6 VISUAL DYNAMICAL ANALYSIS OF LEARNER INTERACTION

This chapter presents what is called *visual dynamical analysis* of learner interaction. This analysis builds on the dynamical perspective developed in chapter three, and is designed to take advantage of the visualisation of the data that was introduced in chapter five. The visual dynamical analysis covers the *first* in the series of four similar dialogue-writing activities (cf. section 4.5).

The purpose of the visual dynamical analysis is to identify patterns and phases in the visualisation of the learner interaction data. As such, this chapter responds to the first research question for the study, which is:

1. What patterns and phases of activity are detected through the visualisation of learner interaction?

The chapter begins with a section introducing the procedure for identifying patterns and phases in the visualised data. Three sections follow this, each one corresponding to the visual dynamical analysis of one of the three participant pairs' learner interaction. The chapter concludes with a summary and discussion of the patterns and phases identified in the data.

6.1 Identifying Patterns and Phases

An exploratory stage of the visual analysis established a procedure for identifying patterns and phases in the visualised learner interaction data. The need for such a procedure arose from the fact that the visualisation included a number of different activity strands and threads, and these formed a complicated web of relationships.

A first observation made by the exploratory analysis was that there were *time-ordered distributions* in the visualisation of different activity strands and threads. That is, different parts of, or periods of time in, the visualisations were associated with different features, or different activity. Moreover, these time-ordered distributions appeared to make sense in relation to the timescale of the dialogue-writing activity. The exploratory analysis also yielded additional features that did not appear distributed across the timescale of the dialogue-writing activity. Furthermore, in the writing and attention strands, these features seemed to be of a longer duration than those in the language code and regulative threads. Hence, these additional features offered a clue to what might be the difference between *activity strands* and *activity threads*.

In order to formalise the above observation, the *temporal modality* of each activity strand and thread, i.e., how features on each strand or thread are organised across time, was

determined. In simplest possible terms, temporal modality was defined by the *duration* of features that could be observed in the visualisation of an activity strand or thread. In reality, however, the temporal modality of a strand or thread was defined in relation to the temporal modality of other strands and threads. Hence, this part of the exploratory analysis involved displaying the visualisations of every possible combination of two activity strands, two threads, as well as strands and threads, alongside each other (a step which was helped by the modular approach to visualisation, cf. section 5.2). Displaying such combinations of visualisations showed that features in the writing strand tended to be of the longest duration, followed by features in the attention strand, and finally, features in the language code and regulative threads. This hierarchy of temporal modalities is represented in figure 6.1. In this figure, the timescale of the dialogue-writing activity is identified as the longest temporal modality. This is followed by the writing strand, the attention strand, and at the bottom the language code and regulative threads. The figure also includes reduced-size pictures of sample basic visualisations of the activity strands and threads, as they will appear in the visual dynamical analysis.

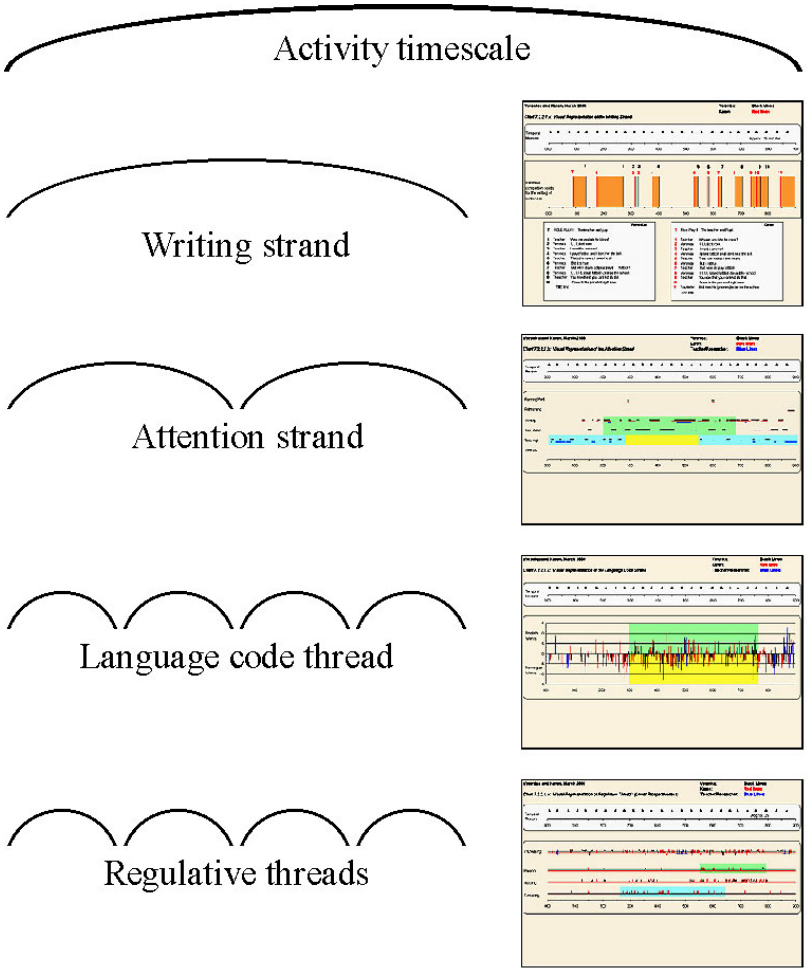


Figure 6.1: Hierarchy of temporal modalities

The exploratory analysis also revealed that features in the writing strand, which were of the longest duration, seemed to act as a *micro-context* for features in the attention strand, the language code thread and the regulative threads. That is, the composition intervals visualised in the writing strand (cf. sub-section 5.3.1) appeared to provide a context for making sense of features observed in the attention strand and the two activity threads. Moreover, features in the attention strand also appeared to act as potential micro-contexts for what could be observed in the language code and regulative threads. By contrast, features in the visualisation of the language code and regulative threads could not be seen to act as such micro-contexts.

In the absence of any concrete examples of activity strands in the literature (cf. discussion in section 3.3), the above observation, that features in the writing and attention strands appeared to act as micro-contexts, and that features in the language code and regulative threads did not act as micro-contexts, was used as the defining difference between *activity strands* and *activity threads* in the research. Hence, the labelling of the different perspectives on the learner interaction as either activity strands or activity threads was an outcome of the visual dynamical analysis. Nevertheless, the full and final labels, including the distinction between activity strands and activity threads, were introduced in chapter five. As was pointed out in sub-section 5.2.1, where the activity strands and threads used in the research were first presented, this was to facilitate the discussion of the identification, coding and visualisation of each activity strand and thread (cf. section 5.3), and to allow consistency in the naming of the strands and threads across the thesis.

Given this distinction between activity strands and activity threads, the exploratory analysis seemed to indicate that identifying micro-contexts in the writing and attention strands could be a starting point for establishing relationships between strands and threads. That is, the micro-contexts could be used to establish patterns in the learner interaction data. Furthermore, the earlier observation, that there were time-ordered distributions, in single activity strands and threads, across the timescale of the dialogue-writing activity, as well as the possibility that patterns showed similar time-ordered distributions, seemed a useful starting point for identifying phases in the learner interaction data.

The insights gained from the exploratory analysis led to the following three-stage procedure for identifying patterns and phases in the visualised learner interaction data.

1. The first stage of the visual dynamical analysis examines the visualisations of single activity strands and threads. The outcome of this visual examination is an inventory of time-ordered distributions, in single activity strands and threads, across the timescale of the dialogue-writing activity. This first stage also notes any other features revealed by the visualisations. Finally, any *recurrent features* in the writing and attention strands are

identified as potential *micro-contexts* for establishing relationships with other activity strands and threads.

2. The second stage of the visual dynamical analysis requires visualising combinations of activity strands and threads together. This visual examination uses the potential micro-contexts in the writing and attention strands, identified in the first stage of the analysis, to establish relationships between activity strands and threads. Such relationships are referred to as *patterns* in the learner interaction. In addition, any time-ordered distributions in these patterns, across the timescale of the dialogue-writing activity, are added to the inventory of time-ordered distributions in single activity strands and threads.
3. Finally, in the third stage of the visual dynamical analysis, all the time-ordered distributions, in single activity strands and threads, and in patterns, across the timescale of the dialogue-writing activity, are summarised. This summary of time-ordered distributions is used to synthesise phases in the learner interaction.

The visual dynamical analyses of all the three cases of learner interaction in this chapter follow this three-stage procedure for identifying patterns and phases.

6.2 Patterns and Phases of Learner Interaction: Case 1

This section contains the visual dynamical analysis of patterns and phases in the learner interaction of Veronica and Karen's first dialogue-writing activity. The section contains three sub-sections, each of which corresponds to one of the three stages in the procedure outlined in the previous section.

6.2.1 Features in Single Activity Strands and Threads

In this sub-section, time-ordered distributions, and any other features, are identified in the basic visualisation of each activity strand and thread of Veronica and Karen's learner interaction. Moreover, recurrent features in the writing and attention strands, which are the first to be examined, are identified as potential micro-contexts to be used in the sub-sequent analysis of relationships between activity strands and threads (cf. sub-section 6.2.2).

Writing Strand: Figure 6.2 (see next page) shows the basic visualisation of the writing strand in Veronica and Karen's first dialogue-writing activity. In this figure, vertical **black** lines represent points in time when **Veronica** completes writing turns in the role-play dialogue, and **red** vertical lines represent **Karen**'s corresponding writing activity. Which particular sentence is completed can be determined by cross-referencing the numbers (or the letter T, which

INSERT FIGURE 6.2

refers to the writing of the title), of the appropriate colour, with the numbered turns in the text boxes in the lower part of the figure. Hence, the text boxes are representative of the separate dialogues Veronica and Karen wrote in this role-play task (cf. sub-sections 5.3.1 and 5.3.2). Note also that figure 6.2 includes a time measure, as does all the basic visualisations of the different activity strands and threads (cf. section 5.2.4). The time measure shows that the dialogue-writing activity was completed in *about* 25 minutes.

Without visual examination we can establish that the pupils wrote slightly different dialogues. For example, Karen wrote one more turn than Veronica did (cf. sentence 10 in the textboxes in figure 6.2). By contrast, a visual examination of the writing strand allows a richer description of the pupils' writing activity. Figure 6.2 clearly reveals that there are frequent 'lags' between the points in time when Veronica and Karen finish writing their individual, but essentially same, dialogue turns. These lags are highlighted in yellow in the figure. An example of such a lag is Karen and Veronica's respective completion points for dialogue turn 1 ('Teacher: Why are you late for klass/class?'). By consulting the time measure one can see that the lag between the pupils completing this same turn is almost 3 minutes. That is, the length (duration) of the yellow highlighted area in the horizontal direction is equal to the space between almost three triangles in the time measure (also highlighted in yellow).

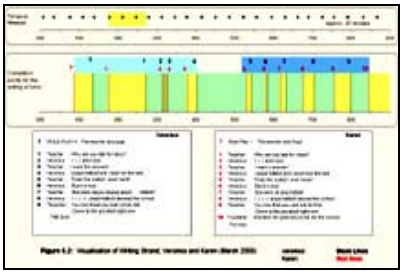
A further observation revealed by the visualisation is that the lags in the pupils' writing vary across the activity. At the beginning of the activity there are two particularly long lags (turn numbers T (title) and 1). By contrast, in the middle of the task the two pupils' writing seems more 'synchronised'. This is the case for turns 2, 3, 5, 6 and 7, and to some extent also turn 4. Finally, there are longer lags again towards the end of the activity, including turns 8 and 9. In other words, there is a transition from asynchrony, to synchrony, and back to asynchrony in the pupils' writing of dialogue turns. It is also clear that Karen writes one turn more than Veronica does (turn 10; the period after turn 10 is partially highlighted in yellow).

Another observation that can be made by visually examining the writing strand is that more of the turns are written in the latter half of the activity. This observation is strengthened by the fact that the title ('Role Play!!! The teacher and the pupil/Pupil') and turn 1 ('Teacher: Why are you late for klass/class?') were suggested by the task sheet for the activity (cf. appendix B). That is, only three novel turns (turns 2 through 4) were written in the first half of the activity (highlighted in light blue), and twice as many novel turns (turns 5 through 10) were written in the last half of the activity (highlighted in dark blue).

The above observations describe three time-ordered distributions across the timescale of the dialogue-writing activity. Table 6.1 summarises these time-ordered distributions. The table makes use of the same colours as used in figure 6.2. For example, in the beginning of the dialogue-writing activity there is more asynchrony in the pupils' writing. In figure 6.2, this asynchrony is marked by highlighting the asynchronous parts of composition intervals in

yellow (cf. also the reduced-size picture to the left of table 6.1). Since there is more asynchrony at the beginning and at the end of the dialogue-writing activity, the yellow colour is used to represent the asynchronous part of the time-ordered distribution in the writing strand in table 6.1. Similarly, the synchronous parts of the composition intervals were highlighted in green in figure 6.2. Since there is more synchrony in the middle part of the dialogue-writing activity, this green colour is used to signify synchrony in the pupils' writing in the middle part of the activity in table 6.1. In the case of the light and dark blue highlighting, the 'transition' from figure 6.2 to table 6.1 is more straightforward. That is, this highlighting corresponds to the same periods of time in both the basic visualisation of the writing strand in figure 6.2, and the time-ordered distributions indicated in table 6.1. Later summaries of time-ordered distributions in other activity strands and threads apply the same principles in their use of highlighting, as is the case in figure 6.2 and table 6.1.

Table 6.1: Distributions in writing strand; Veronica and Karen

Writing strand	< Dialogue-writing activity >		
	Beginning	Middle	End
 (Cf. figure 6.2)	Asynchrony in pupils' writing	Synchrony in pupils' writing	Asynchrony in pupils' writing
	Fewer turns written		More turns written
	Veronica and Karen write equally many turns		Karen writes one more turn
	First half		Last half

The visualisation of the writing strand points to two recurring features that are potential micro-contexts for understanding features in the attention strand, the language code thread and the regulative threads. The first of these is the synchronous parts of the composition intervals, where the two pupils are writing a turn *together*, highlighted in green in the visualisation of the writing strand (cf. figure 6.2). The other one is the asynchronous parts of the composition intervals, where one pupil is finished, but the other is still writing a turn, highlighted in yellow in the visualisation of the writing strand (cf. figure 6.2). It is also possible that complete composition intervals could be micro-contexts. That is, the combination of a synchronous and an asynchronous interval, or a green highlighted interval plus a yellow highlighted interval in the visualisation of the writing strand in figure 6.2. The

possibility that these recurrent features function as micro-contexts for relationships between activity strands and threads will be explored in the next sub-section (cf. sub-section 6.2.2).

Attention Strand: Six different categories of foci of attention were identified in the learner interaction data. These were: 1) off-task topics, 2) task management, 3) generating content for the dialogue, 4) writing the dialogue, 5) rehearsing the dialogue, and 6) planning the performance of the dialogue. The identification of each of these was discussed in detail in chapter five (cf. sub-section 5.3.3).

Table 6.2 is a numerical description of Veronica and Karen's focus of attention in the dialogue-writing activity (as measured by the number of lines of transcription coded for a focus of attention; cf. sub-section 5.3.3). The table shows that 52 percent of the time pupils' focus of attention is on writing, between 34 and 36 percent of the time it is focus on content, and between 11 and 14 percent is on task management. In addition, the pupils spend virtually no time rehearsing, planning the anticipated performance, or talking about off-task topics.

Table 6.2: Numerical description of attention strand: Veronica and Karen

	Veronica		Karen	
Focus of Attention	Attention time*	Percentage of attention time	Attention time*	Percentage of attention time
Planning performance	4	1 %	2	0 %
Rehearsing	0	5 %	0	4 %
Writing	223	52 %	236	52 %
Content	155	36 %	154	34 %
Task management	46	11 %	64	14 %
Off-task	0	0 %	0	0 %

* Attention time = Number of lines of transcription coded for a focus of attention (cf. sub-section 5.3.3).

The basic visualisation of the attention strand appears in figure 6.3 (see next page). In this visualisation the horizontal bars represent the pupils' foci of attention at different times of the dialogue-writing activity (cf. sub-section 5.3.4). Consistent with the overall colour conventions, **black** horizontal bars represents **Veronica**'s focus of attention, **red** horizontal bars **Karen**'s focus of attention, and the **blue** horizontal bars represent contributions to the focus of attention by other speakers (**other pupils**, **researcher**, **teacher**). The captions on the left hand side of figure 6.3 indicate which focus of attention appears on the different horizontal levels of the visualisation.

INSERT FIGURE 6.3

Visual examination of the attention strand in figure 6.3 offers deeper insights on the numbers in table 6.2. Beginning with the pupils' focus on task management, one can see that there is a great deal of task management at the beginning, and at the end, of the activity (to the left and right sides of the visualisation; highlighted in yellow). Moreover, focus on task management is absent in the middle of the activity (not highlighted). These three distinct periods of time last between eight and nine minutes each (cf. the time measure at the top of figure 6.3).

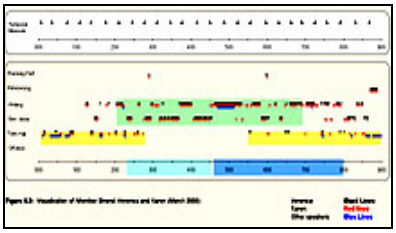
Another observation is that at the beginning and end of the activity Veronica and Karen's focus of attention is not very sustained (that is, the horizontal bars are shorter than they are in the middle of the activity), their focus of attention is changing frequently (between task management, content and writing), and the pupils do not always share the same focus of attention (there are 'orphan' red or black horizontal bars). This observation pertains to a four-minute period between line numbers 100 and 300, at the beginning of activity, and a somewhat longer period of time between line numbers 600 and 850, at the end of the activity. By contrast, in the middle part of the activity the pupils' focus of attention is more sustained (the horizontal bars are longer), their focus of attention changes in a more predictable manner, and the focus of attention is more shared (there are fewer orphan red or black horizontal bars).

A third observation revealed by the visualisation of the attention strand is a shift in the balance between generating content and writing across the dialogue-writing activity. That is, while in the beginning of the activity there is relatively more focus on content, towards the end of the activity there is comparatively more focus on writing. This shift in overall focus of attention seems to be located around line number 450. Before this point there is comparatively more focus on content (highlighted in light blue on the horizontal axis), and after this point there is more focus on writing (highlighted in dark blue on the horizontal axis).

A final observation is the pupils' alternating focus of attention, from generating content to writing of the dialogue. This alternating focus of attention is especially evident in the middle part of the activity (highlighted in green). It is to some extent also visible earlier in the activity (from line number 120 onwards), and towards the end of the activity. Nevertheless, in these earlier and later segments of the activity the observation may be somewhat obscured by the pupils' focus on task management. In addition, the alternating focus of attention may be disintegrating towards the end of the activity because the pupils' focus of attention is less shared, and because there is relatively less focus on generating content.

Table 6.3 summarises the time-ordered distributions in the attention strand across the timescale of the dialogue-writing activity.

Table 6.3: Distributions in attention strand; Veronica and Karen

	< Dialogue-writing activity >		
	Beginning	Middle	End
Attention strand  (Cf. figure 6.3)	Presence of task management	No task management	Presence of task management
	Less sustained focus of attention	More sustained focus of attention	Less sustained focus of attention
	Alternating focus of attention less evident	Alternating focus of attention more evident	Alternating focus of attention less evident
	More focus on content		More focus on writing
	First half		Last half

In addition, the alternating focus of attention, between focus on writing and content, is a recurrent feature in the attention strand, and therefore a potential micro-context for establishing relationships with the language code and regulative threads. This possibility will be explored in the next sub-section (cf. sub-section 6.2.2).

Language code thread: A numerical description of Veronica and Karen's Norwegian and English language use appears in table 6.4. The table shows that the pupils speak a great deal more Norwegian than English. In terms of words spoken, Veronica does so by a ratio of three to one, and Karen by a ratio of two to one. However, the average length of the pupils' English intonation units is shorter than the Norwegian ones, and the difference is therefore somewhat less in terms of number of intonation units. Table 6.4 also shows that overall Karen speaks more than Veronica. This difference is most marked for English, with Karen speaking almost twice as much as Veronica. There are also some differences in the average length of intonation units, with Karen's intonation units, in both Norwegian and English, on average 10 percent longer than Veronica's. Finally, the contribution of other speakers (mainly the teacher) is perhaps surprisingly large. However, the contribution is considerably less in terms of intonation units than it is in terms of words. In addition, some of the teacher's instructions for the task are reflected in the numbers.

Table 6.4: Numerical description of language code thread; Veronica and Karen

Language Code measure	Veronica	Karen	Other speakers	Total
Norwegian				
Number of words	461	528	130	1119
Number of intonation units	134	143	24	301
Length of intonation units (words)	3.44	3.69	5.42	
English				
Number of words	128	256	91	475
Number of intonation units	49	86	16	151
Length of intonation units (words)	2.61	2.98	5.69	

The basic visualisation of the language code thread in Veronica and Karen's learner interaction appears in figure 6.4 (see next page). In this visualisation the vertical lines (or columns) represent Norwegian or English words in successive intonation units in the transcription of the learner interaction data. The height of each of the vertical lines corresponds to the length, in words, of the respective intonation units. The length of individual intonation units can be determined by cross-reference to the scale given by the vertical axis (y-axis) on the left side the chart. Lines that 'point' upwards (positive values) represent words that are spoken in English, and lines that point downwards are words that are spoken in Norwegian (cf. sub-section 5.3.6). Consistent with the overall colour conventions, **black** vertical lines represent **Veronica**'s intonation units, and **red** vertical lines represent **Karen**'s intonation units. **Blue** vertical lines represent other speakers (**other pupils**, **teacher** or **researcher**) contributions to Veronica and Karen's learner interaction.

A visual examination of the language code thread in figure 6.4 confirms some of the numbers in table 6.4. The relatively large amount of Norwegian spoken is evident in the greater number of lines that point downwards. In addition, the prevalence of red lines as compared to black ones is evidence for Karen speaking more. Finally, the blue lines (between line numbers 0 and 100, around line number 500, and towards the end of the activity) represent contributions of other speakers.

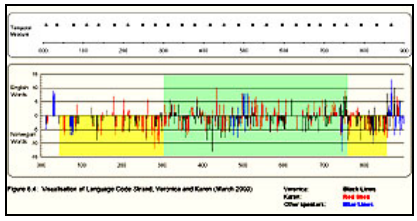
INSERT FIGURE 6.4

The visualisation of the language code thread also reveals some observations that the numerical description misses. One such observation is that most of the English intonation units appear between line numbers 300 and 750 (highlighted in green in figure 6.4). If one compares the amount of English and Norwegian spoken in this middle part of the activity, the balance between the two languages is considerably more even than in the activity as a whole. The Norwegian intonation units, in contrast, are more evenly distributed across the activity. The complete picture then, is less English and more Norwegian spoken in the beginning of the activity, almost as much English as Norwegian spoken in the middle of the activity, and again less English and more Norwegian towards the end of activity.

Another observation that is revealed by the visualisation is that both Norwegian and English intonation units seem to come in clusters. For example, there are clearly defined clusters of Norwegian intonation units around line numbers 80, 140, 290, 360, 600 and 820. In addition, there are less defined clusters of Norwegian that seem spread out between line numbers 200 and 300, 400 and 500, as well as 650 and about 720. While not as prominent, there are some English language clusters around line numbers 330, 390, 530 and 750. None of these clusters seem to constitute any discernible time-ordered distribution across the timescale of the activity as a whole. Rather, it may be that the clusters are embedded in one of the potential micro-contexts identified in the writing and attention strands.

In sum, there is only one time-ordered distribution in the language code thread across the timescale of the dialogue-writing activity. That is, at the beginning of the activity the pupils speak more Norwegian, in the middle part there is a more even balance between Norwegian and English, and towards the end Norwegian is again predominant. This distribution is summarised in table 6.5.

Table 6.5: Distributions in language code thread; Veronica and Karen

Language code thread	< Dialogue-writing activity >		
	Beginning	Middle	End
 (Cf. figure 6.4)	More Norwegian	Balance between Norwegian and English	More Norwegian

In addition, the possibility that the clusters of Norwegian and English intonation units are embedded in one of the micro-contexts of the writing and attention strands will be explored in the next sub-section (cf. sub-section 6.2.2).

Non-prospective regulative thread: Four regulative activities are coded in this regulative thread (cf. section 5.3.7). These are:

- Truncating activity: formulating content, language, or both.
- Pacing activity: providing time to think or act.
- Voicing activity: keeping in mind what to write/what has been written; facilitating spelling of L2 words.
- Focusing activity: framing or focusing next action.

A numerical description of Veronica and Karen's non-prospective regulative activity is provided in table 6.6. These numbers show that Karen is more active than Veronica on this regulative thread. She is responsible for 139 instances of non-prospective regulative activity, as compared to Veronica's 77. In particular, Karen does about four times as much pacing and about ten times as much focusing.

Table 6.6: Numerical description of non-prospective regulative thread; Veronica and Karen

	Number of instances of regulative activity		
Regulative activity	Veronica	Karen	Total
Truncating	36	52	88
Pacing	4	12	16
Voicing	34	43	77
Focusing	3	32	35
Total	77	139	216

The basic visualisation of the non-prospective regulative thread appears in figure 6.5 (see next page). Each of the regulative activities is visualised as two horizontal lines. Consistent with the overall colour conventions, **black** lines and spikes represent **Veronica**'s cognitive regulative activity, and **red** lines represents **Karen**'s corresponding regulative activity. Finally, upwards-pointing spikes along the lines represent instances of regulative activity (cf. sub-section 5.3.8).

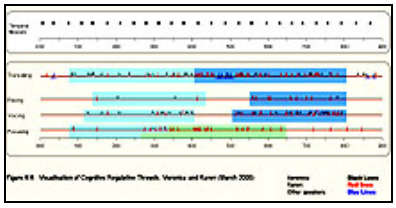
INSERT FIGURE 6.5 ABOUT HERE

The visualisation of the non-prospective regulative thread, shown in figure 6.5, provides additional insights on the numbers in table 6.6. Beginning with truncating activity, one can see that Veronica truncates more intonation units than Karen for about five minutes in the beginning of the activity (between line numbers 80 through 250). In addition, there is a period between line numbers 250 and 400 where Veronica still truncates slightly more than Karen. After line number 400, however, Karen truncates considerably more than Veronica. Hence, in the first half of the dialogue-writing activity Veronica truncates as much, or more, than Karen (highlighted in light blue in figure 6.5), while in the latter half of the activity Karen truncates considerably more than Veronica (highlighted in dark blue in figure 6.5).

For the pupils' pacing activity the visualisation shows that most of the pacing occurs in the latter half of the activity, where 10 instances are visible (highlighted in dark blue in figure 6.5; there are in fact 11 instances of pacing in this part of the activity, but two instances are so close together that they appear as a single spike). By contrast, in the first half of the activity there are only four instances of pacing (highlighted in light blue).

For voicing activity visual examination reveals a similar observation as for truncating activity. That is, in the beginning of the dialogue-writing activity Veronica is comparatively more active (highlighted in light blue), and towards the end of the activity Karen is more active (highlighted in dark blue).

Table 6.7: Distributions in non-prospective regulative thread; Veronica and Karen

Non-prospective regulative thread	< Dialogue-writing Activity >		
	Beginning	Middle	End
 (Cf. figure 6.5)	Karen focuses less	Karen focuses more	Karen focuses less
	Veronica truncates more		Karen truncates more
	Less pacing		More pacing
	Veronica voices more		Karen voices more
	Veronica focuses some		Veronica does not focus
	First half		Last half

Finally, for focusing activity the visualisation again confirms the numbers in table 6.6, showing Karen as being much more active. However, the visualisation also shows that most of Karen's focusing occurs in the middle part of the dialogue-writing activity (partially

highlighted in green). Moreover, Veronica only focuses a few times in the first half of the activity (highlighted in light blue), and not at all in last half (highlighted in dark blue).

Table 6.7 summarises the time-ordered distributions in the non-prospective regulative thread across the timescale of the dialogue-writing activity.

Prospective regulative thread: Five regulative activities are coded in this regulative thread (cf. section 5.3.7). These are:

- Questioning: requesting information.
- Negotiation: clarifying or confirming information.
- Directing: deciding how to do the task; telling the other pupil what to do.
- Suggesting: putting content for the dialogue into shared domain.
- Helping: helping other pupil write L2 (unsolicited).

Table 6.8 provides a numerical description of Veronica and Karen's prospective regulative activity. The numbers in this table show that Veronica is responsible for almost all the questioning and negotiating activity. In contrast, Karen does nearly all the directing and helping. Only for suggesting activity is there some balance between the two pupils' contributions, but with Veronica suggesting slightly more. Finally, regulative activity responded to uncooperatively usually involves Veronica taking an initiative to which Karen responds uncooperatively. For example, Veronica makes 11 suggestions that receive uncooperative responses from Karen.

Table 6.8: Numerical description of prospective regulative thread; Veronica and Karen

	Number of instances of regulative activity*			
Regulative activity	Veronica	Karen	Other speakers	Total
Questioning	8 : 5	2 : 0	1 : 0	11 : 5
Negotiating	23 : 4	3 : 1	5 : 1	31 : 6
Directing	2 : 1	11 : 1	1 : 0	14 : 2
Suggesting	13 : 11	18 : 0	1 : 0	32 : 11
Helping	0 : 0	7 : 0	0 : 0	7 : 0
Total	46 : 21	41 : 2	8 : 1	95 : 24

* Sets of numbers represent regulative activity with cooperative and uncooperative responses, respectively. For example, Veronica asked a total of 13 questions; 8 of which received cooperative responses from Karen, and 5 of which received uncooperative responses from Karen.

The basic visualisation of the prospective regulative thread appears in figure 6.6 (see next page). Just as for the non-prospective regulative thread, two horizontal lines represent each regulative activity in the prospective regulative thread. However, the visualisation in figure 6.6 also uses a convention to represent whether the other pupil cooperatively responds to the regulative activity. That is, spikes pointing upwards represent regulative activity that is responded to cooperatively, and spikes pointing downwards signify regulative activity that is not responded to cooperatively (cf. sub-section 5.3.8). Consistent with the overall colour conventions, **black** lines and spikes represent **Veronica**'s regulative activity, and **red** lines represents **Karen**'s regulative activity. **Blue** lines and spikes represent other speakers (**other pupils**, **teacher** or **researcher**) interacting with the dyad.

The visualisation of the prospective regulative thread in figure 6.6 provides information about the temporal distribution of the pupils' regulative activity across the dialogue-writing activity. Beginning in the top part of the figure, the visualisation reveals that virtually all the questions appear in the latter half of the activity (highlighted in dark blue). That is, apart from two questions around line number 220, there is no questioning in the first half of the activity (highlighted in light blue). For helping activity a converse distribution can be seen. Thus, Karen offers unsolicited help in the first half of the activity (highlighted in light blue), but not in the last half of the activity (highlighted in dark blue).

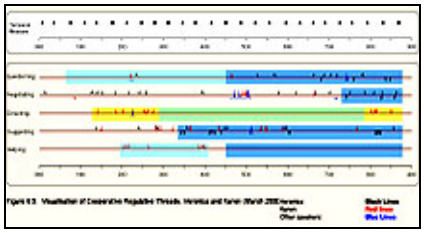
The visualisation reveals that there is no directing by either pupil for a long period of time in the middle of the dialogue-writing activity (highlighted in green). In other words, and recalling from table 6.8 that Veronica does very little directing, Karen's directing is limited to the beginning and end of the dialogue-writing activity (highlighted in yellow). By comparison, negotiation and suggesting activity show a more even distribution across the dialogue-writing activity. If Karen's negotiation with the teacher around line number 500 (note the presence of the blue line in this segment) is excluded, one could say that there is less negotiation in the middle of the activity. However, given that Veronica is responsible for more of the negotiating activity, this is not recorded as a time-ordered distribution.

INSERT FIGURE 6.6

A final observation relates to the uncooperative responses to regulative activity (any spikes that point downwards). The visualisation confirms that it is almost invariably Veronica's regulative activity that receives uncooperative responses (note that the great majority of downwards-pointing spikes are black). However, the potentially interesting dynamic revealed by the visualisation is the gradual increase in uncooperative responses across the dialogue-writing activity. This observation is the clearest when all the prospective regulative activities are examined together. We can see that the first uncooperative responses appear in the visualisation of suggesting activity, around line number 350. In this regulative activity there remains evidence for uncooperative responses throughout the remainder of the dialogue-writing activity (highlighted in dark blue). Then, towards the end of the activity, around line number 700, there is evidence for uncooperative responses to Veronica's questioning activity (previously highlighted as part of another time-ordered distribution) and negotiating activity (highlighted in dark blue).

Table 6.9 summarises the time-ordered distributions in the prospective regulative thread across the timescale of the dialogue-writing activity.

Table 6.9: Distributions in prospective regulative thread; Veronica and Karen

Prospective regulative thread	< Dialogue-writing Activity >		
 (Cf. figure 6.6)	Beginning	Middle	End
	Karen directs	No directing	Karen directs
	Few questions		Veronica asks questions
	Karen offers help		Karen does not offer help
	Karen is cooperative		Karen is less cooperative
	First half		Last half

6.2.2 Relationships between Activity Strands and Threads

This sub-section corresponds to the second stage in the procedure for identifying patterns and phases in the learner interaction data (cf. section 6.1).

From the visual examination of the writing and attention strands in the previous sub-section two recurring features in the writing strand, and one recurring feature in the attention

strand, were noted as potential micro-contexts for finding relationships with other activity strands and threads. On the writing strand this included the synchronous parts of the pupils' composition intervals (highlighted in green in figure 6.2 in the previous sub-section), and the related asynchronous parts of their composition intervals (highlighted in yellow in figure 6.3 in the previous sub-section). In addition, a combination of these was also mentioned as a potential micro-context. In the attention strand the potential micro-context was the alternating focus of attention, between focus on content and focus on writing.

This part of the visual dynamical analysis involves displaying combinations of activity strands, one of which is always the visualisation of the activity strand that forms the potential micro-context to be explored. Only those combinations of activity strands that showed identifiable relationships have been included in the presentation in this sub-section.

Relationship between the writing and attention strands: Figure 6.7 (see next page) shows the basic visualisations of the writing and attention strands combined in a single visual display. In the writing strand the synchronous parts of the pupils' composition intervals are highlighted in green, and the related asynchronous parts, where Karen is finished, but Veronica is still writing a turn, are highlighted in yellow. These same intervals have been superimposed on the visualisation of the attention strand.

Visual examination of this combination of activity strands shows that the recurrent feature on the attention strand, which itself is a potential timescale, i.e., the focus of attention alternating between content and writing, is embedded in some of the composition intervals of the writing strand. What is evident, however, is that both the synchronous and asynchronous parts of the pupils' composition intervals must be considered. Figure 6.8 is a magnified illustration of this relationship for the composition interval for turn 4 (cf. between line numbers 325 and 380 in figure 6.7). Figure 6.8 shows that the pupils' focus of attention is on content at the beginning of the composition interval for turn 4, but then changes to focus on writing towards the end of this same interval. In addition, the focus on writing extends into the asynchronous part of the composition interval (the yellow highlighted area). The complete trajectory of this pattern is outlined in figure 6.8. Given the shape of this pattern, it is henceforth referred to as an *S-pattern*.

INSERT FIGURE 6.7 ABOUT HERE

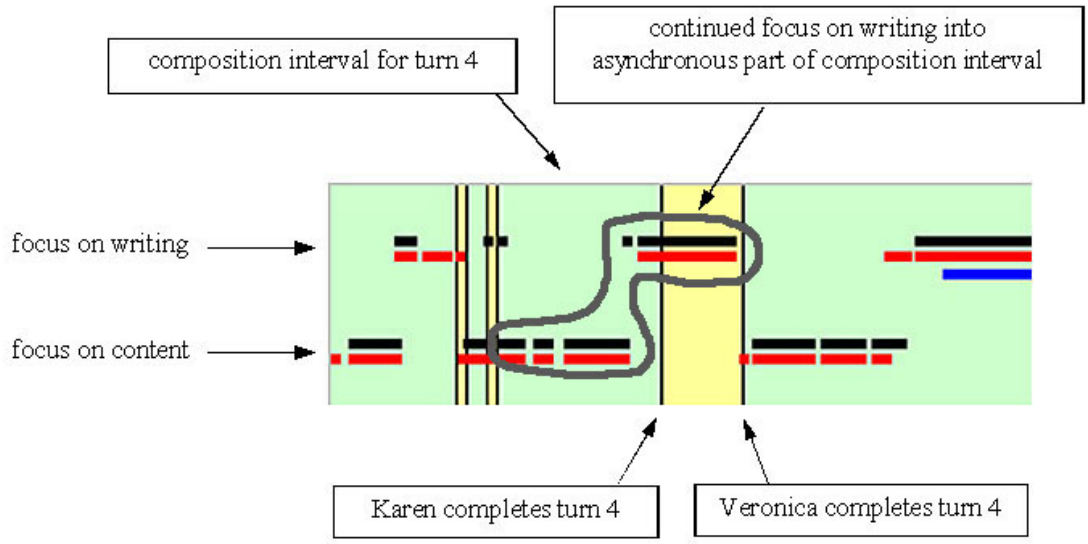


Figure 6.8: S-pattern in Veronica and Karen's learner interaction

A re-examination of the full visualisations of the writing and attention strands in figure 6.7 shows that the S-pattern of attention is a feature of most composition intervals in Veronica and Karen's dialogue-writing activity (the applicable composition intervals are highlighted in green). The only clear exceptions are for the pupils' composition of turns 1 (between line numbers 140 and 270, 6 (around line number 560) and 9 (between line numbers 720 and 800) (these composition intervals are not highlighted in figure 6.7). Moreover, because the composition interval for turn 3 is very brief, it is difficult to establish the S-pattern in this composition interval with certainty.

The lack of any S-pattern in the composition intervals for turns 6 and 9 may relate to the lack of much focus on content in the last half of the activity (cf. figure 6.3 in the previous sub-section). Moreover, the lack of any S-pattern at the beginning of the activity may relate to the fragmented focus of attention, and the presence of task management. Consequently, there seems to be a time-ordered distribution in the S-pattern across the timescale of the dialogue-writing activity. This distribution will be summarised in table 6.10, below.

Relationship between the writing strand and regulative threads: Figure 6.9 (see next page) shows the basic visualisations of the writing strand and the non-prospective regulative thread combined in a single visual display. The pupils' composition intervals are again highlighted in green (synchronous parts) and yellow (asynchronous parts). The intervals have been superimposed on the visualisation of the non-prospective regulative thread in the form of vertical black lines. However, the highlighting that appears in the regulative thread uses different colours, and only covers the asynchronous parts of the pupils' composition intervals.

INSERT FIGURE 6.9

A visual examination of the non-prospective regulative thread in figure 6.9 shows that in the light blue highlighted areas in the first half of the activity there are few, if any, red spikes. This means that in the first half of the activity Karen does *not* engage in non-prospective regulative activity in the asynchronous parts of the pupils' composition intervals. However, in the dark blue highlighted areas in the last half of the activity there *are* red spikes. This means that in the last half of the activity Karen *does* engage in non-prospective regulative activity in the asynchronous parts of the composition intervals. This change in Karen's non-prospective activity is not entirely consistent. That is, in the asynchronous part of the composition interval for turn 7, around line number 625, Karen does not engage in non-prospective regulative activity. Even so, there is a discernible distribution that occurs across the timescale of the dialogue-writing activity. Thus, Karen's non-prospective regulative activity, in the micro-context of the asynchronous parts of composition intervals, is yet another feature to be added to the inventory of time-ordered distributions across the dialogue-writing activity.

A potentially related pattern can be observed in figure 6.10 (see below), which shows the combined visualisation of the writing strand and helping activity for Veronica and Karen's first four composition intervals. This figure reveals that in the first part of the activity Karen was providing unsolicited help to Veronica, and that this help was offered in the asynchronous parts of the pupils' composition intervals. By contrast, this helping activity does not occur in any asynchronous intervals in later parts of the dialogue-writing activity. This is a further time-ordered distribution across the timescale of the pupils' dialogue-writing activity.

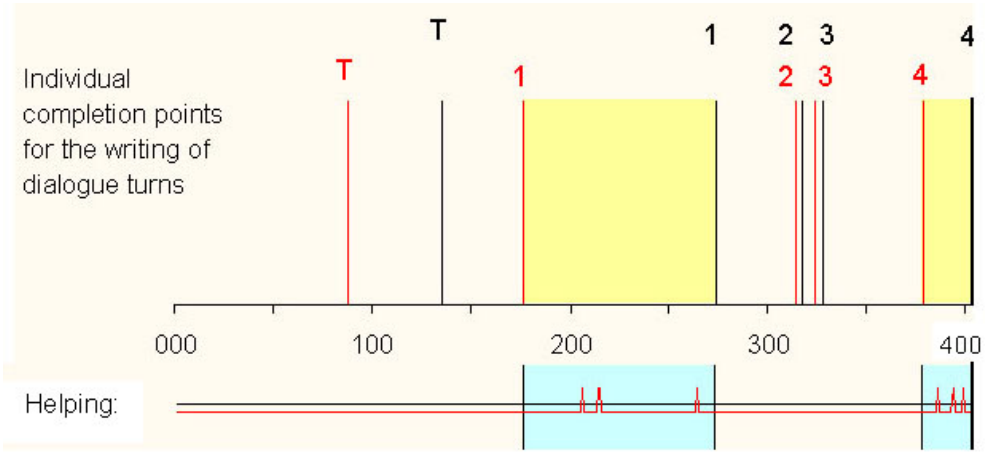


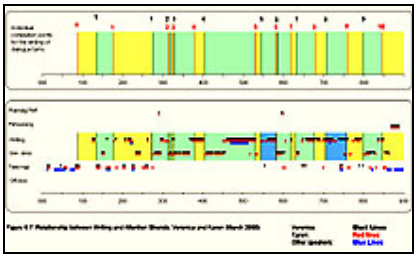
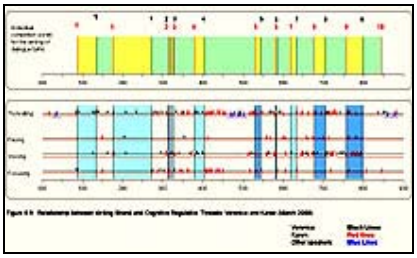
Figure 6.10: Relationship between writing strand and helping activity; Veronica and Karen

Finally, there were some additional relationships between the attention strand and the remaining regulative activities. However, these relationships were given by how these regulative activities were coded (cf. sub-section 5.3.7). For example, there were relationships

between focus on writing and voicing activity, between directing activity and focus on task management, and between suggesting activity and focus on content.

Table 6.10 summarises the time-ordered distributions that were identified through an exploration of the micro-context provided by the writing strand.

Table 6.10: Distributions of patterns embedded in writing strand; Veronica and Karen

<table>
<tr><td rowspan="2">Writing and attention strands
 
(Cf. figures 6.7 and 6.8)</td><td colspan="3">< Dialogue-writing activity ></td></tr>
<tr><td>Beginning</td><td>Middle</td><td>End</td></tr>
<tr><td rowspan="2">Writing strand and regulative threads
 
(Cf. figures 6.9 and 6.10)</td><td colspan="3">S-pattern of attention in complete composition intervals</td></tr>
<tr><td colspan="2">S-pattern more evident</td><td>S-pattern less evident</td></tr>
<tr><td colspan="2">Absence of non-prospective regulative activity by Karen in asynchronous intervals</td><td>Presence of non-prospective regulative activity by Karen in asynchronous intervals</td></tr>
<tr><td colspan="2">Karen offers help in asynchronous intervals</td><td>Karen does not offer help in asynchronous intervals</td></tr>
<tr><td colspan="2">First half</td><td>Last half</td></tr>
</table>

Relationship between attention strand and language code thread: In this combination of activity strands, the intention was to explore the alternating focus of attention, between focus on content and writing, as a potential micro-context for understanding features in the language code thread. However, the alternating pattern of attention did not seem to constitute a clear micro-context for understanding the pupils' activity on the language code thread. Instead, those periods of time when the pupils' focus of attention was on writing dialogue was explored.

INSERT FIGURE 6.11

Figure 6.11 (see previous page) shows the basic visualisations of the attention strand and language code thread combined in a single visual display. The periods of time in the attention strand when the pupils were focusing on writing are highlighted in green. The corresponding periods of time are highlighted in green in the visualisation of the language code thread. However, in the language code thread only the pupils' English language use is highlighted. A visual examination of the language code thread reveals that the highlighted periods of time account for the great majority of the pupils' English language use. That is, there are very few upwards-pointing lines that fall outside the highlighted areas in the visualisation. In other words, the pupils tended to use English only when their focus of attention was on writing the dialogue. However, the pupils also used a lot of Norwegian during these same periods. Finally, this was not a feature that seemed to be distributed across the timescale of the dialogue-writing activity.

The above observation is somewhat tenuous due to the overlap between focus on content and writing in the visualisation of the attention strand. That is, because the visualisation of the attention strand is not fine-grained enough it is difficult to highlight only those periods when the pupils' focus of attention is on writing dialogue. This problem was not limited to the visualisation of the attention strand only. Where appropriate, the problem will be pointed out again in this chapter. Furthermore, since the problem relates to a software limitation (cf. discussion in sub-section 5.2.2) it will be covered in more depth in chapter nine, which discusses the contributions of visualisation to research on learner interaction.

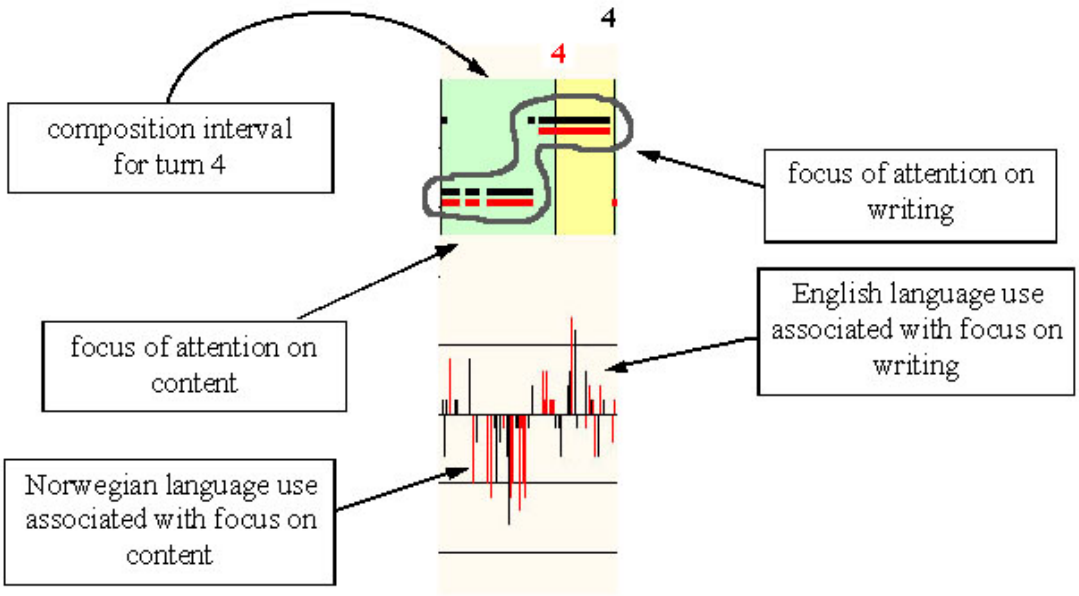


Figure 6.12: S-pattern and language code thread in first half of activity; Veronica and Karen

Combining two of the relationships identified so far, a further relationship can be identified in Veronica and Karen's learner interaction. Taking the composition interval for turn 4, in which the S-pattern was established, and combining this with a visualisation of the language code thread revealed this further relationship. Figure 6.12 illustrates the visualisation of this combination of activity strands and threads for this composition interval. The figure shows that in the case of the composition interval for turn 4 the pupils spoke Norwegian when they were focusing on content, and they spoke mostly English in the later part of the composition interval, when they focused on writing dialogue. However, as the title for figure 6.12 reveals, this relationship only held for the first half of the dialogue-writing activity. Figure 6.13 illustrates the same combination of activity strands and threads in the case of the composition interval for turn 8, which is during the last half of the activity.

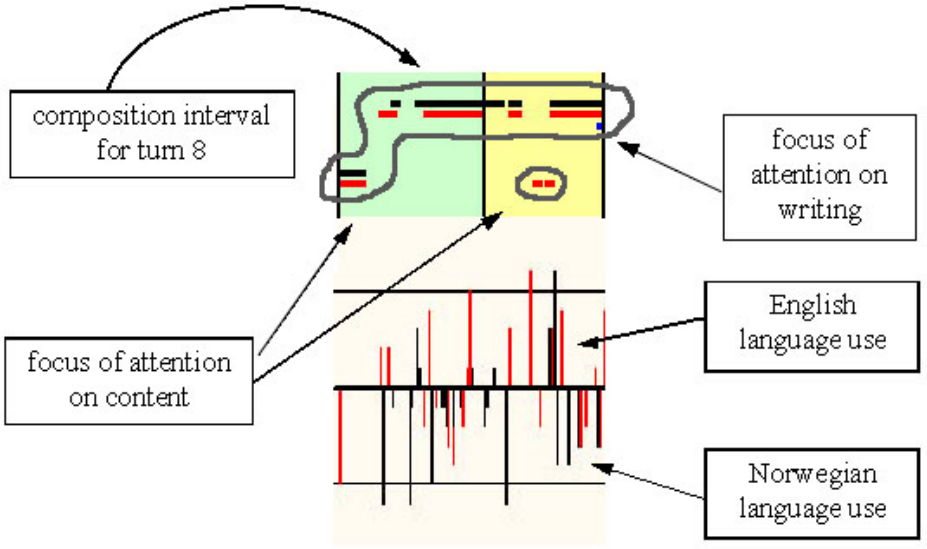
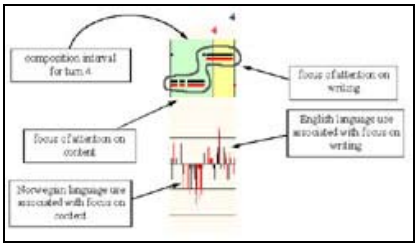


Figure 6.13: S-pattern and language code thread in last half of activity; Veronica and Karen

Figure 6.13 shows that not only is the S-pattern less clear in its progression from focus on content to focus on writing (note the brief period of focus on content in the asynchronous part of the composition interval), there is also less correspondence between the S-pattern and the pupils' Norwegian and English language use. In other words, this overall pattern, between the writing and attention strands, and the language code thread, exhibits a time-ordered distribution across the timescale of the dialogue-writing activity. This time-ordered distribution is summarised in table 6.11.

Table 6.11: Distribution of S-pattern and language code thread; Veronica and Karen

Writing strand, attention strand and language code thread	< Dialogue-writing Activity >	
	Relationship between S-pattern and language code thread	No relationship between S-pattern and language code thread
(Cf. figures 6.12 and 6.13)	First half	Last half

6.2.3 Synthesis of Phases in the Learner Interaction

This sub-section summarises all the time-ordered distributions identified in single activity strands and threads, and in relationships between activity strands and threads, across the timescale of the dialogue-writing activity. This summary is used to synthesise phases in Veronica and Karen's learner interaction.

The summary of the time-ordered distributions can be seen in table 6.12 (see next page). This table shows that there are two different *phase organisations* in Veronica and Karen's learner interaction. A first phase organisation divides the dialogue-writing activity into a beginning, middle and an end phase. This first phase organisation is represented by the yellow and green highlighted areas in table 6.12. Moreover, a second phase organisation divides the dialogue-writing activity into a first half and a last half. This is represented by the light and dark blue highlighted areas in table 6.12.

The first phase organisation appears symmetrically organised across the timescale of the dialogue-writing activity. This includes an initial phase where there is relative asynchrony in the pupils' composition of dialogue turns. On the attention strand there is a lot of focus on task management, and there is less sustained focus of attention. The pupils' speak little English, and regulative activity is characteristic in that Karen does some directing, but not very much focusing. By contrast, in the middle phase there is relative synchrony in the pupils' composition. In the attention strand there is more sustained focus of attention, and there is no focus on task management. The pupils speak more English, and Karen's regulative activity is characterised by more focusing and the absence of directing. During the end phase the pupils' composition is once again asynchronous. Focus on task management reappears together with less sustained focus of attention. There is somewhat less English spoken, and Karen once again directs more and focuses less.

INSERT TABLE 6.12

The time-ordered distributions that make up this first phase organisation have in common that they all seem to make sense, given that the pupils are doing a writing activity, and from what we know about doing writing activities. For example, it makes sense that pupils focus on task management in the beginning of the activity, and that they are relatively less concerned with this in the middle of the activity. Then, towards the end of the activity they again focus on task management, maybe now in the form of evaluating whether what they have done is appropriate in relation to the goals set for the activity. With such a distribution of task management, it also makes sense that the pupils' interaction will vary in terms of other activity strands and threads across the timescale of the dialogue-writing activity, as can be seen in table 6.12.

In contrast, the time-ordered distributions used to synthesise the second phase organisation are not all so easy to explain given that the pupils are doing a writing activity, and knowing what we know about doing writing activities. It *does* make sense that there is more focus on generating content in the beginning of the activity, and more focus on writing down this content as the activity progresses. Furthermore, in the context of this progression from more focus on content, to more focus on writing, it also makes sense that the pupils write more turns towards the end of the dialogue-writing activity. However, it is *not so clear* why Veronica writes one sentence less than Karen at the end of the activity, why Veronica asks almost all her questions in the latter part of the activity, or why Veronica's only focuses in the first half of the activity. Similarly, it is not clear why Karen offers unsolicited help only in the first half of the activity, and why there is an increase in her uncooperative responses across the dialogue-writing activity.

These two phase organisations will be discussed in relation to the phases found in the remaining two cases of learner interaction in the final section of this chapter (cf. section 6.5). Moreover, the pedagogical implications of the two phase organisations will be discussed in chapter seven, which contains an in-depth analysis of Veronica and Karen's learner talk in this first dialogue-writing activity.

6.3 Patterns and Phases of Learner Interaction: Case 2

This section reports on the visual dynamical analysis of pattern and phases in the learner interaction of Morten and Tim's first dialogue-writing activity. Just as in the previous section, the analysis follows the three-stage procedure for identifying patterns and phases outlined in section 6.1.

6.3.1 Features in Single Activity Strands and Threads

This sub-section identifies time-ordered distributions, and any other features, in the basic visualisation of each activity strand and thread in Morten and Tim's learner interaction. In addition, any recurrent features in the writing and attention strands are identified as potential micro-contexts to be used in the sub-sequent analysis of relationships between activity strands and threads (cf. sub-section 6.3.2).

Writing Strand: Figure 6.14 (see next page) shows the basic visualisation of the writing strand in Morten and Tim's first dialogue-writing activity. In this figure, vertical **black** lines represent points in time when **Morten** completes turns in the role-play dialogue, and **red** vertical lines represent **Tim**'s corresponding writing activity (cf. sub-section 5.3.2).

Morten and Tim both wrote 13 dialogue turns. There are, however, some minor differences between what the two pupils wrote in individual turns (e.g., turn 12; cf. textboxes at the bottom of figure 6.14). A visual examination of the writing strand, as it appears in figure 6.14, reveals that the two pupils completed their dialogue turns in relative synchrony throughout the dialogue-writing activity (note the prevalence of green highlighting in the visualisation). The only exceptions are the composition intervals for turns 3 and 4, where Tim finishes slightly before Morten does, and for turn 9, where Morten completes before Tim (these asynchronous intervals are highlighted in yellow in figure 6.14).

Another observation revealed by the visualisation of the writing strand is that the pupils write fewer turns in the first half of the activity, and more turns in the last half of the activity. If we exclude turn 1 ('Techer/Teacher: Why/Wy are you late to school Erik/Eric'), which was suggested by the task sheet (cf. appendix B), the pupils wrote four novel turns in the first half of the activity, as compared to eight novel turns in the last half.

A final observation is that four of the turns are written very quickly. This pertains to turns 4 and 5 (between line numbers 300 and 350) and turns 10 and 11 (between line numbers 650 and 700). The time measure, which appears at the top of figure 6.14, shows that these four turns were written in a minute, or less. Moreover, the textboxes at the bottom of figure 6.14 show that all of these turns are short (between 1 and 6 words long). By contrast, most longer turns, such as for example turns 2, 3, 8 and 12 (which are between 10 and 24 words long), take between two and three minutes each to complete. With some variability (e.g., turn 7 is comparatively long, but is completed in one minute), this amounts to a predictable relationship between the length of turns and the time it takes to complete them.

INSERT FIGURE 6.14

Of the three observations made in the visualisation of the writing strand, only one constitutes a time-ordered distribution across the timescale of the dialogue-writing activity. This is that the pupils write less turns in the first half of the activity, and more turns in the last half. Table 6.13 summarises this distribution.

Table 6.13: Distributions in writing strand; Morten and Tim

< Dialogue-writing Activity >	
Fewer turns written	More turns written
First half	Last half

The visualisation of the writing strand suggests two potential micro-contexts that will be explored further in this later sub-section. The first is the pupils' composition intervals (highlighted in green in figure 6.14). Note that the three asynchronous intervals highlighted in yellow are not included as potential micro-contexts. This is because this feature is an exception to the far more recurrent synchronous intervals in Morten and Tim's writing. The second potential micro-context is the predictable relationship between length of turns and the time it takes to complete turns. That is, longer and shorter turns may be associated with different types of relationships with the attention strand, as well as with the language code and regulative threads.

Attention Strand: Table 6.14 contains a numerical description of the coding of the attention strand in Morten and Tim's learner interaction. The table shows that the pupils' focus of attention is on writing about 55 percent of the time, on generating content between 33 and 35 percent of the time, and on task management eight percent of the time. In addition, the pupils spent a very limited amount of time focusing on off-task topics and planning the anticipated performance. They spend no time rehearsing their dialogue during the dialogue-writing activity.

The basic visualisation of the attention strand in Morten and Tim's learner interaction appears in figure 6.15 (see next page). In this visualisation the horizontal bars represent the pupils' focus of attention at different times of the dialogue-writing activity (cf. sub-section 5.3.4). The **black** horizontal bars represents **Morten**'s focus of attention, the **red** horizontal bars **Tim**'s focus of attention, and the **blue** horizontal bars represent contributions to the focus of attention by other speakers (**other pupils**, **researcher**, **teacher**).

INSERT FIGURE 6.15

Table 6.14: Numerical description of attention strand; Morten and Tim

Focus of attention	Morten		Tim	
	Attention time*	Percentage of attention time	Attention time*	Percentage of attention time
Planning performance	6	1 %	6	1 %
Rehearsing	0	0 %	0	0 %
Writing	340	55 %	359	56 %
Content	215	35 %	210	33 %
Task management	49	8 %	52	8 %
Off-task	5	1 %	13	2 %

* Attention time = Number of lines of transcription coded for a focus of attention (cf. sub-section 5.3.3).

The visualisation of the attention strand in figure 6.15 reveals that Morten and Tim's focus on task management is limited to a very short period in the beginning, and a somewhat longer period at the end, of the dialogue-writing activity (highlighted in yellow in the figure). The only exception to this observation is a brief period of task management around line number 380. The visualisation also reveals that most of the periods of task management involve another speaker, as evidenced by the presence of blue horizontal bars. For example, consulting the transcription of the pupils' interaction showed that the focus on task management around line number 380 involved the researcher, and around line numbers 650, 700 and 850 included the teacher. In general, therefore, the pupils' focus of attention was only on task management when another speaker was involved.

Another observation revealed by the visualisation of the attention strand is the alternating focus of attention, between focus on content and focus on writing the dialogue. Furthermore, this feature recurs throughout the activity (highlighted in green). There are only a few short periods where this feature does not recur. For example, around line number 700 there is a period of about one and a half minute where the feature is not as visible. Moreover, the feature is less visible for a few shorter periods of time, around line numbers 330, 440, and 550.

Finally, unlike what was the case for Veronica and Karen, the visualisation of the attention strand in Morten and Tim's learner interaction shows no shift in the balance between focus on content and focus on writing across the timescale of the dialogue-writing activity. Rather, the ratio between focus on content and focus on writing remains fairly constant throughout these pupils' learner interaction.

Among the above observations, only the distribution of task management can be described on the timescale of the dialogue-writing activity. Table 6.15 summarises this time-ordered distribution.

Table 6.15: Distributions in attention strand; Morten and Tim

< Dialogue-writing Activity >		
Beginning	Middle	End
Some task management	Very little task management	More task management (with teacher)

In addition, the alternating focus of attention, between focus on content and writing, will be explored as a potential micro-context for understanding features in the language code and regulative threads (cf. sub-section 6.3.2).

Language code thread: Table 6.16 gives a numerical description of the English and Norwegian language use in these pupils' learner interaction. The numbers in the table show that the pupils speak about as much English as they do Norwegian. However, Tim uses slightly more Norwegian words (422 words) as compared to English words (331 words). The converse is the case for Morten, who uses 334 Norwegian words and 400 English words. Finally, both pupils produce more English than Norwegian intonation units.

Table 6.16: Numerical description of language code thread; Morten and Tim

Language Code measure	Morten	Tim	Other speakers	Total
Norwegian				
Number of words	334	422	136	892
Number of intonation units	113	124	28	265
Length of intonation units (words)	2.96	3.40	4.86	
English				
Number of words	400	331	61	792
Number of intonation units	145	136	17	298
Length of intonation units (words)	2.76	2.43	3.59	

The basic visualisation of the language code thread of Morten and Tim's first dialogue-writing activity appears in figure 6.16 (see next page). In this visualisation the height of each vertical line (or column) represents the number of English and Norwegian words spoken in successive intonation units in the transcription of the learner interaction data (cf. sub-section 5.3.6). The **black** lines represent **Morten**'s intonation units, the **red** lines represent **Tim**'s intonation units, and the **blue** lines represent intonation units of other speakers (**other pupils**, **teacher** or **researcher**).

The visualisation of the language code thread confirms that the pupils speak about as much English as they do Norwegian (there are about the same number of lines pointing upwards as downwards). Visual examination also reveals that the pupils' intonation units, in both languages, are distributed fairly evenly across the duration of the dialogue-writing activity. In addition, as compared to what was the case for Veronica and Karen, there are not many clear clusters of Norwegian and English language use. What the visualisation does reveal, however, is that there are a lot of single-word English intonation units (lines pointing upwards, and 'contained' within thin strip highlighted in green in figure 6.16). A count of single word intonation units in the spreadsheet where the language code thread was coded (cf. sub-section 5.2.3) showed that Morten and Tim used 118 single-word English intonation units. The corresponding number of Norwegian single-word intonation units was 83. Further examination showed that 44 of the Norwegian single-word intonation units were the words 'ja' and 'nei' (equivalent to 'yes' and 'no' in English). By contrast, of the 118 English single-word intonation units only two were the English words "yes" or 'no'. As a final comparison, the same calculations were done for the language code threads of the other two cases of learner interaction (Veronica and Karen, and Dennis and Marcus). The results of these calculations are summarised in table 6.17.

Table 6.17: Numerical description of single-word intonation units; all cases

	Number of single-word intonation units		
Condition	Veronica & Karen	Tim & Morten	Dennis & Marcus
Including 'yes' and 'no'			
English	49	118	111
Norwegian	66	83	114
Excluding 'yes' and 'no'			
English	48	116	105
Norwegian	30	39	71

INSERT FIGURE 6.16

The results in table 6.17 show that Morten and Tim use 118 English single-word intonation units, as compared to 49 for Veronica and Karen, and 111 for Dennis and Marcus. Furthermore, the count of Norwegian single-word intonation units decreased markedly for all three pupil-pairs when 'yes' and 'no' responses were excluded. The fact that a similar decrease was not observed when 'yes' and 'no' responses where excluded from the English data indicates that the pupils use the two languages differently. Finally, this observation is most clearly evident in the case of Morten and Tim.

Although the above observation was revealed by visualisation, its significance is somewhat uncertain. However, some of the English single-word intonation units appear in clusters in figure 6.16 (e.g., around line numbers 145, 280, 525, 640, 670 and 700). Consequently, it may be that this feature makes better sense in one of the micro-contexts provided by the writing or attention strands. This will be explored in the next sub-section, which identifies relationships between activity strands and threads (cf. sub-section 6.3.2).

Finally, none of the above observations constitute a time-ordered distribution in the language code thread across the timescale of Morten and Tim's first dialogue-writing activity.

Non-prospective regulative thread: A numerical description of this regulative thread in Morten and Tim's learner interaction is given in table 6.18. These results show that Morten and Tim are about equally active on these regulative threads, but with Tim being responsible for slightly more truncating (54 versus 42) and voicing (80 versus 67), and Morten doing slightly more focusing (26 versus 19). There is very little pacing activity by either pupil.

Table 6.18: Numerical description of non-prospective regulative thread; Morten and Tim

	Number of instances of regulative activity		
Regulative activity	Morten	Tim	Total
Truncating	42	54	96
Pacing	3	1	4
Voicing	67	80	147
Focusing	26	19	45
Total	138	154	292

The basic visualisation of the non-prospective regulative thread appears in figure 6.17 (see next page). Four regulative activities are represented in this visualisation (cf. sub-section 5.3.7). The **black** lines and spikes represent **Morten**'s regulative activity, and the **red** lines represent **Tim**'s corresponding regulative activity (cf. sub-section 5.3.8).

INSERT FIGURE 6.17 ABOUT HERE

The visualisation of the non-prospective regulative thread in figure 6.17 reveals that Morten and Tim's non-prospective regulative activity is fairly equally distributed across the dialogue-writing activity. However, a few observations can be made. The first observation is that Morten truncates more in the first half of the activity (26 instances as compared to 15 instances in the last half of the activity). For Tim the converse is the case. He truncates less in the first half and more in the second half of the activity (22 as compared to 32). Hence, the first half of the set of lines signifying truncating activity in figure 6.17 has been highlighted in light blue, and the last half in dark blue. A second observation is that the pupils' voice less in the first half of the dialogue activity (a total of 53 instances; highlighted in light blue), and more in the last half (a total of 94 instances; highlighted in dark blue). Finally, in terms of focusing activity, Morten is more active at the beginning and at the end of the dialogue-writing activity (highlighted in yellow), and less active in the middle of the activity (highlighted in green). There is no such distribution in Tim's focusing activity.

Although the above observations were revealed by visualisation, some of them needed cumulative type figures to be established with more certainty. In particular, the changes in truncating and voicing activity across the timescale of the dialogue-writing activity were difficult to establish with certainty using only visualisation. Moreover, the changes in these two regulative activities were not associated with any clear transition points. Hence, the highlighting that was used is careful to sub-divide the visualisation in exactly equal parts. That is, the areas highlighted in light and dark blue each represent exactly half of the visualisation (using line number 422/423 as the transition point; there are 845 lines in total). This raises questions of method that will be addressed in chapter nine, which discussed the contributions of visualisation as a method for research on learner interaction.

Table 6.19: Distributions in non-prospective regulative thread; Morten and Tim

< Dialogue-writing Activity >		
Beginning	Middle	End
Morten focuses more	Morten focuses less	Morten focuses more
Morten truncates more; Tim truncates less Less voicing		Morten truncates less; Tim truncates more More voicing
First half		Last half

Table 6.19 summarises those observations that describe time-ordered distributions in non-prospective regulative activity across the timescale of the dialogue-writing activity.

Prospective regulative thread: A numerical description of the prospective regulative thread in Morten and Tim's learner interaction appears in table 6.20. There was very little prospective regulative activity that was responded to uncooperatively in Morten and Tim's learner interaction. Hence, such regulative activity is excluded in table 6.20. However, this type of regulative activity was coded in the data, and this is reflected in the very few downwards-pointing spikes in the visualisation of the prospective regulative thread (cf. figure 6.18).

The results in table 6.20 show that in terms of prospective regulative activity Tim was somewhat more active. In particular, Tim was responsible for more negotiating activity (19 instances, as compared to 12 for Morten), and more suggesting activity (30 instances, as compared to 19 for Morten).

Table 6.20: Numerical description of prospective regulative thread; Morten and Tim

	Number of instances of regulative activity*			
Regulative activity	Morten	Tim	Other speakers	Total
Questioning	10	13	3	26
Negotiating	12	19	4	35
Directing	11	9	10	30
Suggesting	19	30	0	49
Helping	6	3	0	9
Total	58	74	17	149

* Regulative activity that received uncooperative responses has been excluded.

The basic visualisation of the prospective regulative thread in Morten and Tim's learner interaction appears in figure 6.18 (see next page). Five regulative activities are represented in this visualisation (cf. section 5.3.7). The **black** lines and spikes represent **Morten**'s regulative activity, the **red** lines and spikes represent **Tim**'s corresponding regulative activity, and **blue** lines and spikes the regulative activity of other speakers (**other pupils**, **teacher** or **researcher**) (cf. sub-section 5.3.8).

INSERT FIGURE 6.18

Whilst the numerical description of prospective regulative activity in table 6.20 highlights the fact that Tim negotiates and suggests more, the visualisation of these regulative threads in figure 6.18 instead reveals two potentially significant time-ordered distributions. The first is that the pupils negotiate more in the first half of the dialogue-writing activity (highlighted light blue), and less in the second half (highlighted darker blue). Note that there is again a problem identifying a clear transition point, and that the highlighting changes exactly halfway through the activity (at line number 422/423). However, as opposed to the truncating and focusing activity in figure 6.17, the evidence provided by the visualisation of the pupils' negotiating activity is sufficiently clear to establish that the pupils' do about twice as much negotiation in the first half of the activity as compared to the last half.

The second time-ordered distribution that is revealed by the visualisation is that Morten does almost all his directing at the beginning and at the end of the dialogue-writing activity (highlighted in yellow), and virtually no directing (only one instance around line number 500) in the middle of the activity (highlighted in green). By contrast, all of Tim's directing appears at the end of the activity, save one instance around line number 150.

Table 6.21 summarises the time-ordered distributions in the prospective regulative thread across the timescale of the dialogue-writing activity..

Table 6.21: Distributions in prospective regulative thread; Morten and Tim

< Dialogue-writing Activity >		
Beginning	Middle	End
Morten directs; Tim does not direct	Very little directing	Both Morten and Tim direct
More negotiating	Less negotiating	
First half	Last half	

6.3.2 Relationships Between Activity Strands and Threads

This sub-section explores relationships between activity strands and threads in Morten and Tim's learner interaction, and hence, corresponds to the second stage in the procedure for identifying patterns and phases in the learner interaction data (cf. section 6.1).

In the visual examination of single activity strands in the previous sub-section two features in the writing strand, and one in the attention strand, were identified as potential micro-contexts for establishing relationships between activity strands and threads. In the

writing strand this included the pupils' composition intervals (highlighted in green in figure 6.14 in the previous sub-section), as well as the predictable relationship between length of turns and the time the pupils took to complete turns. In the attention strand the potential micro-context was the alternating focus of attention, between focus on content and writing (highlighted in green in figure 6.15 in the previous sub-section). These potential micro-contexts will be explored in turn. Just as in the visual dynamical analysis of Veronica and Karen's learner interaction, the analysis only presents those combinations of visualisations that showed relationships.

Relationship between the writing and attention strands: Figure 6.19 (see next page) shows the basic visualisations of the writing and attention strands combined in a single visual display. In the writing strand the pupils' composition intervals are highlighted in green. These same intervals have been superimposed on the visualisation of the attention strand using vertical lines corresponding to the potential writing micro-context.

Visual examination of this combination of activity strands shows that the alternating focus of attention may be embedded in the micro-context of the composition intervals of the writing strand. However, the relationship is more varied than in the case of Veronica and Karen's learner interaction, which was analysed in the previous section. In some of the composition intervals the focus of attention alters *once*, giving the same S-pattern identified in Veronica and Karen's learner interaction (cf. sub-section 6.2.2). This applies to the composition intervals for turns 1, 3, 7 and 13 (highlighted light green in figure 6.19). In other composition intervals, however, the pupils' focus of attention seems to alternate *more than once* (these are highlighted in dark green). For example, there are two composition intervals where the focus of attention alternates *twice or more*, between focus on content and writing. This pattern applies to the composition intervals for turns 2 and 12. There are also three composition intervals where there seems to be a brief return to focus on content before the turn is completed. The clearest case of this is in the composition interval for turn number 8. It may also be the case for the composition intervals for turns 6 and 9 (note that the asynchronous part of the composition interval for turn 9 is not considered). These two new patterns will in the following be referred to as the *double-S-pattern*, in cases where the focus of attention alternates *twice or more*, and *S-plus-pattern*, in cases where there is *a brief return to focus on content* before the turn is finally completed. Despite giving these patterns distinct labels, it is not clear from this one case of learner interaction that these two patterns can be distinguished with sufficient reliability.

INSERT FIGURE 6.19

Figure 6.20 is a magnified illustration of one instance of the S-pattern and one instance of the S-plus-pattern in Morten and Tim's learner interaction. The S-pattern is in the composition interval for turn 7, which appears between line numbers 450 and 480 in figure 6.19, and the S-plus-pattern is in the composition interval for turn 8, which appears between line numbers 480 and 570.

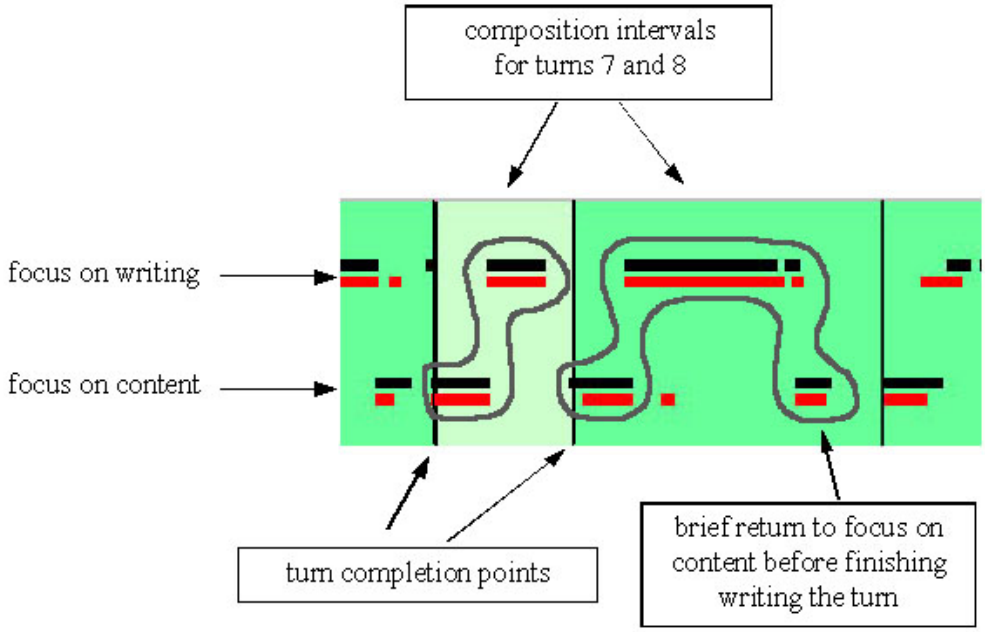


Figure 6.20: S-pattern and S-plus-pattern in Morten and Tim's learner interaction

The double-S-pattern is not illustrated beyond the highlighting provided in figure 6.19. However, this pattern was even more evident in the visual dynamical analysis of Marcus and Dennis' learner interaction, and will therefore be illustrated by a magnified version in the next section (cf. sub-section 6.4.2).

Finally, there are some composition intervals in Morten and Tim's interaction where the relationship between the writing and attention strands is unclear. This applies to the composition intervals for turns 4, 5, 10 and 11. Note that these were identified as very short turns that were written very quickly in the visual examination of the writing strand in the previous sub-section.

Moving now to the second potential micro-context constituted by the writing strand, i.e., the predictable relationship between length of turns and the time it takes to complete turns. Figure 6.21 is a histogram representing the length of the turns written by Morten and Tim. In the histogram, the turns are ordered according to their length, with the longer turns appearing to the left of the figure. Furthermore, the histogram indicates whether a turn is associated with an S-pattern, or one of the more intricate patterns (i.e., either an S-plus- or double-S-pattern).

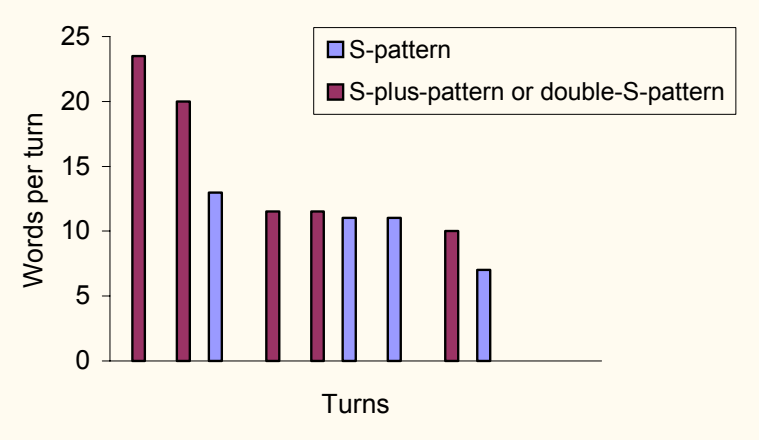


Figure 6.21: Relationship between length of turns and attention patterns; Morten and Tim

Figure 6.21 shows that the two longest turns that Morten and Tim wrote were associated with either an S-plus- or a double-S-pattern. Moreover, more of the shorter turns are associated with S-patterns. Although this result is suggestive, it is probably not enough to establish that the length of turns, and the associated longer duration of composition intervals, is related to the different patterns of attention. However, this possibility will be explored further in sub-section 6.4.2, where relationships in the third case of learner interaction (i.e., Marcus and Dennis) are identified.

Finally, none of the patterns identified so far seem to constitute any time-ordered distribution across the timescale of the dialogue-writing activity.

Relationship between the writing strand and the non-prospective regulative thread: Figure 6.22 (see next page) shows the combined visualisations of the writing strand and the non-prospective regulative thread in Morten and Tim's interaction. For focusing activity (at the bottom of the lower visual panel) the *beginning* of the composition intervals for turns 2, 3, 4, 6, 7, 8, 9, 12 and 13 are highlighted in green. Each of these composition intervals begins with focusing activity. Furthermore, both pupils contribute to this focusing activity. By contrast, the composition intervals for turns 5, 10 and 11 do not begin with focusing activity. Finally, there was no attempt to identify where the composition interval for turn 1 might have started. This relationship between the writing strand and the non-prospective regulative thread does not show any change across the timescale of the dialogue-writing activity.

INSERT FIGURE 6.22

Relationship between attention strand and language code thread: Figure 6.23 (see next page) shows the combined visualisation of the attention strand and the language code thread in Morten and Tim's interaction. Just as was done in the visual dynamical analysis of Veronica and Karen, the periods of time when the pupils' focus of attention is on writing the dialogue are highlighted in green. The pupils' English language use in the corresponding periods of time is also highlighted in green. A visual examination of the language code thread shows that the highlighted areas *does* account for most of the pupils' English language use. However, there are several exceptions, including English language intonation units around line numbers 120, 190, 440, 560, 700, 730 and 800. In other words, this is a considerably weaker relationship than was established in the case of Veronica and Karen's learner interaction.

Another potential relationship to explore in figure 6.23 is between English one-word intonation units and pupils' focus of attention. Another look at the areas highlighted in green in the language code thread shows that focus on writing dialogue accounts for the English one-word intonation units clustered around line numbers 145, 280 and 525. However, there is only a partial relationship between focus on writing and the cluster of one-word English intonation units around line number 640, and no relationship with the clusters around line numbers 670 and 700. Just as was the case in the visual dynamical analysis of Veronica and Karen's learner interaction, this final analysis illustrates the lack of sufficient resolution in the visualisations developed for the research. This is again manifest in the overlap between the horizontal bars that represent focus on writing and focus on content, respectively. In figure 6.23 this overlap is especially clear around line numbers 330 and 610, where the highlighting that was supposed to capture *only* focus on writing also captures some focus on content. Hence, the above relationships between the attention strand and the language code thread, which were weak already, are made even weaker by the lack of sufficient resolution in the visualisations.

INSERT FIGURE 6.23

6.3.3 Synthesis of Phases in the Learner Interaction

Table 6.22 (see next page) provides a summary of all the different time-ordered distributions found in single activity strands and threads (cf. sub-section 6.3.1). This summary reveals that, as compared to the visual dynamical analysis of Veronica and Karen's learner interaction (cf. section 6.2), there are significantly fewer distributions in the different activity strands and threads across the timescale of the dialogue-writing activity. While the same two phase organisations, as were identified in Veronica and Karen's case, are evident, these are considerably less pronounced in this second case of learner interaction. Furthermore, none of the patterns that were identified in these pupils' learner interaction showed any time-ordered distribution across the timescale of the dialogue-writing activity. This indicates that the two phase organisations, in this less pronounced form, did not have much impact on, or much of a dynamical interrelationship with, the patterns that were identified between activity strands and threads.

The phase organisations in this second case of learner interaction also differ in terms of how they may be explained. As compared to the first case of learner interaction (cf. section 6.2.3), most of the time-ordered distributions used to synthesize the second phase organisation in Morten and Tim's interaction (highlighted in light and dark blue in table 6.22) appear to make sense given that the pupils are doing a writing activity. That is, it makes sense that the pupils do more of their writing in the last half of the activity, when they have had time to formulate more content. Moreover, given that voicing activity is associated with focus on writing in the coding scheme (cf. sub-section 5.3.7), and there being more writing in the last half of the activity, it makes sense that there is more voicing in the last half of the activity. That leaves only the changes in the pupils' negotiating and truncating activity unexplained in terms of what makes sense in relation to doing writing activities.

Since the phase organisations in Morten and Tim's interaction are less pronounced, a number of patterns and other features, identified by the visual dynamical analysis, appear to be relatively stable across the timescale of the dialogue writing activity. These include:

- Synchrony in the pupils' composition of turns.
- A predictable relationship between length of turns and time taken to complete turns.
- A balance between Norwegian and English language use.
- Frequent occurrences of English single-word intonation units.
- A combination of S-patterns, S-plus-patterns and double-S-patterns in the micro-context of the composition intervals of the writing strand.
- Most composition intervals begin with focusing activity.

INSERT TABLE 6.22

The significance of the dynamics of Morten and Tim's learner interaction will be discussed in relation to the outcomes of the visual dynamical analysis of the two other cases of learner interaction in the final section of this chapter (cf. section 6.5).

6.4 Patterns and Phases of Learner Interaction: Case 3

This section reports on the visual dynamical analysis of pattern and phases in the learner interaction of Marcus and Dennis' first dialogue-writing activity. Once again, the section follows the three-stage procedure for identifying patterns and phases outlined in section 6.1.

6.4.1 Features in Single Activity Strands and Threads

This sub-section identifies time-ordered distributions, and any other features, in the basic visualisation of each activity strand and thread of Dennis and Marcus' learner interaction. Moreover, recurrent features in the writing and attention strands are identified as potential micro-contexts to be used in the sub-sequent analysis of relationships between activity strands and threads (cf. sub-section 6.4.2).

Writing Strand: Figure 6.24 (see next page) shows the basic visualisation of the writing strand in Marcus and Dennis' first dialogue-writing activity. In this figure, vertical **black** lines represent points in time when **Marcus** completes writing turns in the role-play dialogue, and **red** vertical lines represent **Dennis**' corresponding writing activity (cf. sub-section 5.3.2).

Marcus and Dennis both wrote a title and five turns, and there are only a few minor variations in grammar and spelling in what the pupils wrote (see text boxes in the bottom half of figure 6.24). Visual examination of the writing strand reveals that for the title and turn 1 there is some asynchrony in the pupils' writing (highlighted in yellow in figure 6.24). For the remaining turns, however, Marcus and Dennis' writing is largely synchronous (note the predominance of green highlighting). The visualisation also shows that the pupils only finish writing their first actual turn (turn 1) towards the middle of the activity. In other words, they write turns 2 through 5, which constitutes the bulk of their role-play dialogue, in the last half of the activity. Hence, the first half of the visualisation, where the pupils wrote only one actual turn, is highlighted in light blue, and the last half of the activity, where the pupils wrote most of their turns, is highlighted in dark blue.

INSERT FIGURE 6.24

Another observation that can be made in the visualisation of the writing strand is that, just as was observed for Morten and Tim (cf. sub-section 6.3.1), there is a predictable relationship between the length of turns that Marcus and Dennis write, and the duration of their composition intervals. For example, turn 1 has 16 words and takes about eight minutes to write, and turn 3 has only 4/5 words and takes about one minute to write (cf. time measure in figure 6.24). The only exception to this observation is turn 5, which contains only four words, but took the pupils more than four minutes to write.

Table 6.23 summarises those observations that constitute time-ordered distributions in the writing strand across the timescale of the dialogue-writing activity. Note that since the pupils only wrote a title and five turns these time-ordered distributions are based on less evidence than was available in the two earlier cases of learner interaction.

Table 6.23: Distributions in writing strand; Marcus and Dennis

< Dialogue-writing Activity >	
Some asynchrony in pupils' writing	Synchrony in pupils' writing
Only title and one turn written	Most of the turns written
First half	Last half

The visualisation of the writing strand also points to two potential micro-contexts that will be explored further in sub-section 6.4.2. Just as for the previous two cases of learner interaction, one potential micro-context is the pupils' composition intervals (highlighted in green in figure 6.24). Note that the two asynchronous intervals highlighted in yellow in the visualisation are not included as potential micro-contexts. Just as for Morten and Tim's asynchronous intervals (cf. sub-section 6.3.1), this feature does not recur often enough to be considered as a micro-context. The other potential micro-context is the predictable relationship between length of turns and the duration of the pupils' composition intervals.

Attention Strand: Table 6.24 is a numerical description of the attention strand in Marcus and Dennis' interaction. The table shows that 53 percent of the pupils' focus of attention is on writing, between 27 and 29 percent is focus on content, and 16 to 18 percent is task management. The pupils' spend only a little time focusing on rehearsing, and no time at all focusing on off-task topics or planning the performance of the role-play.

Table 6.24: Numerical description of attention strand; Marcus and Dennis

Focus of attention	Marcus		Dennis	
	Attention time*	Percentage of attention time	Attention time*	Percentage of attention time
Planning performance	0	%	0	0 %
Rehearsing	13	2 %	13	2 %
Writing	350	53 %	313	53 %
Content	178	27 %	167	29 %
Task management	118	18 %	93	16 %
Off-task	0	0 %	0	0 %

* Attention time = Number of lines of transcription coded for a focus of attention (cf. sub-section 5.3.3).

The basic visualisation of the attention strand in Marcus and Dennis' learner interaction appears in figure 6.25 (see next page). In this visualisation the **black** horizontal bars represents **Marcus**' focus of attention, the **red** horizontal bars **Dennis**' focus of attention, and the **blue** horizontal bars represent contributions to the focus of attention by other speakers (**other pupils**, **researcher**, **teacher**) (cf. sub-section 5.3.4)

The visualisation of the attention strand reveals that Marcus and Dennis' focus on task management is concentrated at the beginning and at the end of the dialogue-writing activity (highlighted in yellow). The only substantial exception is some task management around line number 425.

Another observation revealed by the visualisation is the alternating focus of attention, between focus on content and focus on writing dialogue. This feature is more visible in the middle part of the dialogue-writing activity (highlighted in green in figure 6.24). Except for a short period between line numbers 770 and 800, it is also visible at the end of the activity (also highlighted in green). However, the feature is not so evident at the beginning of the activity, where the focus on task management dominates the visualisation.

Finally, the visualisation of the attention strand shows a slight shift in the overall focus of attention across the timescale of the dialogue-writing activity. That is, there is somewhat more focus on content in the first half of the activity (highlighted light blue on the horizontal axis), and more focus on writing in the last half of the activity (highlighted in dark blue on the horizontal axis). This observation does not encompass the very beginning of the activity, where focus on task management dominates, and the very end of the activity, were there seems to be more balance again between focus on content and writing.

INSERT FIGURE 6.25

Table 6.25 summarises the time-ordered distributions in the attention strand across the timescale of the dialogue-writing activity.

Table 6.25: Distributions in attention strand; Marcus and Dennis

< Dialogue-writing Activity >		
Beginning	Middle	End
More task management	Very little task management	Some task management
	Alternating focus of attention more evident	
More focus on content	More focus on writing	
First half	Last half	

In addition, the alternating focus of attention, between focus on content and writing, will be explored as a potential micro-context for establishing relationships with the language code and regulative threads (cf. sub-section 6.4.2).

Language code thread: Table 6.26 gives a numerical description of Marcus and Dennis' Norwegian and English language use. The numerical description shows that both pupils speak considerably more Norwegian than English. Marcus uses 638 Norwegian words as compared to 404 English words, and Dennis uses 394 Norwegian words and only 166 English words. Furthermore, there is a big difference in the average length of Dennis' Norwegian and English intonation units (3.55 and 1.93 words, respectively). This difference is less in Marcus' language use. Finally, Marcus is overall considerably more activity in the language code thread, with a total of 1042 words in 346 intonation units, as compared to Dennis' 560 words in 197 intonation units.

The basic visualisation of the language code thread in Marcus and Dennis' first dialogue-writing activity appears in figure 6.26 (see next page). In this visualisation the **black** vertical lines represent **Marcus**' intonation units, the **red** vertical lines represent **Dennis**' intonation units, and the **blue** vertical lines represent other speakers' intonation units (**other pupils**, **teacher** or **researcher**) (cf. sub-section 5.3.6)

INSERT FIGURE 6.26

Table 6.26: Numerical description of language code thread; Marcus and Dennis

Language Code measure	Marcus	Dennis	Other speakers	Total
Norwegian				
Number of words	638	394	245	1277
Number of intonation units	196	111	62	369
Length of intonation units (words)	3.26	3.55	3.95	
English				
Number of words	404	166	37	607
Number of intonation units	150	86	20	256
Length of intonation units (words)	2.69	1.93	1.85	

Visual examination of the language code thread in figure 6.26 confirms that the pupils speak more Norwegian than English (there are more lines pointing downwards than there are lines pointing upwards). However, if one looks at the middle part of the dialogue-writing activity, between line numbers 220 and 650, there is a more even balance between Norwegian and English (highlighted in green in the visualisation). That is, in the middle part of the activity there are almost as many lines pointing upwards (English) as there are lines pointing downwards (Norwegian).

As predicted in the visual dynamical analysis of the previous case of learner interaction (cf. sub-section 6.3.1), the visualisation reveals that Marcus and Dennis also use many English one-word intonation units (highlighted in dark green in figure 6.3). This includes clusters of English one-word intonation units around line numbers 230, 390, 610, and 890. In addition, there are many such one-word intonation units between line numbers 650 and 750.

Another observation that can be made in the visualisation of the language code thread is that Dennis is responsible for many very long Norwegian intonation units in the beginning of the dialogue-writing activity (highlighted in light blue on the horizontal axis in figure 6.26). After line number 330, however, the downward pointing red lines, which signify Dennis' Norwegian intonation units, are considerably shorter (highlighted in dark blue on the horizontal axis). Figure 6.27, which contains a visualisation of *only* Dennis' language use, shows this time-ordered distribution more clearly.

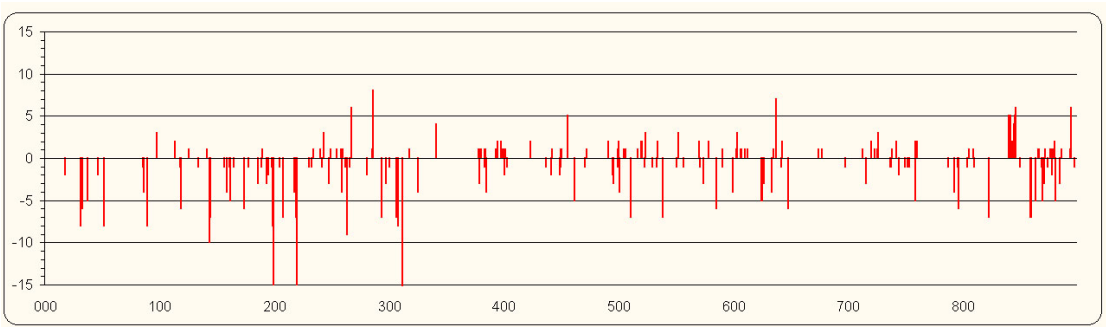


Figure 6.27: Visualisation of Dennis' language code thread

A final observation that can be made in the visualisation of the language code thread is that there are some clusters of both Norwegian and English language use. The clearest of these are two English language clusters around line numbers 80 and 850. However, the first of these clusters represents Marcus reading the task sheet (the cluster around line number 80), and the second cluster represents the two pupils rehearsing the role-play dialogue they have written (the cluster around line number 850). Moreover, some of the Norwegian language clusters are associated with other speakers, e.g., around line numbers 130, 420 and 670. Nevertheless, there are some remaining clusters that do not have such clear explanations. For example, there are Norwegian language clusters around line numbers 200 and 800, and English language clusters around line numbers 230, 380 and 500. None of these clusters show any time-ordered distribution across the timescale of the dialogue-writing activity.

Table 6.27 summarises the time-ordered distributions in the language code thread across the timescale of the dialogue-writing activity.

Table 6.27: Distributions in language code thread; Marcus and Dennis

< Dialogue-writing Activity >		
Beginning	Middle	End
More Norwegian	Balance between Norwegian and English	More Norwegian
Dennis uses longer Norwegian intonation units	Dennis uses shorter Norwegian intonation units	
First half	Last half	

In addition, the subsequent analysis of relationships between activity strands and threads (cf. sub-section 6.4.2) will explore whether some of the clusters, in English one-word intonation

units or English and Norwegian language use, can be understood in a micro-context given by the writing or attention strand.

Non-prospective regulative thread: A numerical description of the non-prospective regulative thread is provided in table 6.28. Apart from pacing activity, which neither pupil does much of, the results in the table show that Marcus is between two and three times as active as Dennis in the non-prospective regulative thread.

Table 6.28: Numerical description of non-prospective regulative thread; Marcus and Dennis

	Number of instances of regulative activity		
Regulative activity	Marcus	Dennis	Total
Truncating	65	21	86
Pacing	1	0	1
Voicing	87	40	127
Focusing	35	11	46
Total	188	72	260

The basic visualisation of the non-prospective regulative thread in Marcus and Dennis' learner interaction appears in figure 6.28 (see next page). Four regulative activities are represented in this visualisation (cf. sub-section 5.3.7). The **black** lines and spikes represent **Marcus**' regulative activity, and the **red** lines represents **Dennis**' corresponding regulative activity (cf. sub-section 5.3.8).

A first observation that can be made in the visualisation of this regulative thread, in figure 6.28, is that Dennis truncates 12 times (11 spikes; one of which consists of two instances of truncating) in the first half of the dialogue-writing activity (highlighted in light blue), as compared to 9 times (8 spikes; one of which consists of two instances of truncating) in the last half. This difference between 12 and 9 instances of truncating may not appear very great. However, cross-reference to the time measure in figure 6.28 shows that the last half of the dialogue-writing activity, in the case of this partition, is almost five minutes longer in duration than the first half. The difference, therefore, is more in terms of instances of truncating per minute. A somewhat clearer time-ordered distribution can be seen in Dennis' focusing activity. That is, Dennis focuses more in the first half of the dialogue-writing activity (highlighted in light blue), and less in the last half of the activity (highlighted in dark blue). By contrast, Marcus' truncating and focusing activity is more evenly distributed across the dialogue-writing activity.

INSERT FIGURE 6.28

Table 6.29 summarises the two time-ordered distributions in non-prospective regulative activity across the timescale of the dialogue-writing activity.

Table 6.29: Distributions in non-prospective regulative thread; Marcus and Dennis

< Dialogue-writing activity >	
Dennis truncates more	Dennis truncates less
Dennis focuses more	Dennis focuses less
First half	Last half

Prospective regulative thread: A numerical description of the prospective regulative thread in Marcus and Dennis' learner interaction appears in table 6.30. Just as in the case of Morten and Tim, regulative activity that received uncooperative responses was rare in Marcus and Dennis' interaction. Hence, this has been excluded from the numbers in table 6.30.

Table 6.30 shows that also on this regulative thread Marcus is more active than Dennis. However, the difference between the two pupils is not as great, or persistent across regulative activities, as was the case for the non-prospective regulative thread. Only for directing activity is there a major difference between the two pupils, with Marcus directing 29 times as compared to 10 for Dennis.

Table 6.30: Numerical description of prospective regulative thread; Marcus and Dennis

	Number of instances of regulative activity*			
Regulative activity	Dennis	Marcus	Other speakers	Total
Questioning	7	5	6	18
Negotiating	16	20	8	44
Directing	10	29	11	50
Suggesting	23	24	0	47
Helping	2	4	0	6
Total	58	82	25	165

* Regulative activity that received uncooperative responses has been excluded.

The basic visualisation of the prospective regulative thread appears in figure 6.29 (see next page). Five regulative activities are represented in this visualisation (cf. sub-section 5.3.7). The **black** lines and spikes represent **Marcus**' regulative activity, the **red** lines and spikes represent **Dennis**' regulative activity, and the **blue** lines and spikes represent other speakers' regulative activity (**other pupils**, **teacher** and **researcher**) (cf. sub-section 5.3.8).

The visualisation of the prospective regulative thread reveals only two potentially significant time-ordered distributions. This is for questioning activity where Dennis can be seen asking more questions in the first half of the dialogue-writing activity (partially highlighted in light blue), and less questions in the last half (partially highlighted in dark blue). Marcus, however, asks all his questions in a nine-minute period (cf. time measure at the top of figure 6.29) in the middle of the dialogue-writing activity (partially highlighted in green), and no questions in the beginning and end of the activity (partially highlighted in yellow). The visualisation of the prospective regulative revealed no time-ordered distributions in the remaining prospective regulative activities.

Table 6.31 summarises the two time-ordered distributions in questioning activity across the timescale of the dialogue-writing activity.

Table 6.31: Distributions in prospective regulative thread; Marcus and Dennis

< Dialogue-writing Activity >		
Beginning	Middle	End
Marcus does not ask questions	Marcus does ask questions	Marcus does not ask questions
Dennis asks more questions	Dennis asks less questions	
First half	Last half	

INSERT FIGURE 6.29

6.4.2 Relationships Between Activity Strands and Threads

This sub-section explores the potential micro-contexts identified in the writing and attention strands to establish relationships between activity strands and treads. Just as in the visual dynamical analysis of the two previous cases of learner interaction (cf. sections 6.2.2 and 6.3.2), only those combinations of visualisations that showed identifiable relationships are included in this sub-section.

In the visual examination of single activity strands and threads two features in the writing strand, and one in the attention strand, were identified as potential micro-contexts. In the writing strand this included the pupils' composition intervals (highlighted in green in figure 6.24 in the previous sub-section), as well as the relationship between length of turns and the time it took the pupils to write the turns. In the attention strand it included the alternating focus of attention, between focus on content and writing (highlighted in green in figure 6.25 in the previous sub-section). These potential micro-contexts will be explored in turn.

Relationship between the writing and attention strands: Figure 6.30 (see next page) shows the basic visualisations of the writing and attention strands combined in a single visual display. In the writing strand the pupils' composition intervals are highlighted in green. These same intervals have been superimposed on the visualisation of the attention strand using vertical lines.

Just as for the two cases previously analysed, visual examination of this combination of activity strands shows that the alternating focus of attention is again embedded in the micro-context of the pupils' composition intervals. However, in Marcus and Dennis' learner interaction the relationship is almost invariably *two or more* full alternations between focus on content and focus on writing (the applicable composition intervals are highlighted in dark green in figure 6.30). Only in the composition interval for turn 3 is the relationship between the writing and attention strands a single alternation (highlighted in light green).

In the visual dynamical analysis of Morten and Tim's learner interaction, a double alternating relationship between focus on content and writing was referred to as a *double S-pattern*. Figure 6.31 is a magnified illustration of the double-S-pattern in the composition interval where Marcus and Dennis are writing turn 2 (which appears between lines 470 and 580 in figure 6.30).

INSERT FIGURE 6.30

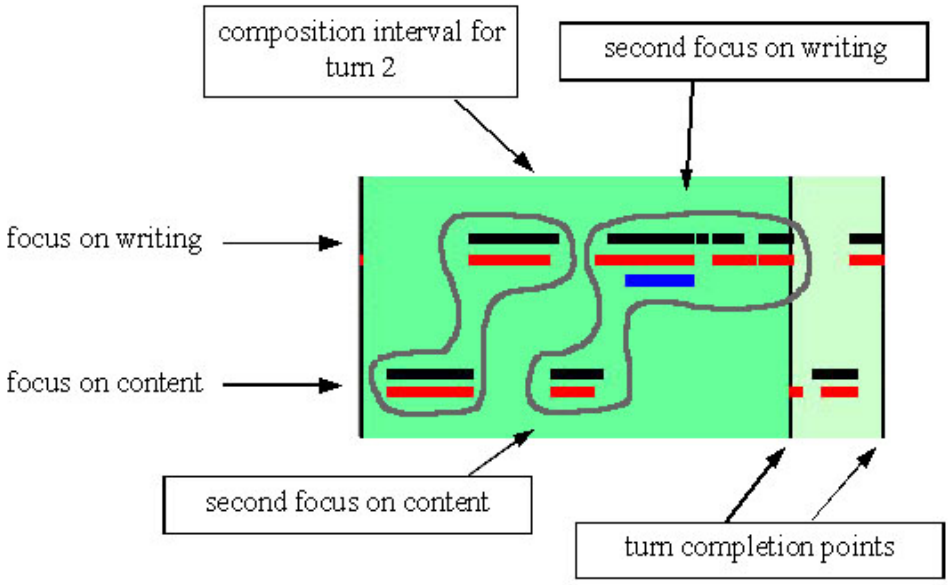


Figure 6.31: Double-S-pattern in Marcus and Dennis' learner interaction

A further insight on the double-S-pattern in Marcus and Dennis' interaction is given by its relationship to the second potential micro-context in the writing strand. That is, the combined visualisation in figure 6.30 reveals that longer composition intervals, and therefore also the pupils' writing of longer turns, is associated with the double-S-pattern. This is the case for turns 1, 2 and 4. Conversely, turn 3, which is only 4/5 words long, and which is written in about a minute, is associated with a 'single' S-pattern. An exception is the pupils' writing of turn 5, which is relatively short (4 words), and which composition interval exhibits a double-S-pattern. However, this particular composition interval was also an exception in terms of the relationship between length of turns and the duration of composition intervals (cf. discussion in previous sub-section). Furthermore, the fact that a similar relationship was made in the analysis of Morten and Tim's writing of dialogue turns (cf. sub-section 6.3.2), makes the relationship more plausible.

A related observation is that turns that contain more than one clause are associated with the double-S-pattern. That is, turns 1, 2 and 4 in Marcus and Dennis' role-play text all contain at least two clauses, and are all associated with a double-S-pattern. Conversely, turn 3 contains only one clause, and is associated with an S-pattern. Section 6.5, which summarises the different patterns observed in the three cases of learner interaction, will discuss these observations in more detail.

The visualisation of the combination of the writing and attention strands reveals one final observation. That is, in most of the pupils' composition intervals another speaker contributes to the pupils' writing. This can be determined from the presence of blue horizontal bars along the horizontal level signifying focus on writing in the composition intervals for turns 1,2 and

4 in figure 6.30 (around line numbers 350, 550, and between line numbers 650 and 700). Consulting the transcript of Marcus and Dennis' learner interaction showed that the other speaker in these cases was the teacher.

Table 6.32 illustrates that the double-S-pattern, in association with the writing of two-clause turns, appeared in the middle of the pupils' dialogue-writing activity. Note that since the double-S-pattern in the composition interval for turn 5 was not associated with a two-clause turn, it is excluded from consideration.

Table 6.32: Distributions of patterns embedded in writing strand; Marcus and Dennis

Dialogue-writing Activity		
Beginning	**Middle**	**End**
	Double-S-pattern of attention (including the teacher)	

Relationship between attention strand and language code thread: Figure 6.32 (see next page) shows the basic visualisations of the attention strand and the language code thread combined in a single visual display. The periods of time when the pupils' focus of attention is on writing the dialogue are highlighted in green. The pupils' English intonation units in the corresponding periods of time are also highlighted in green. A visual examination of these highlighted areas in the language code thread reveals that there is some association between focus on writing in the attention strand and English language use. This relationship gets stronger if one excludes the beginning and ends of the dialogue-writing activity, where two significant clusters of English language intonation units can be seen (around line numbers 75 and 850). Note that these two clusters were identified as Marcus reading from the task sheet, and the pupils rehearsing their role-play dialogue, respectively. There are also a few exceptions in the middle part of the activity. For example, there is a significant English language cluster that falls outside the highlighted area around line number 490. Hence, the cautious conclusion that can be made is that there is *some* relationship between a focus on writing and English language intonation units. This relationship is weaker than the one found for Veronica and Karen (cf. sub-section 6.2.2), but, for the middle of the dialogue-writing activity, it is somewhat stronger than the one identified in Morten and Tim's learner interaction (cf. sub-section 6.3.2).

INSERT FIGURE 6.32

An additional observation that can be made from figure 6.32 pertains to the clusters of English one-word intonation units that were observed in Marcus and Dennis' learner interaction (cf. previous sub-section). That is, the highlighted areas in the language code thread seem to account for all of these clusters. For example, clusters of English one-word intonation units around line numbers 230, 390, 610 and 890 all fall within the highlighted areas. In addition, the highlighted area also covers the many one-word English intonation units between line numbers 650 and 750. Hence, there seems to be a relationship between Marcus and Dennis' focus on writing dialogue and their use of English one-word intonation units.

Relationship between attention strand and prospective regulative thread: Figure 6.33 (see next page) shows the basic visualisations of the attention strand and the prospective regulative thread in a single visual display. The periods of time when the pupils' focus of attention is on writing the dialogue are highlighted in green, and the corresponding periods are highlighted in the visualisation of the prospective regulative threads.

This combination of visualisations shows that, except for a period at the beginning of the dialogue-writing activity, all the pupils' questions occur in the context of focus on writing the dialogue. A similarly close relationship exists for the helping thread. However, this latter relationship is an artefact of the coding scheme. That is, this could be expected given how the helping thread is defined (cf. sub-section 5.3.7). Similarly, an opposite relationship exists for the suggesting thread (it is associated with focus on generating content), but this is again an artefact of the coding scheme.

Table 6.33 summarises those relationships that are embedded in a micro-context of the attention strand, and which exhibit a time-ordered distribution across the timescale of the dialogue-writing activity.

Table 6.33: Distributions of patterns embedded in attention strand; Marcus and Dennis

< Dialogue-writing Activity >		
Beginning	Middle	End
	Relationship between focus on writing and English language use	
	Relationship between pupils' questions and focus on writing dialogue	

INSERT FIGURE 6.33

6.4.3 Synthesis of Phases in the Learner Interaction

Table 6.34 (see next page) summarises all the time-ordered distributions identified in the two previous sub-sections. This summary of time-ordered distributions shows that this third case of learner interaction can be understood in terms of the same two phase organisations as were identified in the previous two cases of learner interaction.

The yellow and green highlighted areas in table 6.34 represent the first phase organisation in Marcus and Dennis' learner interaction. This includes a first phase associated with the beginning of the activity, where there is more task management, more Norwegian spoken, and Marcus does not ask questions. By contrast, in a middle phase there is very little task management, Marcus asks questions, there are double-S-patterns in the micro-context of the composition intervals, there is a relationship between focus on writing dialogue and English language use, and a similar relationship between focus on writing dialogue and one-word English intonation units. Finally, the end phase again contains more task management, more Norwegian, and no questions asked by Marcus.

The second phase organisation, represented by the light and dark blue highlighted areas in table 6.34, divides the dialogue-writing activity into a first and a last half. Here, the first phase is associated with some asynchrony in the pupils' writing of turns, less turns written, and more focus on content. In addition, Dennis uses longer Norwegian intonation units, focuses and truncates more, and asks more questions. By contrast, in the last phase there is synchrony in the pupils' writing, more turns are written and there is more focus on writing. Moreover, Dennis uses shorter Norwegian intonation units, focuses and truncates less, and asks fewer questions.

As compared to the other two participant pairs, the phases in Marcus and Dennis' learner interaction are somewhat more pronounced than those in Morten and Tim's interaction, but somewhat less pronounced as compared to Veronica and Karen's learner interaction. Moreover, most of the time-ordered distributions used to synthesise the first phase organisation (highlighted in yellow and green in table 6.34) tend to make sense given that the pupils are doing a writing activity, and from what we know about doing writing activities. However, just as was the case in Veronica and Karen's learner interaction, fewer of the time-ordered distributions that make up the second phase organisation (highlighted in light and dark blue in table 6.34) make sense in this way. In particular, the changes in the length of Dennis' Norwegian intonation units, as well as his regulative activity, do not make any immediate sense.

The dynamics of Marcus and Dennis' learner interaction will be discussed in relation to the dynamics identified in the other two cases of learner interaction in the next section of this chapter (cf. section 6.5).

INSERT TABLE 6.34

6.5 Summary and Discussion of Patterns and Phases

This section reviews the patterns and phases identified in each case of learner interaction in turn. This is followed by a discussion of commonalities between the patterns and phases identified in the three cases of learner interaction.

Two phase organisations were identified in the visual dynamical analysis of Veronica and Karen's learner interaction (cf. table 6.12 in sub-section 6.2.3). This included a first phase organisation dividing the dialogue-writing activity into beginning, middle and end phases, and another phase organisation dividing the activity into first and last phases. Moreover, the first phase organisation was synthesised by time-ordered distributions that appeared to make sense given that the pupils were doing a writing activity, and from what we know about doing writing activities. By contrast, the second phase organisation was synthesised with time-ordered distributions that not all made sense from such a perspective. Figure 6.34 contains an illustrative version of these two phase organisations in Veronica and Karen's learner interaction

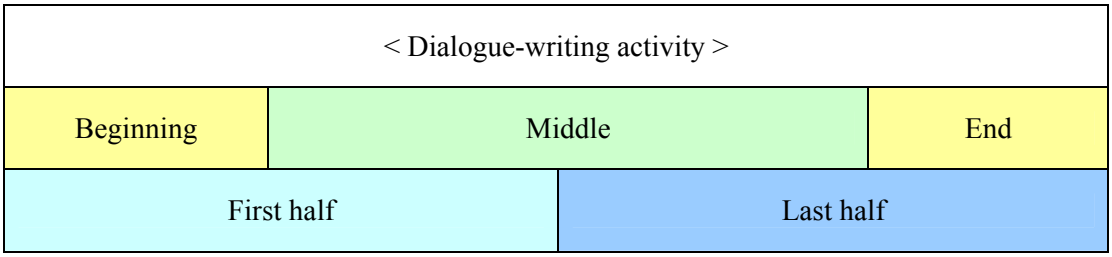


Figure 6.34: Illustration of phases in Veronica and Karen's learner interaction

The visual dynamical analysis of Veronica and Karen's learner interaction also identified a number of relationships between activity strands and threads. In the micro-context of the composition intervals of the writing strand there was an S-pattern in the attention strand. This S-pattern spanned both the synchronous and asynchronous parts of the pupils' composition intervals. This S-pattern is illustrated in figure 6.35.

There was also a relationship between the S-pattern and the language code thread, as shown in figure 6.36. However, there was some variability in both the S-pattern and the overall pattern involving the combination of writing and attention strands, and the language code thread. That is, the S-pattern was more easily identifiable in the middle of the dialogue-writing activity, corresponding to the middle of the first phase organisation (highlighted in green in figure 6.34), as well as in the first half of the dialogue-writing activity, corresponding to the first half of the second phase organisation (highlighted in light blue in figure 6.34). Moreover, the overall pattern, involving the language code thread, was also more visible in

the first half of the dialogue-writing activity, and less clearly identifiable in the last half of the activity. Again, this seemed to correspond to the second phase organisation in the pupils' interaction.

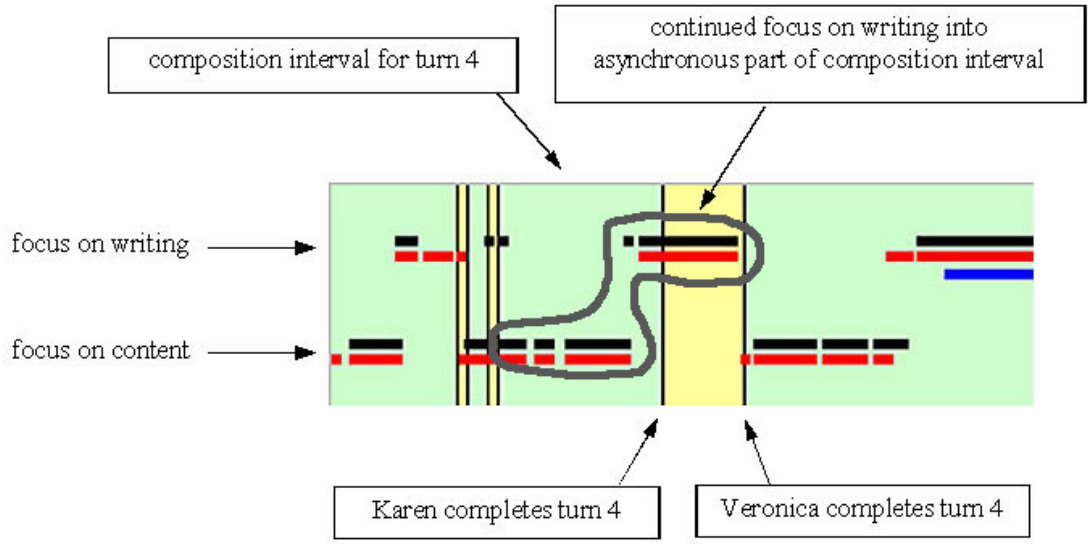


Figure 6.35: S-pattern in Veronica and Karen's learner interaction

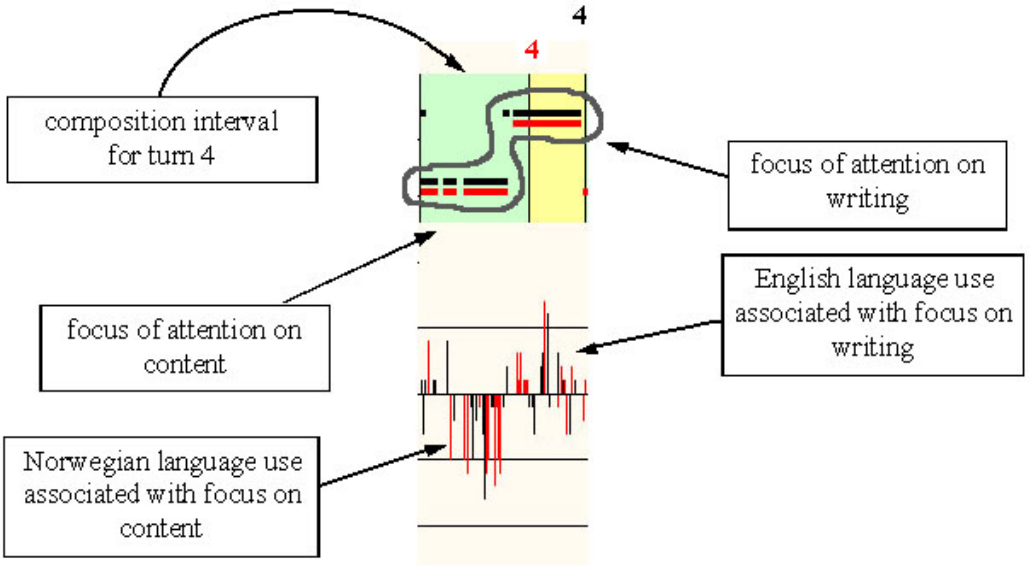


Figure 6.36: S-pattern and language code thread in Veronica and Karen's learner interaction

The visual dynamical analysis of Veronica and Karen's learner interaction also revealed relationships between the writing strand and regulative threads. In the first half of the dialogue-writing activity, Karen could be seen offering unsolicited help to Veronica in the asynchronous parts of the composition intervals (cf. figure 6.10 in sub-section 6.2.2). In these same asynchronous intervals, Karen also refrained from any non-prospective regulative

activity (cf. figure 6.9 in sub-section 6.2.2). In the last half of the dialogue-writing activity, however, the reverse was the case. That is Karen did not offer help, and she proceeded with her own non-prospective regulative activity in the asynchronous parts of the composition intervals. This change across the timescale of the dialogue-writing activity seemed to correspond to the second phase organisation in the pupils' learner interaction (highlighted in light and dark blue in figure 6.34).

Finally, the above interrelationships, between the patterns and phases identified in Veronica and Karen's learner interaction, suggest a dynamical relationship between the patterns and phases. Hence, both the patterns and the phases of the pupils' learner interaction, as well as the interrelationship between these, must be taken into account in a full description of the dynamics of these pupils' learner interaction.

The same two phase organisations, as were identified in Veronica and Karen's learner interaction, were also evident in the visual dynamical analysis of Morten and Tim's learner interaction. However, as compared to the first case of learner interaction, the phases in Morten and Tim's case were much less pronounced, associated with fewer time-ordered distributions across the timescale of the dialogue-writing activity (cf. table 6.22 in sub-section 6.3.3), and did not seem to affect the relationships between activity strands and threads as much. Moreover, the time-ordered distributions used to synthesise both phase organisations appeared to make sense from the perspective of what we know about doing writing activities.

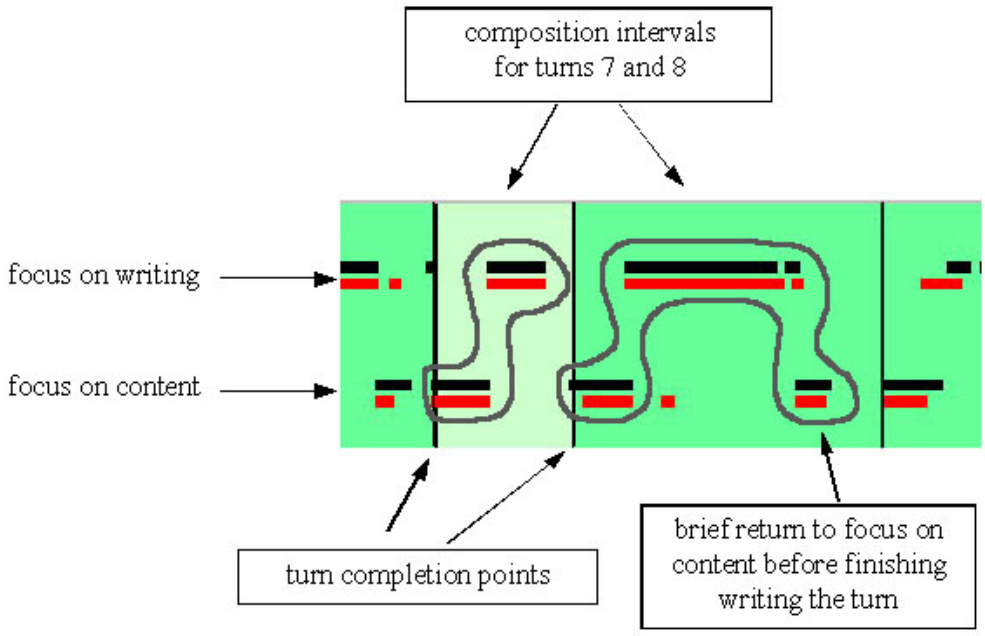


Figure 6.37: S-pattern and S-plus-pattern in Morten and Tim's learner interaction

An S-pattern in the attention strand was also a feature in the visualisation of Morten and Tim's learner interaction. However, in their case there were also S-plus-patterns, as well as double-S-patterns. Furthermore, these different patterns appeared in the micro-context of composition intervals that were mostly synchronous. Finally, S-patterns tended to be associated with the composition of shorter dialogue turns, while the more intricate S-plus-patterns and double-S-patterns tended to be associated with the composition of longer dialogue turns. Figure 6.37 illustrates the occurrence of the S-pattern and the S-plus-pattern, in this second case of learner interaction.

A final pattern in Morten and Tim's learner interaction was between the writing strand and the non-prospective regulative thread. That is, most composition intervals in the writing strand would begin with focusing activity. This was the case for composition intervals characterised by both S-patterns and S-plus-patterns.

In Marcus and Dennis' learner interaction the same two phase organisations, as were identified in the other two cases, were again visible. In this case the phases were more clearly visible, and associated with more time-ordered distributions, than in Morten and Tim's case. However, the phases were somewhat less visible, and associated with less time-ordered distributions, than in Veronica and Karen's case (cf. table 6.34 in sub-section 6.4.3). Nevertheless, the phases did seem to have some effect on the relationships between activity strands and threads in Marcus and Dennis' learner interaction. In addition, some of the time-ordered distributions making up the second phase organisation (highlighted in light and dark blue in table 6.34 in sub-section 6.4.3) did not appear to make sense from the perspective of what we know about doing writing activities.

In the micro-context of Marcus and Dennis' composition intervals, the predominant feature was a double-S-pattern. Just as was the case in Morten and Tim's learner interaction, there was little asynchrony in the pupils' composition of turns. Hence, the double-S-pattern appeared in mostly synchronous composition intervals. The double-S-pattern only appeared *after* an initial period of task management, and was less clearly visible at the end of the dialogue-writing activity. Hence, the pattern seemed to be affected by the first phase organisation in the pupils' learner interaction. Figure 6.38 illustrates the double-S-pattern in Marcus and Dennis' learner interaction.

Another pattern in Marcus and Dennis' interaction was that the teacher contributed to the pupils' focus of attention in most of the composition intervals. There was also some association between focus on writing dialogue and the pupils' use of English. However, this relationship did not apply to the beginning and end phases of the pupils' dialogue-writing activity. Finally, there was a relationship between Marcus and Dennis' focus on writing dialogue in the attention strand and their questions in the prospective regulative thread. That

is, except for the beginning of the dialogue-writing activity, most of the pupils' questioning activity occurred when they focused on writing dialogue.

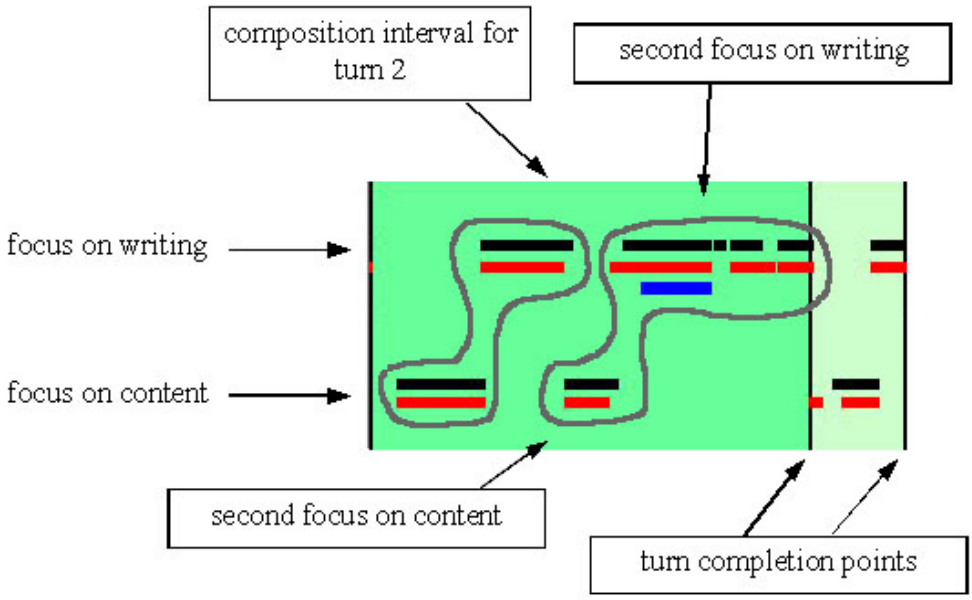


Figure 6.38: Double-S-pattern in Marcus and Dennis' learner interaction

Finally, combining the findings from the three cases of learner interaction provides some additional insight into the different patterns and phases identified through the visual dynamical analysis.

First of all, all three cases of learner interaction exhibited the same two phase organisations (cf. figure 6.34 in this sub-section). Hence, to varying degrees, all pupil pairs went through qualitatively different periods of learner interaction. However, since the two phase organisations, in part, were given by the way the time-ordered distributions in activity strands and threads were identified, the more important observation is that the 'strength' of the phases varied, and that they showed different interrelationships with patterns, across the three cases of learner interaction. For example, the phases were more clearly evident in Veronica and Karen's interaction, and the least clearly evident in Morten and Tim's interaction. This may relate to the fact that Veronica and Karen were considered a heterogeneous pair, and Morten and Tim a homogeneous pair (cf. sub-section 4.3.2). Whether this is the case or not, the different 'strength' in phases across these two pupil-pairs constitutes a potentially significant difference in dynamics. This difference is evident from the fact that in Veronica and Karen's interaction the phases could be seen to affect patterns, and vice versa. In the case of Morten and Tim, such a dynamic interrelationship could not be established. This may mean that Veronica and Karen's learner interaction is less stable, involving more contingencies arising during the dialogue-writing activity. In contrast, Morten

and Tim's learner interaction appears more stable, with less contingencies arising during the activity. In pedagogical terms, this might mean that Veronica and Karen are less able, and Morten and Tim more able, to get on with the task at hand, i.e., the dialogue-writing activity. Chapter seven, which presents an in-depth analysis based on the outcomes of the visual dynamical analysis, will explore this possibility in the case of Veronica and Karen's learner interaction.

Another commonality between the three cases of learner interaction was that the 'simple' S-pattern seemed to be fundamental in describing the relationship between the writing and attention strands. This is because the double-S-pattern only tended to occur when the turn the pupils composed contained more than one clause. In other words, when the pupils were writing a turn with two clauses, the 'single' S-pattern would manifest itself *twice* in a single composition interval, and would thus appear as a double-S-pattern in the visualisation of the interaction. Furthermore, the S-plus-pattern only seemed to occur in composition intervals where the pupils were attempting to compose longer dialogue turns. However, also here the S-pattern was fundamental, with the only difference being a brief return to focus on content towards the end of the composition interval.

The pedagogical significance of the S-pattern may be interpreted in combination with the relationship between the pupils' focus on writing dialogue and English language use. This relationship was most evident in Veronica and Karen's learner interaction (cf. figure 6.36 in this section). Hence, it appears that Veronica and Karen approached the dialogue-writing activity by formulating content in Norwegian, and only when this ideational content was established did they use any English. By contrast, the relationship between focus on writing dialogue and English language use was the weakest in the case of Morten and Tim. Moreover, these pupils used as much English as Norwegian throughout the dialogue-writing activity (cf. figure 6.16 in sub-section 6.3.1). Hence, as compared to Veronica and Karen, it may be that these two pupils used Norwegian and English differently in their composition of dialogue turns.