (0.77). In Zoe's case, the time spent on neutral facial expression was much higher compared to the use of other facial expression types, such as serious (0.08), smile (0.02) and laugh (0.02).

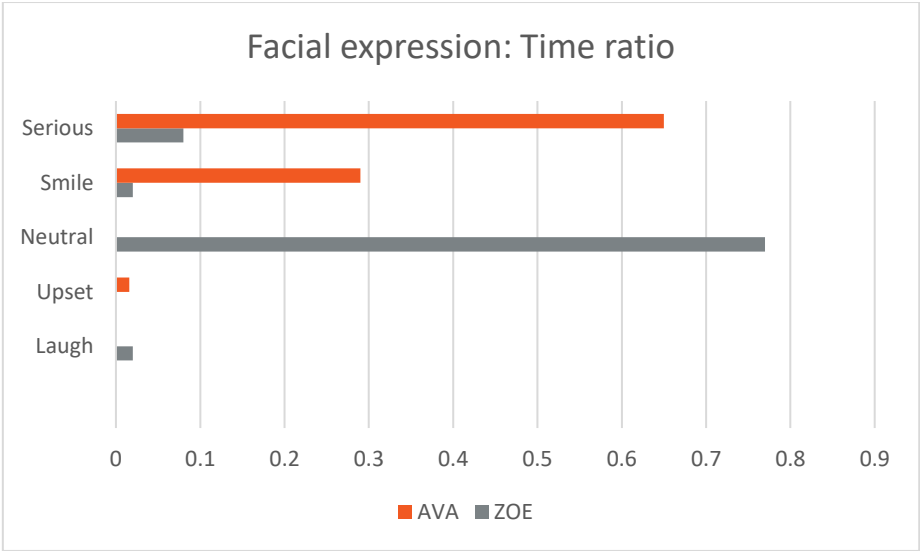

Figure 7. Time ratio of facial expression

The next section compares how the two presenters used gaze and facial expression to perform communicative functions.

3.2. Multimodal discourse analysis of gaze and facial expression

3.2.1. The high-performing presenter

The high-performing presenter, Ava, combined the use of a direct gaze at the audience with various facial expressions to mediate different communicative functions to attain the goal of convincing the audience to endorse the product. Table 7 shows a summary of salient examples extracted from the coded data that highlight how gaze and facial expression were combined to perform communicative functions and create meaning to enhance the communicative goal.

E.g.	Time frame (min: sec)	Video frame	Transcription of speech	Co-occurring gaze and facial expression	Communicative purposes and functions
1	00:48-00:55		*So by the click of a button, you can easily retract it or extend it.*	Gaze at audience + facial expression serious	To explain how the smart awning works
2	01:48-01:50		*So, next, let's look at the implementation, er, on how this Smart Awning is going to work.*	Gaze at screen + Gaze at the audience + facial expression serious	To direct the audience to a new topic on the product implementation plan
3	02:13-02:16		*It's going to be different from ours because ours is able to detect the rain.*	Gaze at audience +facial expression serious	To explain how her product is different from other competitors.

4	03:18-03:23		*So one moment it is going to be sunny and hot, and the next moment it is going to be pouring*	Gaze at audience+ facial expression upset	To highlight the problem of the unpredictable weather in Singapore
5	03:31-03:34		*It has a mind of its own, so it can automatically detect the rain droplets*	Gaze at audience + facial expression smile	To highlight the benefits of the awning

Table 7. MDA of gaze and facial expressions used by Ava

In example 1, Ava gazed at the audience directly while wearing a serious facial expression to explain how the awning can be operated "by a click of a button". The gaze directed at the audience reinforced her direct address to the audience via the second personal pronoun "you" on how the awning can be "easily" retracted or extended. When combined with a direct gaze at the audience, the serious facial expression may suggest her serious attitude and undivided attention towards the act of explaining important information to the audience.

In example 2, Ava gazed at the screen momentarily, perhaps to check on a new slide that showed a new topic on the product implementation plan. The gaze at the screen could have also served as an attentional cue to direct the audience to follow her action of looking at the screen. Both her utterance "let's look at the implementation" and her non-verbal signal of gazing at the screen reinforces the meaning of each other to direct the audience's attention to her message. Her gaze returned to the audience very quickly once the purpose to introduce the topic change was accomplished.

In example 3, Ava combined a direct gaze at the audience and a serious facial expression to highlight the ability of the product to detect rain, which is different from other rival products.

In example 4, Ava used an upset facial expression while maintaining a direct gaze at the audience. The upset facial expression was used to emphasise the negativity of the verbal message on unpredictable weather, highlighting a problem that can be solved with the promoted product.

In example 5, a direct gaze at the audience was combined with a smile to highlight the benefits of the proposed product of a "smart awning". The smile indicated positivity, which may reflect the positive verbal message content that

described the benefits associated with using the awning, such as it being "automatic", "having a mind of its own", and "able to detect rain droplets".

In sum, Ava combined direct gazes at the audience and a variety of facial expressions (e.g. serious, smile, and upset) to emphasise the meaning of the verbal messages and the context in which they were conveyed.

3.2.2. The low-performing presenter

Similar to Ava, Zoe attempted to combine gaze and facial expression in her oral presentation. Table 8 provides some salient examples to show Zoe's attempts to combine gaze and facial expressions with co-occurring utterances to mediate various communicative functions. Drawings of the video images were used to anonymise the low-performing presenter.

In example 1, Zoe made many gaze shifts from gazing at the audience to the notes, and then back to the audience, before gazing at the screen and then at the notes again. A serious facial expression was used to signal the importance of her presentation at its beginning. However, her presenter's role to introduce the outline of her presentation seemed to be weakened by the rapid frequency of gaze shifts, which signal a lack of attentiveness. The averted gazes from the audience did not help her to draw attention to her verbal message or her product.

E.g.	Time frame (min: sec)	Video frame *	Transcription of speech	Co-occurring gaze and facial expression	Communicative purposes and functions
1	0:03-0:10		*For now, I'll be elaborating on the benefits, implementation, cost and lastly conclusion of my presentation.*	Gaze at audience + gaze at notes+ gaze at audience + gaze at screen + gaze at notes + gaze at audience + facial expression serious	To introduce an outline of the presentation
2	1:09-1:18		*Moving on to the benefits, the brush-washing machine provides a quick and hassle-free solution for cleaning brushes due to its automatic wash-and-dry mechanism.*	Gaze at screen+ gaze at notes + gaze at audience + gaze at notes + gaze at audience+ gaze at notes + facial expression neutral	To convey the benefits of the brush-washing machine

3	1:19-1:28		*It also serves, serves as a, serves as a, oh, sorry, as a sterile storage function as it provides a bacteria- and dust-free environment to our storage.*	Gaze at presentation remote control+ gaze at screen + gaze at notes+ gaze at audience+ gaze at note+ gaze at audience + facial expression neutral	To convey the benefits of the brush-washing machine
4	2:14- 2:24		*The total cost of the manufacturing…o ops… oops... The total cost of manufacturing the brushing machine is projected to be $70.*	gaze at notes + gaze at screen + gaze at notes + gaze at audience + gaze at notes + gaze at audience + facial expression laugh + facial expression smile	To list the manufacturing cost of the machine

* Drawings of the video frames were used to maintain the anonymity of the low-performing presenter.

Table 8. MDA of gaze and facial expressions used by Zoe

In example 2, Zoe made rapid successions of gaze at the screen, and then at her notes, before turning to gaze at the audience, and then repeated similar gaze shifts during her short utterances of less than 10 seconds. Her use of gaze on the audience was shifted too quickly and frequently to draw attention and awareness to the verbal message that she has uttered. The neutral facial expression used also signalled minimal emotion or interest in the utterances or the product.

Both examples 3 and 4 show similar rapid shifts of gaze. The laugh in example 4 co-occurred with the utterance of "oops" to signal embarrassment when Zoe clicked on the wrong slide. A smile that seemed to suggest embarrassment also appeared shortly after the laugh. The laugh and smile seemed to be spontaneous responses to the blunders to mitigate any possible embarrassment felt. Her gaze at the presentation remote control also indicated her lack of familiarity with operating the presentation aids.

In sum, Zoe made constant and rapid gaze shifts while speaking, spreading her attention on different gaze fixations to solely focus on the audience. Unlike Ava who focused her gaze on the audience consistently, Zoe diluted her focus on the audience by looking at mostly inanimate objects. Her facial expressions used were predominantly neutral, lacking in emotions to reflect the verbal messages uttered to promote her product.

4. DISCUSSION

The high-performing presenter (Ava) combined a direct and sustained gaze at the audience with different facial expressions throughout her presentation. These combination patterns helped her perform a variety of communicative functions to convince the audience to endorse the product presented. Gaze and facial expressions were used to 1) emphasise the verbal messages, 2) evaluate and promote the product, 3) establish rapport with the audience, and 4) foster a competent impression of the presenter.

To emphasise the verbal messages that evaluate and promote her product, the high-performing presenter used a variety of facial expressions to communicate the emotions generated by the verbal messages. Smiles were used to signal happiness when the verbal messages highlighted the positive experience of using the product. An upset facial expression was used to indicate unhappiness when describing a persistent problem (e.g. unpredictable weather) that her product can solve. A serious expression was used to mimic the seriousness of the topic of operating the product. When facial expressions were combined with a direct and sustained gaze at the audience, they heightened the audience's attention to focus on the presenter. This is because a direct gaze has the effect of triggering preferential detection processes to induce deeper face processing and encourage the audience to focus on the speaker's face (Conty, N'Diaye, Tijus, & George, 2007; Lyyra et al., 2018). In this way, a direct gaze at the audience gave prominence to the presenter's face, bringing the audience's attention to the presenter's facial expressions, and raising the audience's awareness of the presenter's thoughts and emotions associated with the facial expressions. The connectivity between gaze and facial expression helped the presenter to emphasise the verbal messages about the product and the context in which it was used. In this way, the presenter heightened the audience's attention and awareness of the product using a combination of gaze and facial expression, contributing to the goal of convincing the audience to endorse the product.

To foster rapport with the audience, the high-performing presenter used a direct and sustained gaze at the audience to signal her attention and interest, seeking to attain mutual attentiveness with the audience to establish rapport with them (see Tickle-Degnen, 2006). According to Forey and Feng (2016), engaging the audience by developing a positive relationship with them may contribute to persuading the audience to acknowledge the presenter's arguments. When combined with smiling facial expressions that exude happiness and warmth, the perceptions of the speakers' warmth may invite positive affective reactions from the audience that could be transferred to the product that they are promoting (Chen & Wyer, 2020; Hennig-Thurau et al., 2006; Howard & Gengler, 2001; Schwarz & Clore, 2007).

Gaze and facial expressions can contribute to creating a competent impression for the high-performing presenter. Serious facial expressions used when speaking about product-related messages, such as the product's characteristics and workings, may signal the speaker's product knowledge and earnestness. When combined with

a direct, steady and sustained gaze throughout the presentation, the speaker can be perceived as being more competent, likeable, and credible (see Hall, Coats, & LeBeau, 2005; Marschner et al., 2015).

In contrast, the low-performing presenter did not use gaze and facial expressions as successfully to perform communicative functions in the oral presentation. Short and inconsistent gazes at the audience weakened her level of focus on them, compromising her ability to capture their attention and invite them into her world of thoughts, attitudes and emotions to promote her product. The frequent gaze shifts, together with the short duration and length of gaze at the audience can be interpreted as being inattentive and uninterested (see Böckler et al., 2014; Lyyra et al., 2018), which may, in turn, diminish her ability to build a positive relationship with them. Prolonged gaze at the notes and the presentation remote control diversified the audience's attention, de-emphasising her focus on the audience and the product. Spending too much time gazing at the notes, the screen and the presentation remote control also signalled an unfamiliarity with the content of her presentation, as well as the presentation aids used. This may in turn affect the audience's perception of her competence as a presenter. Neutral expressions which were used predominantly throughout her presentation indicated a limited range of emotions needed to mirror and emphasise co-occurring verbal messages. The lack of a direct and sustained gaze at the audience weakened the impact of any facial expression used to signal attention to messages and incapacitated her overall performance to convince the audience to endorse her product.

The results underscore the impact of multimodal communication in facilitating the process of meaning-making via non-verbal resources. This study shows that multimodal analysis provides an additional pragmatic dimension to communication by strengthening one's understanding of how both non-verbal communicative resources are used in various contextual events. In this study, drawing on such communicative resources provides affordances for audience engagement and persuasion to take place, such as through reinforcing verbal messages to enhance the evaluation and promotion of the product, establishing rapport with the audience, and fostering a competent impression of the presenter. In this way, this study is in line with previous work that shows how audience engagement and persuasion can be performed multimodally to meet the rhetorical demands of spoken genres such as research and business pitches (e.g. Ruiz-Madrid, 2021; Valeiras-Jurado & Morell, 2020).

5. CONCLUSION

Within the theoretical framework of multimodal discourse analysis, this case study compared how a high- and low-performing presenter used gaze and facial expression in engineering oral presentations to fulfil communicative purposes. Unlike the low-performing presenter, the high-performing presenter combined gaze and facial expressions purposefully to express meaning that contributes to reinforcing her

verbal messages, promoting her product, establishing rapport with her audience, and fostering a competent impression of herself in her role as a presenter.

This study provides some pedagogical implications for engineering instructors and ESP/EAP researchers and practitioners. Firstly, learners can be taught explicitly to use gaze and facial expression as presentation tools to reinforce verbal messages, construct a competent presenter's persona, as well as engage the audience's attention. Secondly, classroom activities can focus on authentic and specific communicative events such as engineering research pitches and product proposal presentations to allow learners to practise multimodal communication within the context of specific discourse. Thirdly, modelling strategies can be incorporated into engineering presentation lessons where novice presenters can learn the skills of using gaze and facial expression by observing high-performing presenters through the four stages of observing, emulating, practising, and adapting (see De Grez, Valcke, & Roozen, 2014; Zimmerman, 2000). These four stages can provide a systematic learning process for novice presenters to use within the context of engineering practices to raise their awareness and competence in multimodality so as to fulfil the rhetorical needs of engineering presentations, such as engaging the audience and promoting product solutions.

The use of gaze and facial expressions in oral presentations is infinite, as well as how they can be interpreted and studied. The findings of this case study have captured a small portion of their uses via a comparative case analysis of two student oral presentations. More is needed to be done to extrapolate the findings further beyond this study. For instance, the use of other communicative modes such as the orientation of head movement and body posture could have affected the perceived direction of the presenter's gaze. It will be useful for future research to explore how gaze and facial expressions can be combined with these other modes of communication to make meaning to fulfil communicative goals. On a small scale, this case study provides some insights into how gaze and facial expression can be interpreted and used in engineering oral presentations, as well as how they can be combined to perform specific communicative functions to achieve communicative success.

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JEAN CHOONG PENG LEE holds a PhD in Applied Linguistics and is currently a lecturer at the Language and Communication Centre at Nanyang Technological University, Singapore. She teaches language and engineering communication courses and develops the curriculum and learning materials for them. Her research interests are in multimodal discourse studies, academic spoken discourse, interdisciplinary studies, as well as the teaching and learning of professional communication skills.

Appendix

Presentation Assessment Tool

	Comments	Score
Content & organisation (25%)		
• Provides an introduction, body and conclusion • Uses attention grabber and previews presentation • Uses the structure of main and supporting points to organise content • Provides claims and elaborates them logically using evidence, explanations and examples • Uses transitional devices to maintain coherence • Uses summary, makes recommendations and calls for action		
Delivery (60%)		
• Uses gaze, facial expression, gestures, intonation, stance and posture appropriately and effectively • Appears confident and competent • Able to engage the audience's attention and establish rapport with the audience • Able to persuade the audience to endorse the product • Uses equipment confidently • Manages time well • Uses language correctly and effectively, uses transition words and other signposts to ensure coherence and fluency		
Visual aids (15%)		
• Uses appropriate slide design • Uses a clear layout • Uses a professional colour scheme • Uses tables and figures correctly • Uses text effectively • Provides clear content • Uses animation appropriately		
Other comments:	Total:	