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Spatial pedagogy: mapping meanings in the use of classroom space

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Spatial pedagogy: mapping meanings in the use of classroom space

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The positioning and movement of the teacher in the classroom are fundamental to the pedagogical process. Specific spaces in the classroom take on certain meanings because of the nature of pedagogic discourse that occurs on the site and the positioning and distance of the site relative to the students and the teaching resources. Spatial pedagogy is realised through the patterns of positioning and the directionality of movement, as well as the intersemiotic correspondences in the use of space with other semiotic resources (e.g. language, gesture and teaching materials). This paper investigates the different types of space in the classroom and their associated meanings. It also discusses an approach for annotating the teacher's use of space, and the usefulness of visualising this annotation through digital graphical methods. The notion of 'structured informality' in the classroom is proposed through data analysis of two teachers conducting similar lessons, but with apparently different pedagogical styles.

Keywords: multimodality; spatiality; pedagogy; multimodal classroom discourse analysis

1. Introduction

Social semiotic approaches to educational research have extended the scope of investigation beyond language to the other semiotic resources (e.g. Jewitt, 2008b; Jewitt & Kress, 2003; Kress, Jewitt, Ogborn, & Tsatsarelis, 2001; O'Halloran, 2000, 2005; Unsworth, 2001, 2006). Such studies challenge the traditional view that teaching and learning are primarily linguistic accomplishments (e.g. see Schleppegrell, 2007). The pedagogy of the teacher is realised through the combinational deployment of modalities and semiotic resources, which can include gesture, gaze, images and movement, alongside with language. '[L]anguage alone cannot give us access to the meanings of the multimodally constituted messages; language and literacy now have to be seen as partial bearers of meaning only' (Kress, 2003, p. 35). As O'Halloran (2007, p. 79) explains, 'the study of linguistic discourse alone has theoretical limitations which have the potential to simplify and distort the actual nature of pedagogical practice'. In this light, the focus of educational research is moving towards a multimodal approach which takes into account the complete range of resources utilised in the classroom in order to gain deeper insights into the pedagogical process and how the classroom experience is constructed for the students. This is a particularly important agenda in the current age of interactive digital media technology.

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Following recent research in spatial semiotics (e.g. Stenglin, 2009, 2010), we investigate the use of space through the positioning and movement of the teacher which is viewed as meaningful in the sense that a 'spatial pedagogy' is realised. That is, spaces in the classrooms are constantly negotiated and reconfigured (1) statically through the stationary position of the teacher in a specific location and (2) dynamically though the teacher's movement and pacing. The teacher's position in the classroom is significant as the material site where the semiotic resources of the teacher (e.g. gesture, language and others) are embodied and instantiated. As such, different spaces in the classroom acquire specific meanings due to the typical configuration of semiotic choices in the pedagogic discourse that occurs in that space, as well as the positioning and distance of the site relative to the students and the teaching resources, such as the whiteboard and screen.

In this study, the positioning and movement of the two teachers are mapped and a categorisation of the various spaces in the classroom is proposed according to the functional use of those spaces. Based on the analysis, meanings are ascribed to the different material sites in the classroom. The study reveals that the teacher's use of space through positioning and movement is a significant semiotic resource for effective pedagogic discourse.

The study is undertaken from the perspective of Halliday's (1973, 1978) social semiotic theory which models the meaning potential of semiotic resources into three distinct 'metafunctions': *ideational* meaning, which is expression of our ideas about the world; *textual* meaning for the organisation of the meaning into coherent texts and units; and *interpersonal meaning* which is the enactment of social relations.

Halliday's three metafunctions are realised through spatial semiotics (e.g. Martin & Stenglin, 2007; Stenglin, 2009, 2010). Kress et al. (2005, p. 26), for instance, propose that ideational meanings in classroom spaces are realised through the interaction of three factors, namely (1) the teacher's movement itself, (2) the meaning of the space in which the teacher moves, and (3) how and where the students may move. For example, they describe a teacher's slow and deliberate movement as 'invigilating' which they term 'a patrol'. 'Pedagogic space' in the classroom is also constantly reconfigured, 'indicated by the placement of the teacher's desk in relation to the rows of tables; and produced by the transforming action of the teacher in his pacing'. With respect to textual meanings, Kendon (2010) explains that the physical site allows for people to organise themselves spatially according to the nature of their interaction. Lastly, Hall (1966), Ravelli and Stenglin (2008) and Matthiessen (2010) explain that material distance realises 'semiotic distance' which establishes interpersonal social relations. In our case, it is the relationship between the teacher and students in the classroom.

In terms of social distance, Hall's (1966) seminal work on proxemics led to the development of the 'distance sets' hypothesis. Hall (1996) defines four general sets of space – namely Public, Social-Consultative, Causal-Personal and Intimate – according to the typical distances in which they occur, as well as the extent of visibility and contact experienced by the other party (see Figure 1). In the context of the classroom, most communication takes place within the Social-Consultative Space, which construes the appropriate formal and professional relationship between teacher and students.

Given that the Social-Consultative Space is a generalised space for most teacher–students interaction, it is useful to develop sub-divisions within this space to more adequately investigate the differences in ideational, interpersonal and textual
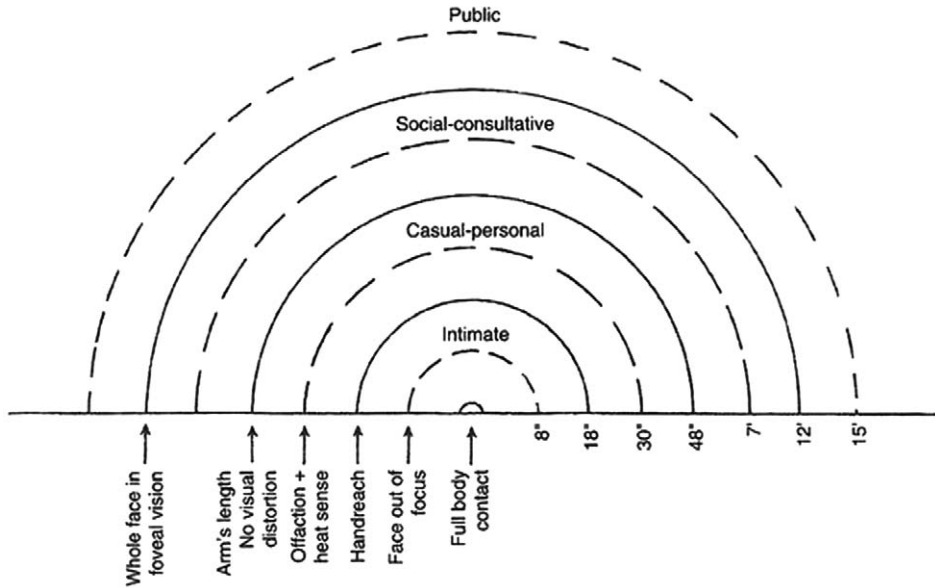
Figure 1. Hall's (1966) distance sets (reproduced from Matthiessen, 2010, p. 27).

meanings in different parts of the Social-Consultative Space in the classroom. A rudimentary segmentation and preliminary theorisation of the different types of space in pedagogic discourse located within Hall's Social-Consultative Space is proposed and applied in this study. This extension of Hall's (1966) foundational work on proxemics is undertaken with the view to explore how spatial semiotics can contribute to a multimodal classroom discourse approach to pedagogy.

2.   Types of space in the classroom

Four different types of space in the classroom which are situated within Hall's Social-Consultative Space are proposed. They are namely (1) Authoritative Space, (2) Personal Space, (3) Supervisory Space and (4) Interactional Space. The proposal is based on the view that the semantics of classroom space are regularised through conventional stages in the development of a lesson. These lesson stages are more accurately described as lesson 'microgenres' by O'Halloran (2004), following Christie's (2005) Curriculum Genre Theory. These lesson microgenres (e.g. 'pre-lesson', 'preliminary', 'main lesson', 'end of lesson' and 'interpolated disruptive' microgenres) are instantiated through particular selections in the co-deployment of semiotic resources.

The space in front of the teacher's desk and in the front centre of the classroom can be described as the *Authoritative Space* where the teacher is positioned to conduct formal teaching as well as to provide instructions to facilitate the lesson. The semantics of this space can be observed from the teacher's return to this position, for example, to continue with the lesson or to provide further instructions. The Authoritative Space is located at the outer limit of the Social-Consultative Space as it is usually furthest from the students in terms of proximity. Following from Matthiessen's (2010) discussion of Hall's (1966) distance sets, the material distance

in the Authoritative Space constructs a formal tenor in the relationship between teacher and students.

There are also occasions where the teacher moves between the rows of the students' desk without offering consultation to the student(s) but primarily for the purpose of supervision. The teacher may also pace alongside the rows of students' desks as well as up and down the side of the classroom transforming these sites into the *Supervisory Space*. This usually happens during student's activities when a task is set to the students to perform individually or in groups. This has been observed in English classrooms in the UK by Kress et al. (2005), who explain that the teacher 'patrols' in these classroom space so as to ensure compliance of the students to the task set.

The *Surveillance Space*, located within the Supervisory Space, is where extreme control and power are exerted implicitly through a sense of 'invisible' monitoring. For example, the teacher is positioned at the back of the classroom, often but not always, silently, watching the backs of the students as they go about their tasks. This forms a Panopticon (Foucault, 1977/1995) where control and power are exerted over the students by means of invisible surveillance. Foucault (1977/1995) explains, 'the major effect of the Panopticon: to induce in the inmate a state of conscious and permanent visibility that assures the automatic functioning of power' (1977/1995, p. 195). The positioning of the teacher at the back of the classroom follows this principle where power is exercised through surveillance from a vantage point, constructing a sense of 'permanent visibility'. In this manner, meanings of power and authority are constructed and asserted through the positioning of the teacher in relation to the students.

The *Interactional Space* is located along the cline of Social-Consultative Space but inclined towards the Causal-Personal Space (see Figure 1). *The Interactional Space is* realised by the teacher standing alongside the students' desk or between the rows of students' desks. This usually occurs during student activities where students are working on a set task individually or in groups. The closer proximity between the teacher and the student(s) facilitates interaction and reduces interpersonal distance. The interaction usually takes the form of personal consultation where the teacher offers guidance on the task set or clarification on an earlier instruction. In some instances, there might be occasional banter between the teacher and students as well. While the Surveillance Space and Interactional Spaces have been observed in other lessons, they are, however, not actively used by the teachers in the two lessons investigated for this study.

The same physical space in the classroom can also be reconfigured by the nature of activities and interactions into a new semiotic space with a different set of meanings. This happens when the lesson microgenre changes according to configurations of semiotic selections. In this regard, the spatial semiotics of the space changes, according to the nature of the activity which is taking place.

As such, physical spaces in the classroom may not always only serve a single function. They are constantly redefined by the nature of the lesson activities or the lesson microgenres. For instance, the space behind the teacher's desk can be described as the *Personal Space* where the teacher packs and prepares for the next stage of the lesson. However, the same space can be transformed into an Authoritative Space when she starts to teach from behind the teacher's desk. This reconfiguration of the space is observed when the teacher points and teaches with the visualiser located on the teacher's desk. Hence, the space behind the desk can be

transformed from a Personal Space into an Authoritative Space, depending on the nature of the lesson activity as constructed by the configuration of semiotic selections.

The classroom space theorised in this study is typical of a traditional classroom, where the teacher's performance space is located at the front of the classroom and the students are seated in rows facing that space. However, the meanings ascribed to spaces in the classroom are dependent on the layout of the furniture in the room. In this study, the meanings given to the spaces are based on a specific layout typical of traditional classrooms.

3.   Background of study

This paper is part of a larger project (Lim, 2011) that investigates the meanings made in the multimodal pedagogic discourse, specifically in language, gesture, positioning and movement in the General Paper classroom in Singapore. The General Paper is a unique subject in the sense that it does not have a fixed set of core curricular knowledge to be transmitted. This is unlike, for example, Science, History or Geography, where there is a pre-determined body of knowledge for each level. Instead, the assessment of the General Paper in the Singapore-Cambridge General Certificate of Education (Advanced Level) tests the student's ability to answer questions based on unseen passage(s), write an expository essay on a topic and develop his or her arguments based on general knowledge and experience. Bryer (2008, pp. 3–4) surmises that the General Paper aims to foster

> a critical awareness of both continuity and change in the human experience. Students are encouraged to broaden their global outlook, but at the same time remain mindful of the historical and social experience they share with others both within Singapore and the region and beyond.

The class is conducted at the pre-university level in a Junior College. The video data is collected from two teachers, with pseudonyms Adeline and Wilson, as they conduct a General Paper lesson on the topic of 'Application Question Structure'. The Application Question requires a personal response to specific ideas from the passage. In making such a response, the students are expected to 'synthesise information and respond to concepts or ideas conveyed in the text in a task derived from the text' (Bryer, 2008, p. 4). Students are also required to

> consider viewpoints or issues that have been presented with and apply them to the context of their country. In expressing their own beliefs and opinions, they are expected to make close reference to the authorial viewpoints and/or how the issues dealt with in the text relate to their own country. (Bryer, 2008, p. 5)

The two lessons are chosen as there are several similarities between them, which make them comparable in terms of data analysis. Firstly, both lessons were for Year 2 (Final Year) classes which comprise students (aged 17) of the same mixed-ability profile. Secondly, the timing of the lessons was identical as both lessons were at the same curriculum genre of a revision lesson, the final lesson before the students sit for their preliminary examinations. Thirdly, both lessons were on the same topic where the focus is the production of a good answer to the Application Question. Lastly, the students in each class have spent approximately 20 months with the same teacher, hence there is a sense of continuity and familiarity with the teacher.

While there are compelling similarities between the two lessons which serve as controls, what makes the two lessons interesting for study are the significant differences in the profiles of the two teachers, which represent the variables in this study. Wilson and Adeline differ in gender and also in teaching experience. Wilson is a novice male teacher with less than two years of experience in teaching the General Paper. Adeline is an experienced female teacher who has taught the General Paper for more than 10 years. She also holds leadership appointment in the English Department and is intimately involved in the planning of the curriculum and the Scheme of Work for the teachers. Despite the similarities in the lesson stages, espoused objectives and materials, the following multimodal analysis reveals very different use of semiotic resources by the two teachers. Through the orchestration of semiotic resources, unique classroom experiences are constructed through the multimodal pedagogic discourse in each lesson.

Rather than relating the findings to the professional and personal attributes of the teachers, this study focuses on examining and comparing the different set of meanings constructed in the teacher's use of space through the positioning and movement in the classroom as well as how these meanings are contextualised with the co-deployment of the other semiotic resources realising the teacher's pedagogy. This is undertaken with a view to developing a theoretical and analytical approach which may be applied to a larger corpus of lessons. While the differences in the teachers' profiles are marked, generalisations cannot be extended to the gender class or level of experience which Wilson and Adeline inadvertently represent. Neither can the observations of the pedagogical styles and strategies be broadly extended as consistent features across all their lessons. This study is limited in scope as it analyses only one lesson from each teacher.

4. Data analysis and methodology

In light of the theoretical propositions made in the preceding sections, the aim of this paper is to apply the proposed conceptions on two teachers' use of space in a similar lesson. An approach in the visualisation of the use of space in the classroom through the use of state transitions figures is also explored.

In this study, the use of classroom space through the positioning and the movement of the teacher are coded at a one-second intervals, along a set of 40 parameters using Microsoft Office Excel 2007. The rationale for coding at an intensive one-second interval is to record any changes in the teacher's positioning and movement during the lesson in as detailed and specific a manner as possible. The data for the two lessons consist a total of 11,658 rows, each representing one second, across the 40 parameters. Wilson's lesson is 6035 seconds (≈100 minutes) and Adeline's lesson is 5633 seconds (≈93 minutes) in duration.

The analysis of the data in the spreadsheet is undertaken through the use of a Pivot table with the results displayed graphically on Pivot charts using Microsoft Office Excel 2007. The frequency of certain semiotic choices and the resultant trends and patterns can be observed from the graphs, thereby allowing comparisons to be made (Figure 2).

Cytoscape software is also used to visualise the data in terms of networked graphs consisting of nodes and directed edges (see Figure 3). Developed by Shannon et al. (2003), Cytoscape, is an open source bioinformatics software platform for visualising molecular interaction networks and integrating these interactions with
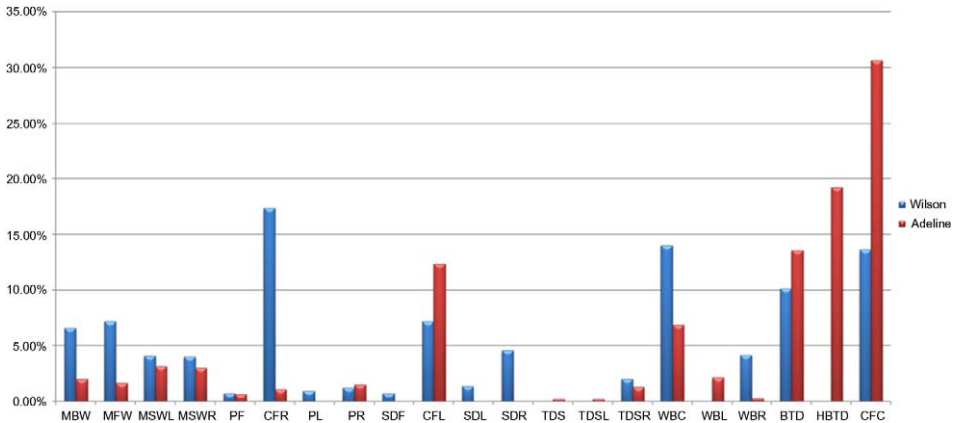
Figure 2. Use of space. For key, see Figure 3.

gene expression profiles and other state data. However, its application is not confined within the scientific disciplines. Network graphs have also been used in the social sciences in fields ranging from education, sociology to political science. For example, Bender-deMoll and McFarland (2006) explore the affordances of dynamic network visualisations as a methodological tool and propose a framework for visualising social networks using data from a high school economics classroom. Likewise, Butts and Cross (2009) use network graphs to visualise global patterns of stability and change within blogs during the US Presidential election campaign, and Dekker (2005) applies network graphs to analyse conceptual distance between people as an indication of the nature of communication within an organisation. In the present study, network graphs are used to explore spatial patterns of positioning and movement in the classroom.

Cytoscape allows for the visualisation of the two teachers' use of space in the classroom in Figure 3 through the mapping of positioning and movement according to the following dimensions:

(1) *Static or dynamic movement*: Static positions are represented as circles and movement and pacing are represented as rectangles.
(2) *Correspondence to the actual location in the classroom*: The nodes are positioned in accordance to the layout of the classroom.
(3) *Frequency of occurrence*: The larger size of the node, the more frequent the space is selected.
(4) *Directionality of movement from one space to another*: The arrows represent the directionality of the movement, and the size and tone of the arrows represent the frequency of the same directional movement.

The visualisations of Adeline's and Wilsons's use of space in Figure 4 are interpreted according to their positioning and movement in the classroom.

An investigation of the respective spatial pedagogies of Wilson and Adeline illustrate how the conceptions proposed in this paper yield insights into the ways which meanings are made in their lessons. The following sections describe their use of space through positioning and movement as well as compare the contrasting meanings made in their semiotic selections.

A
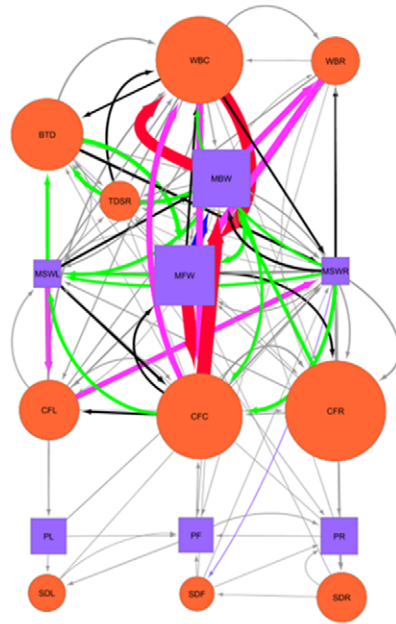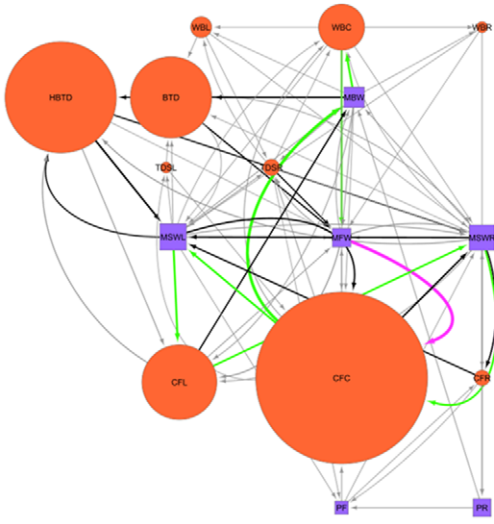
B

LEGEND

BTD	Behind Teacher's Desk	HBTD	Half Behind Teacher's Desk
TDSL	Teacher's Desk Side Left	TDSR	Teacher's Desk Side Right
CFL	Classroom Front Left	CFR	Classroom Front Right
CFC	Classroom Front Centre	WBC	Whiteboard Centre
WBL	Whiteboard Left	WBR	Whiteboard Right
SDL	Students' Desk Left	SDR	Students' Desk Right
SDF	Students' Desk Front		
MFW	Move Forward	MBW	Move Backward
MSWL	Move Sideway Left	MSWR	Move Sideway Right
PL	Pace Left	PR	Pace Right
PF	Pace Front		

Figure 3.   Adeline's (left) and Wilson's (right) use of space.

4.1.   *Analysis of positioning*

As both lessons take place in the same classroom, the spatial layout is identical. The two graphs generated by Cytoscape, however, reveal telling differences in the use of space through the positioning and movement of the teachers, and by extension their pedagogy.

In the two lessons investigated, both Wilson and Adeline spend most of the time in the Authoritative Spaces in the classroom (Figure 4). As discussed earlier, the front of the classroom is the classical Authoritative Space where the teacher instructs and teaches. Classroom Front Centre (CFC), the space right in front of the students, is associated with formality, given the power relations which are established through spatial distance. Adeline spends a substantial portion of the lesson time (≈30%) in CFC. Comparatively, Wilson spends much significantly less time (≈13%) in that same position. While Adeline also has a slight tendency to stand on

Figure 4.   Classroom Front Centre.

the Classroom Front Left (CFL), she spends substantially most of the time in the CFC, construing a professional relationship with the students in the Authoritative Space.

Perhaps to mitigate the power conveyed through occupying the CFC, teachers might stand off-centre to the left or right. While still in the Authoritative Space, they play down the authority by positioning themselves off-centre. From the graph of Wilson's lesson, it seems that Wilson tends to stand more often in Classroom Front Right (CFR) (≈18%) compared to CFC (≈13%). His proclivity for standing off-centre to the right in the classroom (Figure 5) contrasts with Adeline's use of CFC.

As previously mentioned, the space behind the teacher's desk is typically construed as the Personal Space. This is where the teacher organises materials and prepares for the next part of the lesson (Figure 6). However, as discussed earlier, spaces are reconfigurable according to the functions they serve. To varying degrees, the use of traditional and technological teaching resources also defines, and to some extent, constrains the position and movement of the teacher. This observation is consistent with Jewitt's (2011) study of the use of Interactive White Boards (IWB) in the classroom, where the tendency is for the teachers to limit their movement and stand around the IWB.

In the two lessons observed, both teachers inhabit the space around the teacher's desk regularly, for practical reasons, namely to use the visualiser and operate the laptop. Wilson spends a reasonable amount of time Behind the Teacher's Desk (BTD) (≈11%). The main reason he enters that space is to operate the laptop, but he almost never teaches from that position. Adeline, on the other hand, spends a significant part of the lesson teaching BTD (≈13%) and Half-Behind the Teacher's Desk (HBTD) (≈19%). Adeline's use of the visualiser to display her notes confines her to this space and reconfigures the Personal Space into an Authoritative Space. She tends to stand behind the teacher's desk and lecture from that position, using the desk like a podium (Figure 7). She spends a significant amount of time there, including Teacher's Desk Side Left (TDSL) and Right (TDSR) (≈34%). By convert-
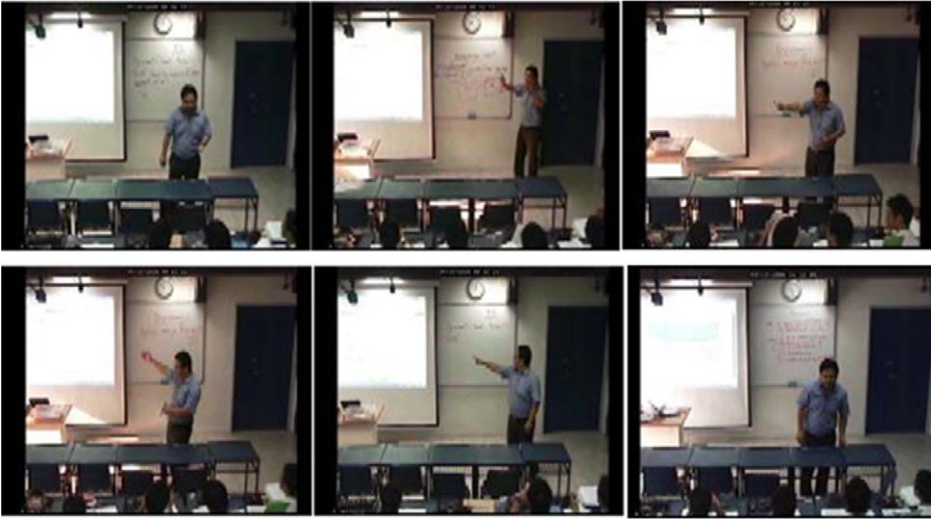
Figure 5.   Off-Centre.

Figure 6.   Around teacher's desk as Personal Space.

ing BTD into an Authoritative Space, Adeline's spatial selections again indicate a more formal relationship and a sense of professional distance with her students.

The time that Adeline and Wilson spend in the Authoritative Spaces, including movement within these spaces, is 96 and 86%, respectively. This is a regular phenomenon in most classrooms where the didactic nature of instruction is foregrounded. However, it must be noted that the power and authority of the teacher is mitigated somewhat through positioning away from the front centre of the classroom. Wilson achieves this by standing slightly off-centre. Adeline achieves this to some extent by standing BTD and HBTD which is located within the left front area of the classroom. Arguably though, teaching BTD with the desk as a quasi podium (as Adeline does), constructs a sense of formality and professional distance between teacher and students as well.

Figure 7. Around teacher's desk as Authoritative Space.

4.2. *Analysis of movement*

Adeline is observed to move forward and backward at times from Classroom Front Centre (CFC) to Whiteboard Centre (WC) during the lesson (Figure 3). The usual reason for this movement is to move backward to use the whiteboard and to move forward to emphasise a teaching point to the student. In contrast, Wilson tends to make even more of such movements, adopting this pedagogic strategy significantly more often than Adeline. In comparison to Wilson's style, Adeline displays less movement from space to space. She prefers to deliver the lesson mostly from a static position.

The differences in movement are evident from the graph of Adeline's movements which is much simpler than Wilson's graph in Figure 3. That is, there are fewer arrows and an absence of blue and red arrows in Adeline's graph which suggests a low frequency of movement. On the other hand, the complexity and density of arrows and the presence of blue and red arrows in Wilson's graph reflects his tendency to move around in the classroom. Wilson spends about 21% of the time in movement whereas Adeline spends under 10% of the time moving around in the classroom.

During student activities, the teacher may also choose to Pace at the Front, Left and Right (PF, PL, PR) of the classroom. This has been earlier described as the Supervisory Space where the teacher invigilates the students' activities and conducts a 'patrol' around the fringes of the classroom.

Pacing in the Supervisory Space is observed 4% of the time in Adeline's lesson (Figure 8) and 8% of the time in Wilson's lesson (Figure 9). This is consistent with Wilson's pedagogy where he uses rapid movement and pacing regularly across the different spaces. Furthermore, Wilson's pacing around the students, in a sense, encircling them, assumes functions of control and compliance, particularly, if the pacing is coupled with other semiotic resources, like gesture or language, that signify dominance and authority.

Figure 8.   Adeline's pacing.
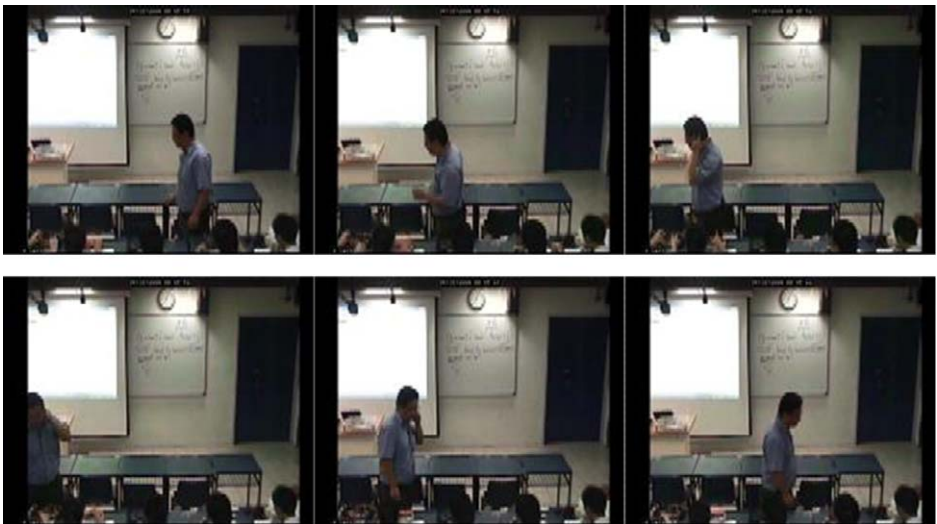
Figure 9.   Wilson's pacing.

Even as Wilson is able to convey a sense of energy and dynamism in the lesson through his penchant for pacing, there is also a risk that the high frequency of movement could potentially draw attention away from the meanings he makes with the other semiotic resources, such as language. This is particularly so if the meanings made from his use of space and movement and language are divergent, rather convergent, in nature. The specific implications of a high degree of random movement in the classroom on effective teaching and learning of these movements invite further investigation beyond the scope of this paper.

5. Structured informality in the classroom

As proposed earlier, in terms of the use of space in the classroom, Wilson's choice to stand off-centre constructs a less formal interpersonal relationship with the students compared to Adeline. The effectiveness of this pedagogical strategy must be interpreted with respect to the use of the other semiotic resources and the logogenesis of the lesson. Preliminary findings of the meanings made in the other semiotic resources investigated in the larger project (Lim, 2011), but not discussed in this paper, suggest that while a sense of informality is constructed through the use of space and movement, Wilson tends to be more authoritative and displays more explicit power through language and gestural communication. While his positioning in the classroom suggests a sense of casualness, the control exerted through his pacing and use of language and gesture recontextualises the meanings he makes through his use of space.

In addition, the organisation of Wilson's lesson, in the unfolding of the lesson stages, is also less structured. His display of power and authority through language and gesture might perhaps be negatively construed as attempts to compensate and manage the disorder ensuing from his use of space and the looser structure observed in the lesson. Coupled with a high degree of random movement in the classroom and the arbitrary sequence of lesson microgenres, Wilson's off-centre positioning leads to a general sense of ambivalence in his pedagogy. In an unfortunate parallel, Wilson's spatial pedagogy resonates with Kress et al.'s (2005, p. 26) description of another teacher whose 'pedagogy realized spatially and in the teacher's movement is multiply ambivalent, and contradictory'.

On the other hand, Adeline constructs a formal and professional interpersonal relationship with the students through the regular use of Authoritative Spaces with minimal distracting movements. Again, the meanings made must be interpreted together with the other semiotic resources and the logogenesis of the lesson. Analysis of the unfolding of the lesson (Lim, 2011) suggests that her lesson unfolds in an orderly and progressive fashion with a clear structure which is reinforced by her use of space and movement. However, a certain extent of informality is injected through interpersonal meanings made through language, such as the high use of modality and adjuncts to construct solidarity with the students, as well as through gesture, such as the use of indexical gestures to indicate openness and possibilities.

Savery and Duffy (1995), building on Vygotsky's (1978) social constructivist approach to pedagogy, propose that a teacher should structure the learning experience just enough to make sure that the students get clear guidance and parameters within which to achieve the learning objectives. However, the learning experience should be open and free enough to allow for the students to discover, enjoy, interact and arrive at their own understanding and construction of knowledge.

Structured informality is constructed in the classroom when the teacher projects a range of interpersonal meanings which is juxtaposed against an organised presentation of ideational and textual meanings in the knowledge structure of the lesson. Operating intersemiotically, the different semiotic systems in Adeline's lesson construct this sense of structured informality, where it is arguably more conducive for effective teaching and learning in a classroom with adolescent students. Through the orchestration of semiotic resources, Adeline achieves her lesson objectives, encourages students' participation and brings about overall enjoyment of her lesson, as signalled by the frequent occurrences of students' laughter. A further indicator of

Adeline's effectiveness is evident in her students' eventual stronger performance in the examinations.

6. Implications and limitations of study

This study extends Hall's (1966) work on proxemics to multimodal classroom discourse analysis as well as Matthiessen's (2010) thesis that material distance realises socio-semiotic meanings. Hall's (1966) groundbreaking work on distance sets and the formulation of Socio-consultative Space is applied to the classroom space where the teacher is positioned in relation with the students. In this study, this space is further sub-classified into Authoritative, Supervisory, Interactional and Personal spaces. These spaces are negotiated statically through the teacher's positioning and dynamically through the teacher's movement and pacing in the classroom. The teacher's semiotic selections in positioning, movement and pacing realise what is described in this paper as a 'spatial pedagogy', through which the lesson experience for the students is, in part, derived.

The paper also proposes the notion of 'structured informality' stemming from the observations from Wilson's and Adeline's lessons. A specific combination of semiotic choices made in the classroom is coordinated to construct a conducive learning environment for students where explicit display of power dynamics between the teacher and students are managed. Through specific semiotic choices which function to maintain a didactic structure for learning, other semiotic choices are made to mitigate the hierarchical distance between the teacher and students. This achieves a degree of rapport building and solidarity between teacher and students uncommon in more traditional authoritative classrooms.

The concept of structured informality in the classroom can be helpful for teachers to construct a non-threatening learning environment where students feel comfortable enough to respond and speak up, within a structured progression of the lesson which is conducive for effective teaching and learning. This finding may be particularly pertinent for classrooms, such as those observed in this particular school, where the adolescent students are generally more reticent and reluctant to verbalise their opinions and participate in the lesson. Nonetheless, although it may seem to have worked well in the lesson studied, the effectiveness of structured informality in encouraging students' more active participation requires further research to be empirically verified and established as a useful concept for teaching and learning.

This study also explores the possibilities offered by interactive digital media in the annotation, visualisation and analysis of the multimodal data. Given that multimodal studies usually involves a large corpus of data and that a multimodal approach often involves time-intensive detailed data analysis across multiple dimensions and parameters, manual transcription alone without the aid of new media technologies is often not viable. As O'Halloran (2009, p. 113) explains, 'judging from the state-of-the-art in mathematics and the sciences at the present time, multimodal analysts from the social sciences appear to have much to gain by understanding and utilizing the expanded meaning potential afforded by computer technology to further multimodal analysis theory and practice'. The use of Cytoscape in this project, while demonstrating the usefulness of interactive digital media in multimodal discourse analysis, also accentuates the compelling need for an integrative software program that is especially designed for multimodal studies.

In addition, a multimodal approach to classroom analysis has implications for teaching and learning as well as teacher training and development. A key impetus for multimodal research in education, such as researching spatial pedagogy, is that it paves the way to a more focused and intentional deployment of the range of semiotic resources for effective teaching and learning. Individuals are social agents who make meanings through the use of semiotic resources. The choices, while motivated, may not always be fully explicit or conscious. Sensitisation to the range of semiotic resources available to the teacher in the classroom can encourage a more congruent and effective co-deployment of the resources at hand. Making explicit the multimodal choices the teacher has will enable more motivated selections to enhance the teaching and learning experience in the classroom, effectively reducing unintended divergent, sometimes conflicting, and possibly confusing meanings. From the perspective of multimodal classroom discourse, the nonverbal is often as powerful as the verbal. Recognising the multimodal nature of teaching and learning can offer teachers the promise and potential of critical reflection on their use of embodied action, along with other semiotic resources, to critique and (re) design these aspects of their professional practice.

Research in multimodal literacy can also assist with the development of effective pedagogical approaches, strategies and models in the classroom. Teachers, curriculum specialists and policymakers can assimilate and adopt the knowledge and understanding of the significance and centrality of multimodality in contemporary literacy practices. As Jewitt (2008a, p. 262) notes, 'how teachers and students use gaze, body posture, and the distribution of space and resources produces silent discourses in the classroom that affect literacy'. Kress et al.'s (2005, p. 170) suggestion of an 'in-service programme' to help teachers use the various semiotic resources at their disposal more effectively and intentionally in teaching and learning can be adopted as part of teacher training.

Furthermore, this study suggests a certain inadequacy of classroom research which involves language resources only. Unsworth (2006, p. 55) asserts that 'it is now widely accepted that literacy and literacy pedagogy can no longer be confined to the realm of language alone'. This recognition has 'significant implications in terms of epistemology and research methodology' (Jewitt, 2008a, p. 245). What this implies is that a more adequate and holistic investigation into the understanding of the teaching and learning in the classroom would require consideration of the 'multimodal ensemble' (Kress & van Leeuwen, 2001) at work in any communicative event, by taking into account the 'non-verbal' along with the 'verbal' semiotic resources. Further explorations in the nature of multimodal resources in the classroom promises a less impoverished understanding of the pedagogic work by the teacher in the classroom.

There are obvious limitations in this study, given the constraints of time and space. The most apparent is that only the use of space though positioning and movement of the teacher is discussed in this paper. Other resources, such as language and gesture, while explored in the larger study (Lim, 2011), are not presented in this paper. In addition, there are also other semiotic resources at work such as intonation in language and facial expression that are not investigated. The teaching materials used in the lesson, such as the students notes, the teacher's writing on the whiteboard, the teacher's PowerPoint presentation and notes, and the video are not examined either, given the focus on spatial pedagogy. Notwithstanding this, as discussed earlier, it must be emphasised that semiotic resources operate integratively to

construct the multimodal lesson experience. It is therefore important to consider the interplay of meanings made in the complex network of semiotic choices. The scope of this study is limited as the data is based on two teachers and their 90–100-minute lessons. In part, this is attributed to the extent of delicacy and depth required in multimodal studies. This is also compounded by the size of any multimodal data corpus, the rigorous annotation and the detailed quantitative analysis required. As explained, the limited scope makes the generalisablity of the results to the profiles of the teacher based on gender or experience limited. However, the purpose of this paper is primarily exploratory in nature. Having discussed the theoretical conceptions exemplified through the two lessons, this paper invites introspection and consideration of how spatial pedagogy, co-deployed with the use of other semiotic resources, might construct very different lesson experiences for students which can either achieve or hinder effective learning in the classroom.

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