MANAGING AND ANALYSING TASK-BASED INTERACTION IN DIGITAL TABLETOP ENVIRONMENTS

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ABSTRACT

This study aimed at developing a model that can facilitate the analysis of second language task-based interaction. The study used a combination of methods and technologies so that the model can enable a holistic analysis of task-based interaction. Task-based Language Teaching, multimodality, Conversation Analysis and the Tabletop technology made up the key components of the model. It is argued that the model can enable a holistic analysis of task-based interaction.

The problem of analysing task-based interaction has been documented in the literature. Students' interaction in tasks is very fluid and dynamic. Previous research fails to capture in fine detail the intricacies and multimodal nature of task-based interaction. This is one reason why a holistic model is needed to portray the details of what happens in language classrooms.

The study applies the model to data collected from a digital Tabletop environment. Analysis of the data shows how participants synchronise verbal and non-verbal resources using precise timing to accomplish the task. Multimodal analysis in this study can reveal the mutual interplay between verbal and non-verbal resources and how these resources are used to organise action. Analysing the data using the model also shows that participants develop unique speech exchange systems that involve a lot of non-verbal communication to accomplish tasks in the Tabletop environment. Furthermore, it is possible to apply the model to outline the main characteristics of task-based interaction.

This study contributes to an emerging line of research which explores the interplay between interaction, multimodality, and technology in language classrooms. The model is a promising tool that could potentially allow researchers to unravel how learning precisely happens in task-based classrooms.

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DEDICATION

This thesis is dedicated to the memory of my father and mother who passed away before the culmination of this journey.

DECLARATION

I declare that Chapter 5 contains some material which has already been published collaboratively with Prof. Paul Seedhouse.

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CHAPTER 1: INTRODUCTION

1.1 Research overview

The process of globalisation appears to be accelerating at a relentless rate and affecting all aspects of life around the globe. The whole world is becoming more closely connected than ever. We are living in an era of interdependency. Economic factors and international trade are connecting the world together. Recent developments in communication technologies have enabled people to connect and engage with each other at a global level. People from different places can interact socially using various technological means. Technology is enabling companies as well as individuals to maintain constant contact with people and communities around the world. Technology has been one of the two major forces driving globalisation, the other being the English language (Tsui and Tollefson, 2007).

The use of English has been spreading rapidly and it has become the world's most spoken language (see, e.g., Crystal, 2003, 2008; Seidlhofer, 2004, 2008; Kirkpatrick, 2007). English has become the global language. It is the language of business, education and the media in many parts of the world. It is the official language in many countries in addition to English-speaking countries such as the USA and the UK. All over the globe people are learning English for a variety of purposes. The dominance of this language is undeniable. English has become the preferred means of disseminating the massive body of knowledge being produced around the world. This demand for English has obviously increased the need for learning and teaching it.

Human communication is not restricted to the spoken word. As people interact with each other they not only use language per se but also rely on non-verbal resources. Multimodal communication is ever-present in all human interaction. Humans use talk,

gesture, gaze and the material environment when they communicate. For example, in classrooms students not only use talk when interacting with teachers or peers but also deal with the local environment - the book, the board, etc. The study of multimodality is thus important for the study of classroom interaction and discourse (Jewitt, 2006, 2009; O'Halloran et al., 2010). To understand the complexity of interaction in the language classroom we need to take into account the various multimodal resources that students employ.

Multimodality in the language classroom has not gained centre stage status and remains an under-explored area in second language research. With the advent of new technologies the juxtaposition of various modalities became possible. Technology has now made possible the interactive combining of text, audio, video and visual elements, and the same technology that can be used to present knowledge can also be used for the analysis of such multimodal environments. Kress (2000) claims that it is now "impossible to make sense of texts, even of their linguistic parts alone, without having a clear idea of what these other features might be contributing to the meaning of a text" (p. 337). Clearly there is a need for a further exploration of the nature of multimodal interaction in classrooms using the latest available technological resources.

Recent developments in technology, such as the emergence of Tabletop technology (see chapter 2, section 2.9.2), make it possible to track and capture the micro details of the interaction in language classrooms, including talk, gesture and other multimodal actions. Human interaction, whether in classrooms or anywhere else, is extremely dynamic and fluid. It has previously been very difficult to acquire a full picture of the interactional phenomenon. Task-based interaction in classrooms is one of the settings where it has been difficult to obtain a holistic view of the interaction. Technology can now help to give us a clearer picture of the details of task-based

interaction. It is now possible to see the different aspects of the interaction as they evolve in time. These involve talk, gesture, multimodal actions and the environment.

Research into the teaching of English as a second or a foreign language has always been vibrant and is constantly developing. Over the years various methodologies and approaches have been developed for the teaching of English. One such method is Task-Based Language Teaching (TBLT). TBLT is widely used in language classrooms nowadays and has also been extensively researched. However, some aspects of TBLT remain difficult to pin down. One of these aspects is the analysis of task-based interaction. Interaction involves a large number of processes and elements, including non-verbal communication, and this makes it immensely difficult to analyse. Generally speaking, tasks in language classrooms are plans of action. The actual interaction that takes place during the enactment of those plans is variable and has not been properly examined owing to its complexity and indexical nature. It would thus be interesting to portray what actually happens during the processes of tasks, including the non-verbal part of the interaction. This might lead to understanding how learning takes place in tasks. To accomplish this, this thesis proposes a model that incorporates various elements. These include TBLT, CA, the Tabletop technology and multimodality. Task-based interaction taking place in the Tabletop environment is analysed using CA, taking into account the multimodal resources employed by the students.

1.2 Task-Based Language Teaching

TBLT has gained recognition since the 1970s, when educators and researchers began to be interested in communicative language teaching (Brumfit and Johnson, 1979). Since then, there has been more emphasis on meaning and on the need for learners to communicate and exchange information (Harmer, 1983; Wesche and Skehan, 2002). One of the reasons for this change was that educators had realised that

focusing solely on structure in language teaching did not produce good results, and that a focus on meaning was also necessary (Widdowson, 1978). This pedagogical development led to the emergence of task-based teaching and learning, the aim of which is to help learners to communicate collaboratively through the use of tasks. Learners' interaction during tasks is believed to enhance the process of language acquisition as learners try to understand each other and to express their meaning (Larsen-Freeman, 2000: 114).

Task-based language teaching is widely supported in the literature and its potential in language learning and communicative language teaching is well recognised. The notion that language is primarily a tool for making meaning is emphasised in task-based learning. Skehan indicates that in task-based learning "meaning is primary…the assessment of the task is in terms of outcome", and that task-based learning is not "concerned with language display" (Skehan, 1998: 98). The importance of verbal interaction in language learning and development has been emphasised by many research studies (e.g., Long, 1996; Gass, 2003). For example, Long (1980) suggests that the interactional modifications that occur during the interaction make the input more comprehensible. He also argues that there is a theoretical link that connects interactional modification, comprehension and acquisition. Ellis (1994) asserts that interaction helps to make the linguistic data more salient for the learner.

The above discussion shows that TBLT is an interesting and important area for language teaching and learning. As one might expect, various aspects of TBLT have been widely researched. However, one key problem that remains unsolved is the fact that it is difficult to analyse task-based interaction. The interaction that takes place during task processes remains complex and not easy to disentangle owing to its indexical nature, and also because it involves a non-verbal element that affects how

humans interact. It has been extremely difficult to relate the actions performed by the task takers and their non-verbal communication to the talk produced during tasks. This thesis proposes a model for analysing task-based interaction using a combination of tools. The proposed model was tested during the research process. Task-based interaction data were collected from a digital Tabletop environment, which captures in great detail task-related activities. These multimodal task-based interaction data were then analysed using Conversation Analysis (CA) methods in order to examine closely the micro details of the interaction. Video recordings of the activities were also fed into the model for analysis. The findings suggest that the model makes it possible to analyse task-based interaction in more detail than ever before. This in turn might allow researchers to see how and when learning takes place in TBLT.

1.3 Why Task-Based Interaction?

The majority of research efforts in Task Based Language Learning (TBLL) have always focused on tasks as plans for language pedagogy, while not much emphasis has been placed on the actual processes that students engage with in the classroom. This research was concerned with the analysis of task-based interaction. In language classrooms teachers use tasks to help students practise the language. The task that is given to the students is merely a plan of what should happen (task-as-workplan)[1]. What the students actually do with the task (task-in-process)[2] might not necessarily go as suggested by the plan (see Coughlan and Duff, 1994; Donato, 2000; Foster, 1998; Ohta, 2001; Seedhouse, 2005). This is why I have focused on the actual enactment of the task, that is, the processes that take place when the students perform the task. That is where the actual pedagogy happens. The processes of task-based interaction are very complex and extremely variable, which is why there is a need to find better ways of analysing

[1] See chapter 2, section 2.3 for a more detailed discussion of this term.
[2] See footnote 1, above.

task-based interaction. In this research, therefore, a holistic model was used and CA and Tabletop technology were employed in an attempt to analyse episodes of naturally occurring task-based interaction. Published work that treats task-based interaction in this manner, especially with the use of such technology, is scarce. This study represents a move forward in this direction. The intention was to obtain a better understanding of the realities of the interaction that takes place during tasks around digital Tabletop displays, and to demonstrate how the proposed model might help us construct a holistic view of task-based interaction.

In this research an analytical model, using CA as the theoretical basis, was developed to analyse TBI. The results are described in this thesis. This research adds to the body of research that has called for a social shift in studying second language learning (e.g., Firth and Wagner, 1997, 2007; Schegloff et al., 2002; Wagner, 2004). The majority of research into Task-Based Language Teaching and Learning has been conducted from a product-oriented perspective. This study, on the other hand, adopted an emic perspective in order to examine closely the micro-moments of interaction in the Tabletop environment. Task-based interaction was looked at from a microanalytic perspective[3] by employing Conversation Analysis as an analytical tool. CA was chosen because it is a powerful tool that can capture the nuances of dialogic talk. CA methods make it possible to look at the micro details of interaction. The use of CA thus adds value to the proposed model and enables it to reveal the organisation of task-based interaction in detail. TBI is seen here as a locally situated activity. Participants' contributions to talk are context-shaped, in the sense that "they cannot be adequately

[3] This perspective has also been adopted by many researchers studying task-based interaction (e.g., Markee, 2000, 2004a, 2005b; Mori, 2002, 2004; He, 2004; Kasper, 2004; Mondada and Pekarek Doehler, 2004; Olsher, 2004; Hellermann, 2006, 2007; Jenks, 2006, 2009a).

understood except by reference to the sequential environment in which they occur and in which the participants design them to occur" (Seedhouse, 2005).

Another aspect of task-based interaction that makes it an interesting subject for research is that it involves a great deal of non-verbal communication. This is because students in groups have to exchange gaze and use gesture while communicating. This was important in this research as the proposed model involves the analysis of non-verbal communication. Participants have to employ non-verbal resources when working in the digital Tabletop environment. The nature of the task requires them to manipulate the surface of the Tabletop by moving, connecting and grouping things. Gesture and interaction have been examined and explored in numerous studies (e.g., Goodwin, 1979, 1986, 2000, 2003; Goodwin and Goodwin, 1986; Hayashi, 2003, 2005; Heath, 1986; Hutchins and Palen, 1997; Murphy, 2005; Sidnell, 2005; Schegloff, 1984; Streeck, 1993, 1994, 2003; Streeck et al., 2011). The current study adds to that body of research as the proposed model gives a holistic view of task-based interaction incorporating gesture, talk and other multimodal resources.

1.4 Statement of the Problem

Task-based interaction (TBI) has been at centre stage for many years now. It has received increasing attention in language teaching and learning research. However, there remains a difficulty in analysing the processes that take place during the interaction in TBI owing to the indexical nature of that interaction. This is the problem that was addressed in this research. If we succeed in analysing TBI we might be able to relate the interaction to the learning process and thus understand TBLT better. There is much support for TBLT on the grounds that it enhances language learning and development. However, the analysis of this phenomenon has always been elusive and complex. To understand TBLT fully it is necessary to have a clearer picture of the

learning processes that take place during the interaction. Swan (2005) points to the lack of sufficient evidence of how TBLT operates in real teaching contexts, and clearly, studying interaction is an important part of this. In this study an attempt was made to solve the problem by developing a model that makes the holistic analysis of TBI possible. To the best of my knowledge no other researchers have attempted to analyse TBI in this manner. The only exception is Seedhouse and Almutairi (2009)[4], who tried to analyse TBI in a similar fashion. This study therefore attempts to provide insights into how TBI can be analysed more effectively. Seedhouse (1999) indicates that there is a need to look into the benefits of task-based interaction using a "holistic analysis of interaction" that is based on lesson transcripts. This study attempts to fill this gap by proposing a model for analysing TBI holistically, including verbal and non-verbal communication.

1.5 Purpose of the study

The primary aim of this Conversation Analysis (CA)-inspired qualitative study was to tackle the difficulty in analysing task-based interaction. This was achieved by developing a model that incorporates various elements. As described above, the analysis of TBI has always been very difficult and it has not previously been possible to analyse it holistically. In this research the model was applied in the hope of demonstrating how participants manage their task-based interaction around the digital Tabletop.

This study represents a venture into an unexplored terrain in the sense that it involves the application of a technological innovation to the area of task-based interaction. It is unique in the sense that it develops a model to analyse task-based interaction in an under-researched environment taking into account verbal and non-verbal resources. The study also contributes to research which explores gesture and non-

[4] This article is based on a pilot study that I conducted earlier.

verbal communication in language learning settings. This line of research is clearly under-researched in second language studies.

This study is original in various ways. Firstly, this study may be regarded as the first research effort to develop such a comprehensive model to analyse TBI in the digital Tabletop environment taking into account verbal and non-verbal communication. TBI has never been analysed as holistically and as meticulously as is done using the proposed model. The model takes into account the details of interaction and the non-verbal communication. Secondly, second language literature calls for a deeper understanding of TBLT and how it operates in real contexts (Swan, 2005). The current study is unique in how it approaches the analysis of TBI using Conversation Analysis, the Tabletop technology, and taking into account non-verbal communication. CA is a tool that enables us to see the moment-by-moment details of the interaction, while the Tabletop can provide rich details about the interaction taking place. The inclusion of these two tools in the proposed model could result in the creation of a powerful method of revealing the complexity and details of task-based interaction.

1.5.1 Research questions

The aim of this research was to develop a model that would make possible a holistic analysis of the micro details of task-based interaction. This goal has been very difficult to achieve in language studies. In this study it is achieved by incorporating various elements: TBLT, multimodality, CA and the Tabletop, into a model that gives us a more comprehensive view of the processes of task-based interaction. The proposed model was developed and applied to data collected from second language learners performing a language task in a digital Tabletop environment.

The aim of the study was to answer the following questions:

1. Is it possible to develop a holistic model that facilitates the analysis of task-based interaction?
2. Does the model enable a holistic analysis of task-based interaction?

Answers to these two questions are provided in Chapters 4 and 5. The discussion in chapter 4 answers the first question. The proposed model and its various components are presented in detail. Chapter 5 describes the application of the model to second language data to show how it makes possible a holistic analysis of task-based interaction.

1.6 The role of technology

Technology represents an important part of this study. Various technologies were used as part of the overall model for analysing task-based interaction, one of these being the digital Tabletop (discussed in detail in chapter 2, section 2.9.2). This is an innovative technology that has never been used in analysing task-based interaction in the manner discussed in this thesis. This technology is a key element in the proposed model for analysing TBI for a number of reasons. One reason is the fact that it is a horizontal digital surface that allows face-to-face communication among learners, so its configuration is perfectly suitable for analysing tasks as learners interact in pairs or groups. Another reason is its ability to capture in great detail what happens during tasks. It can keep track of movement on the surface and can sort out who is doing what at all times during the interaction. Another form of technology that was used as part of the model is Transana, which is a piece of software suitable for the multimodal analysis of conversation. Transana puts video, text and audio data together in one place so the analyst can look at all the data simultaneously. Using Transana the data can be played synchronously so that we can see the different aspects of the interaction at the same time. Video technology was also used in this research, and video recordings of the

learners performing the task were also used to feed the model. These represent an important element of the model as they show the learners' non-verbal behaviour around the Tabletop. It will be demonstrated that these types of technology allow a closer look at the details of interaction from different perspectives. By incorporating these elements in the model a holistic view of task-based interaction, which is missing in the study of TBLT, can be achieved (see chapter 4, section 4.2).

1.7 Thesis outline

This thesis is composed of seven chapters, of which this is the first. In this chapter a brief overview of research relevant to the study has been provided. The purpose of this research and the research questions have been presented, and the important role that technology plays in this study has been highlighted.

The second chapter provides an overview of the relevant literature and positions this research within that literature. It argues that there is a need for a holistic analysis of task-based interaction and identifies the characteristics of a holistic model that would make this possible. This chapter puts forward the argument that task-based interaction has previously been difficult to analyse and shows how such a holistic model is needed to inform our understanding of TBI.

The third chapter presents the methodological foundation of the study. It outlines the methodological basis, tools and procedures used in this research. The chapter starts by re-establishing the focus of the study and the research questions. It then states the research paradigm and epistemological position taken in this research. The main analytical tool, Conversation Analysis, is also discussed and the way in which it adds value to the model is presented in this chapter. The discussion proceeds with a brief overview of multimodality and how embodied actions were treated in this

research. This is followed by a detailed description of the main study, including a detailed illustration of the digital task. An outline of the data preparation, collection and analysis procedures is then presented. Issues of reliability, validity and ethical issues related to this research are discussed, and the chapter concludes with a description of the limitations of the study.

In the fourth chapter the first research question is answered by presenting the proposed model and identifying its various components. The chapter starts with a brief discussion of the model showing what makes it holistic. The discussion then proceeds with a detailed description of each component of the model. The chapter concludes with an overview of how the model works with all its components in place.

The fifth chapter provides an answer to the second research question by presenting the data analysed using the model. It shows how the proposed model can be used to analyse task-based interaction. In this chapter the model is used to analyse data to see if it can enable a holistic analysis of TBI. The analysis of the data shows how the model can reveal the mutual interplay between and synchronisation of the verbal and non-verbal elements of task-based interaction. This chapter also shows that the holistic analysis demonstrates how participants develop unique speech exchange systems that involve a great deal of non-verbal communication to accomplish tasks in the Tabletop environment. The analysis also shows how the model is able to portray the complexity of task-based interaction. The chapter concludes with a discussion of the characteristics of task-based interaction.

The sixth chapter contains a summary and discussion of the research findings. An overview of how the model was developed and applied to data is presented. This chapter presents a discussion of the results that emerged from applying the model to

second language data. Following this, the research findings are located within the relevant literature.

In the last chapter of this thesis the final conclusions of this research are presented. The chapter also contains some reflective thoughts on the model and on the methodology used in this study. Furthermore, this chapter sheds light on the implications of this study for research into second language learning. More specifically, it is shown how the findings of this study could effectively inform the research and practice of TBLT. The chapter concludes by making some recommendations for possible directions for future research.

CHAPTER 2: LITERATURE REVIEW

2.1 Introduction

This chapter positions the present study within the relevant literature. The chapter presents the argument that there is a need for a holistic analysis of task-based interaction and identifies the characteristics of a model which could make this possible. TBI is a complex phenomenon that is difficult to analyse. It will be shown how such a holistic model is needed to gain a better understanding of TBI.

This chapter is divided into eight sections. The first section is an introduction to the chapter. The second section (2.2) introduces Task-Based Language Teaching and provides an overview of some published work on TBLT. Section 2.3 provides a detailed discussion of task-based interaction and some of its characteristics. These characteristics of TBI establish part of the argument for the need to analyse TBI holistically. The discussion in section 2.6 presents additional supporting evidence for this argument, explaining how, despite the fact that TBLT is often claimed to promote language learning, little evidence has been provided to show how that happens in real contexts. This section explains the reasons why we need a more efficient method of analysing TBI. It also highlights the emic perspective (section 2.6.1) that has been adopted in this study. Section 2.7 outlines research that has examined non-verbal communication with an emphasis on its use in language learning settings, and the reasons why there is a need to examine non-verbal communication in the analysis of TBI are explicated. Section 2.8 introduces an important aspect of this thesis, i.e., Conversation Analysis (CA). This section provides an introduction to and a definition of CA and surveys the range of studies that have adopted CA as a methodology. It also reviews the use of CA in second language research and its contribution to that field of study. An overview of Computer Assisted Language Learning (CALL) is given in Section 2.9. This section also

introduces the Tabletop (2.7.2) and shows how it fits within CALL research. An overview of research that has involved the use of the Tabletop is also provided (2.7.3). The relevance of and rationale behind using the Tabletop to analyse TBI is explained in section 2.9.4. The final section (2.8) contains a summary of this chapter.

2.2 Task-Based Language Teaching and Learning (TBLT)

This section provides a brief introduction to TBLT in order to set the stage for the subsequent discussion of task-based interaction. TBLT is the underlying teaching approach in which tasks are used and researched and where TBI takes place. The present study evolved under the overarching umbrella of TBLT. The aim was to find ways of analysing TBI in a manner that could inform our understanding of TBLT and the learning processes that take place.

The interest in task-based learning and teaching was triggered by the 1970s move toward communicative language teaching (Brumfit and Johnson, 1979). During that period there was a growing emphasis on the need for learners to focus on meaning and to convey information to one another (Geddes and Sturtridge, 1979; Harmer, 1983; Wesche and Skehan, 2002). The widespread assumption at that time was that focusing on structure in language teaching was insufficient, and that language teaching needed to be enhanced by including a similar focus on meaning (Widdowson, 1978). This pedagogical development paved the way for the emergence of task-based teaching and learning, the aim of which is to help learners to communicate effectively by giving them the space and freedom to do so through the use of tasks. While learners are working on tasks they have the opportunity to interact and communicate. This interaction is thought to aid in language acquisition as the learners attempt to understand each other and try to express their meaning (Larsen-Freeman, 2000: 114).

Task-based language teaching is supported by a wealth of theoretical proposals that illustrate its potential effectiveness in language learning and communicative language teaching. First of all, it is aligned with most of the underlying assumptions about the nature of language. For example, the notion that language is primarily a tool for making meaning is emphasised in task-based learning. Skehan indicates that in task-based learning "meaning is primary…the assessment of the task is in terms of outcome" and that task-based learning is not "concerned with language display" (Skehan, 1998: 98). This approach also supports the notion that conversation is a key element in language acquisition. Tasks in one way or another involve communicating and exchanging information. Some of the principles underlying communicative language teaching are also subsumed in task-based learning. The tasks provide the input and output that could lead to negotiation and interaction and thus to language acquisition. Another aspect is the fact that the tasks by nature can be motivational for the learners and thus can promote learning.

In task-based learning and teaching the emphasis is on the use of tasks and especially those that involve real use of the target language. The assumption here is that learners learn the language by interacting and engaging in tasks that trigger genuine communication. In this approach the focus is on the communicative process itself as it is regarded as the space where language learning takes place. Tasks that lead to meaningful use of the target language are more likely to be conducive to learning. In this approach tasks are employed in a specific order, and in a task-based syllabus are normally sequenced according to their difficulty. Task difficulty is another notion that is often discussed in TBLT research and that includes several elements, including the learner's previous experience, the complexity of the task, the level of support provided, and the linguistic ability required to perform the task (Richards and Rodgers, 2001).

Furthermore, it should be noted that in TBLT students work in pairs or groups to accomplish tasks. After allocating the task to the students the teacher withdraws and gives the floor to the students. The students have to work together to work out the task at hand. They have to talk and exchange information collaboratively. Teachers normally monitor students' interaction and intervene when needed. TBLT works well with the digital Tabletop in the sense that it requires people to work in groups and communicate with each other. This is one reason why the Tabletop is an important element of the proposed model for analysing TBI. It represents an ideal environment where TBLT can take place, and the researcher can monitor, track and record the interaction for analysis.

Task-based language teaching and learning has attracted a great deal of attention on the part of second language researchers and educators. This approach has been the key topic of many studies in second language research (see Bygate, Skehan and Swain, 2001; Crookes and Gass, 1993; Eckerth and Siekmann, 2008; Ellis, 2003; Robinson, 2011; Samuda and Bygate, 2008; Skehan, 1998a). These studies and this orientation, however, fall outside the scope of this research as it adopts a CA-inspired emic approach.

This section has provided a general overview of TBLT. TBLT has been brought into the discussion because it involves task-based interaction, which is an important focus in this research, since the principal aim of the study was to facilitate the analysis of TBI. Despite the enormous interest in TBLT among the research community, a holistic analysis of the interaction that accompanies it is still difficult to achieve, and is what this study has attempted to accomplish. The following section introduces TBI in more detail.

2.3 Task-based interaction

This section introduces task-based interaction and provides a description of the features of task-based interaction. It also touches on the conceptual debate concerning the term 'task' and the different phases of a task (Breen, 1987). This introduction to TBI is necessary in order to lay the foundation for the next section (2.4), which deals with the need to analyse TBI. This section describes the characteristics of TBI which form the basis of the need for a holistic analysis of TBI.

Various approaches have been adopted in earlier research on task-based interaction. Skehan (2003) has summarised three main approaches: the psycholinguistic, cognitive and sociocultural approaches. The psycholinguistic approach is influenced by Long's (1983, 1989) work on the negotiation of meaning. One of the concerns in this approach is to explore those conditions and characteristics that lead to tasks showing more 'beneficial' negotiation of meaning. The more comprehension checks, clarification requests and confirmation checks the task has the better. The cognitive approach, on the other hand, is concerned with the psychological processes that affect task takers (Skehan, ibid.). For example, researchers have looked at how attentional resources are used during tasks and how task characteristics influence performance (fluency, accuracy and complexity). The third approach is the sociocultural. In this approach the focus is on learners' co-construction of meaning when they engage in interaction. The analysis goes beyond negotiation of meaning to the way learners make sense, reinterpret tasks, and create the collaborative space. Although these approaches offer insights into various aspects of task-based interaction, they do not depict in detail the nature of interaction or the various interactional processes that take place.

It is probably worth mentioning that there are well known conceptual problems in terms of specifying what actually constitutes a 'task' (see Ellis, 2003). That is not,

however, the focus of this section; rather, the focus is on the temporal unfolding of the task as it evolves in time, or in other words, the way a task is conceptualised as it is enacted. In this study I have taken into account Breen's (1987) conception of the three phases of tasks: task-as-workplan, task-in-process and task-as-outcomes. The task-as-workplan is the plan of action drawn up before the task is implemented in the class. It is the intended action of the students and the teacher during the task implementation. The task-in-process is the actual implementation (pedagogy) of the task. It is the real task event as the students perform the action. The task-as-outcomes is the product that the students come up with at the end. It can be a solution to the main question or a digital or physical artefact.

These three phases of the 'task' need to be taken into account when trying to analyse task-based interaction holistically. The relationship between the phases should be considered as the task is implemented in order to obtain a full picture of TBI. Previous research has shown that sometimes the same task-as-workplan can result in a different task-in-process (Coughlan and Duff, 1994; Donato, 2000; Foster, 1998; Ohta, 2001; Mori, 2002; Roebuck, 2000; Seedhouse, 2005). Coughlan and Duff have shown that the same task (task-as-workplan) does not produce similar results with regard to task-in-process when performed by different individuals or when performed by the same individuals at different times. This makes the analysis of task-based interaction very difficult.

Defining task-based interaction is not a straightforward matter, especially when we consider the three phases of 'task' mentioned above. Tasks typically generate some interaction amongst task takers. Should the focus be on the task-as-workplan or on one of the other phases? The problem is sometimes that students are introduced to a task but the resulting interaction is not related to the task given to them (Seedhouse, 2004). In

this study the interactional data were gathered from the actual implementation of the task (task-in-process). It is thus necessary to use a definition that sheds light on that phase - where interaction is generated. Seedhouse and Almutairi (2009) use a definition that serves the purpose of this study. They define task-based interaction as "L2 interaction in which participants display an orientation to the completion of a task". This definition focuses on the task-in-process, which is exactly where the data are collected and is also the phase where the complexity of TBI lies. If we are to understand TBI better we need to understand what happens during that phase and how participants behave.

An important issue to consider with regard to the definition above is heterogeneity. Since there are several varieties of task that could potentially result in several varieties of interaction, is it possible to identify some features which are common to all these varieties? Would participants sometimes orient to tasks in similar ways?

Seedhouse (1999) has shown some of the characteristics of task-based interaction based on his database of 330 L2 lessons. He has shown that each variety of interaction has its own pedagogical focus which shapes the turn-taking system that accompanies it. He found that in task-based interaction the focus is on the accomplishment of the task. Therefore, learners employ a turn-taking system that suits this pedagogical focus. The following extract shows how the nature of the task constrains the type of turn-taking that takes place. The task is an information gap task. Two students who cannot see each other have a map of the same island but one of them has some features missing. They have to find out what is missing and where to draw it.

Extract 2.1

1 L1: The road from the town to the Kampong Kelantan . . . the coconut =
2 L2: = Again, again.
3 L1: The road is from the town to Kampong Kelantan (7.5 sec) the town is in the
4 Jason Bay.
5 L2: Again. The town, where is the town?
6 L1: The town is on the Jason Bay.
7 L2: The, road?
8 L1: The road is from the town to Kampong Kelantan (11.0 sec) OK?
9 L2: OK.
10 L1: The mountain is behind the beach and the Jason Bay (8.1 sec) The river is from
11 the jungle to the Desaru (9.7 sec) The mou- the volcano is above the Kampong
12 Kelantan (7.2 sec) The coconut tree is along the beach.

(Warren, 1985: 271, cited in Seedhouse, 1999)

The participants are collaboratively co-constructing the progress and direction of action. The interaction has many instances of confirmation checks and repetition requests as they want to make sure the task is being accomplished in the way they wanted to accomplish it. One of the learners is forced by the nature of the task to ask for clarification or to check information or to ask for a repetition. The nature of turn-taking that results from this task is shaped by the nature of the task. Another feature of task-based interaction that can be seen through the above extract is the notion that task-based interaction generates many cases of clarification requests, comprehension checks, confirmation checks and self-repetitions (Seedhouse, 1999).

Seedhouse (ibid.) has also indicated that task-based interaction shows a tendency toward minimalisation and indexicality. The following example shows a convergent task (Duff, 1986) where we can see a great deal of minimalisation and indexicality. Convergent tasks such as information gap tasks normally show these features. The task in this example is an information gap task. One of the two students has to give

instructions to the other as to how to lay out bricks in a particular pattern. The students cannot see each other.

Extract 2.2

1 L1: ready?
2 L2: ready
3 L1: er (.) the blue oblong above the red oblong, eh? the yellow oblong.
4 L2: (.) alright. (.) >faster, faster.<=
5 L1: =the: red cylinder (.) beside the (.) blue oblong,
6 L2: (.) left or right?=
7 L1: =right.
8 L2: (.) right yeah ( ) OK.
9 L1: (1.0) the the red cube (.) was: (1.0)
10 L2: the red cube?

(Warren, 1985: 275, cited in Seedhouse and Almutairi, 2009)

In some cases task-based interaction can be extremely indexical, as in the following example where students are labelling a geometric figure. The turns are short and their meaning can only be understood when we know the task and the context.

Extract 2.3

1 L1: What?
2 L2: stop.
3 L3: Dot?
4 L4: Dot?
5 L5: Point?
6 L6: Dot?
7 LL: Point point, yeah.
8 L1: Point?
9 L5: Small point.
10 L3: Dot.

(Lynch, 1989: 124, cited in Seedhouse, 1999)

The nature of the task and the pedagogical focus has an impact on the resultant interaction. For instance, divergent tasks (Duff 1986), which involve discussion and

debate, generate a different type of task-based interaction. The following example shows students debating a certain topic.

Extract 2. 4

1 L2: yeah e:r (2.0) when you look at in the (1.0)
ekteskap ((tr: marriage))
2 LL: marriage
3 L2: marriage yeah you just look at marriage and you
think it will cause problems for the two for the two
people living together?=
4 L1: =no for the children.
5 L2: the children? (1.0) yeah (1.0) I think it could be
a problem for the marriage itself too e:r because
I I read e:r a survey=
6 L1: =((unintelligible 2 sec))
7 L2: yeah, yeah and I just e:r how to how you behave and
how which which what kind of moral you have, I read
a survey from Norway e:r which said that most
divorces was caused with the marriages between a
Norwegian and a foreigner=
8 L3: mhm.
9 L2: =so that e:r – the marriages are more unstable (2.0)
and yeah it might be that it would cause problems
for the childrens
(Seedhouse, 1996: 389, cited in Seedhouse and Almutairi, 2009)

The task-based interaction in this extract is obviously different from that in extract 2 or 3. This is owing to the nature of the task. The debate triggers different directions for the interaction. The learners feel free to talk and build arguments and use long stretches of talk to support their views in the debate.

In this section the characteristics of task-based interaction have been described and illustrated. It is important to understand task-based mechanisms in order to see why we need to analyse TBI. It has been shown that TBI is usually indexical and shows a tendency toward minimalisation. It also demonstrates a variety of types of turn-taking system. All of these issues make the task of analysing TBI difficult. This is why we

need a holistic analysis of task-based interaction. This issue is further developed and elaborated on in the next section.

2.4 Learning and interaction

Interaction in second language contexts has long been of interest to researchers. A famous example is the Interaction Hypothesis (Doughty and Long, 2003; Pica, 1988). It is suggested that learning happens if it is facilitated by interaction in the target language (e.g. Ellis, 2009). He (Ellis, 1994) also indicates interaction is conducive to learning because it makes the linguistic data more salient for the learner. Interactional modifications (Long, 1983) have long been assumed to promote learning and as evidence of learning. It is claimed (Long, 1980) that interactional modifications during interaction enhance learning because they make the input more comprehensible.

Various SLA studies have focused on the impact of different aspects of interaction on the learning processes. For example some studies focused on how the different characteristics of tasks can affect language production and memory (e.g. Baralt, 2010; Ellis, 2005; Michel, 2011; Revesz, 2009, 2011). This can be illustrated by the case of convergent and divergent tasks (Duff, 1986). Convergent tasks lead to a specific end result and this could lead to minimal production of the target language. On the other hand divergent tasks open up the space for discussions and debates and could potentially lead to more usage of the target language.

Learning and interaction can also be viewed from a Sociocultural perspective. TBLT can fit well to the concepts of Vygotskian Sociocultural theory where learning is viewed as a collaborative and social effort that is co-created in a situated context. TBLT can furnish this theory with a platform where learning and interaction can be created. Most tasks are interactional by nature and this creates a space for learners to interact and

thus co-create 'learning'. Groups of learners normally represent different levels of language mastery. This allows the creation of the novice-expert relationship supported by the Sociocultural theory to learning. It is believed that learners learn the language when they are given assistance that a little bit beyond their current level of mastery.

2.5 Issues and debates in TBLT

Although it has been adopted and used for more than two decades TBLT remains controversial (Samuda and Bygate, 2008). Many researchers have criticised different aspects of TBLT. In a recent article Ellis (2009) presented an account of some of such criticisms and attempted to sort out the misunderstandings around TBLT. Ellis was arguing for the case that many of the criticisms target to TBLT can be due to a misunderstanding of what a 'task' is and of the theoretical underpinnings that inform TBLT. He also points out that these criticisms can be due to lack of acknowledging that there are multiple versions of TBLT.

For instance, Seedhouse (1999 and 2005) raised the issue of whether or not a 'task' would constitute a valid construct for building a language teaching program. Widdowson (2003) also questioned the criteria for designing a task and indicated that such criteria are loose. Ellis (*ibid*) also cited Li (1998), Carless (2004) and Butler (2005) who criticised TBLT from an empirical basis. They raised a practical question. That is, whether TBLT is practical in Asian countries where the teaching approaches are different to what would typically happen in TBLT classrooms.

More specifically, Ellis attempted to tackle the following criticisms:

"(1) The definition of a 'task' is not sufficiently clear to distinguish it from other kinds of instructional activities.

(2) Tasks prioritize pragmatic meaning and neglect semantic meaning.

(3) The interaction that results from tasks is often impoverished and thus cannot constitute an adequate context for L2 acquisition.

(4) It is not possible to predict what kinds of language use will result from the performance of a task, and thus it is not possible to ensure adequate coverage of the target language in a task-based course.
(5) Because there is no underlying grammar syllabus, TBLT cannot ensure adequate coverage of grammar;
(6) Attention to form in TBLT is limited to corrective feedback in order to ensure minimal interruption of the performance of a task.
(7) Attention to grammar in the post-task phase is limited to consciousraising activities (i.e. there are no production practice activities).
(8) The theoretical rationale for TBLT addresses only grammar, ignoring vocabulary and pronunciation.
(9) TBLT emphasizes output and thus fails to ensure that learners are exposed to rich input.
(10) The role of the teacher in TBLT is limited to that of a 'manager' or 'facilitator' of communicative activities.
(11) TBLT is only suited to 'acquisition-rich' contexts.
(12) There are insufficient empirical findings to support the theoretical rationale for TBLT or to show that TBLT is superior to traditional approaches." pp. 225-226.

This shows the range of the criticisms that have been raised by many researchers. Ellis (*ibid*) explained how he thinks these issues might be handled. This tells us that, like any other approach in the field, TBLT has some merits and obvious benefits to language education. On the other hand it has its own deficiencies.

2.6 Why do we need to analyse task-based interaction?

In this section it is explained why there is a need to analyse task-based interaction. I will demonstrate how the difficulty of analysing TBI establishes the need to develop a holistic model that can reveal the details of TBI. Task-based interaction, as discussed above, is of great relevance in this research as it is the place where the interactional data are generated and gathered.

Strong claims have always been made in support of TBLT. The argument is that TBLT enhances language learning. However, we do not have a full understanding of

how it does that. TBLT involves numerous processes that need to be revealed through meticulous analysis. It is evident from the literature that it has not yet been adequately demonstrated how TBLT works in real teaching settings (Swan, 2005). This is one reason why there is a need to examine task-based interaction in order to reveal how it operates in real contexts. Another impetus for examining TBI is in order to have a closer look at what happens during task implementation and see whether the task does what it is intended to do. The majority of data are gathered from task-in-process and therefore it becomes necessary to understand how this process is organised and enacted.

The majority of early TBLT research adopted Long's (1996) Interaction Hypothesis, which relies on the quantification of isolated features of the interaction. Features like clarification requests and confirmation checks are isolated and quantified. According to Samuda and Bygate (2008: 96), there is a problem associated with this way of looking at task-based interaction in that "it allows less detailed analysis of the data and less attention to the perceptions and processes engaged in by the participants". From a qualitative perspective research has also examined task-based interaction using sociocultural theory and Conversation Analysis. The problems with these approaches are that it is difficult to generalise from them and that they provide little information on the design and implementation of tasks by teachers (ibid.). I will show later how the proposed model to analyse task-based interaction takes these issues into account. The proposed model adopts a holistic approach to task-based interaction. No individual features of interaction are pre-selected in advance or used to represent the whole interactional phenomenon. All the features of interaction are considered for the analysis. The model considers the interplay between the different features and how they contribute to the learning process. More importantly, the model considers the non-verbal elements of interaction. This is something that has rarely been done in TBLT

research. Is it necessary to adopt a holistic approach in order to analyse task-based interaction? Samuda and Bygate (2008) indicate that a task is a holistic activity. Therefore, it obviously makes more sense to describe and analyse the interaction holistically than in a segmental way.

It is important to analyse TBI in order to understand TBLT. Claims are made regarding the effectiveness of TBLT but there is insufficient proof of that, especially in real teaching contexts. Previous attempts to analyse TBI have fallen short of capturing the full picture of the reality of what happens in a detailed manner. This is because of the nature of TBI; it is indexical, complex, fluid and dynamic, and exhibits a tendency toward minimalisation (see section 2.3). Furthermore, there is a need to analyse task-based interaction holistically so that we are able to compare it to other varieties of second language classroom interaction. If it becomes possible to do so then we might find evidence that TBLT has more advantages than other teaching methods, as is often claimed. When it becomes possible to analyse TBI as a variety then we can compare it to other varieties to see whether it has more value than other varieties. Seedhouse (2004) suggested a framework for comparing the different varieties of second language classroom interaction. He indicated that all types of task-based interaction have some common characteristics (see section 2.3 for more details). These characteristics can be summarised as follows: there is a reflexive relationship between the nature of the task and the turn-taking system, there is a tendency toward minimalisation and indexicality, and tasks tend to generate many instances of comprehension checks, clarification requests, confirmation checks and self-repetitions. A problem that remains is the issue of heterogeneity in task-based interaction, as discussed in the previous section. This shows why it is necessary to find a way of analysing task-based interaction as a variety so that it can be compared to other types of interaction. The present study proposes a

holistic model that will make possible a clearer description of task-based interaction as a variety.

Finally, another reason for the need to look at TBI holistically is the fact that non-verbal elements of the interaction are rarely considered in TBLT research. The proposed model in this study considers non-verbal communication as an important element. This makes it necessary to find ways of analysing it in a manner that gives a holistic view of this language learning phenomenon.

2.6.1 Task-based interaction at an emic level

In this research task-based interaction in the Tabletop environment was examined using CA, i.e., from a micro-analytical perspective. Over the last two decades, studies examining interaction in educational contexts from an emic perspective have flourished in various areas, such as ethnographic micro analysis (Erickson and Shultz, 1982; Erickson, 1992, 1996), constitutive ethnography (Mehan, 1979), sociocultural theory (Frawley and Lantolf, 1985; Van Lier, 1988, 2004; Donato and Lantolf, 1990; Lantolf and Appel, 1994; Hall and Verplaetse, 2000; Ohta 2001; Lantolf and Thorne, 2006) and Conversation Analysis (Markee, 2000, 2004a, 2005a; Mori, 2002, 2004; He, 2004; Kasper, 2004; Mondada and Pekarek Doehler, 2004,; Olsher, 2004; Hellermann, 2006, 2007; Jenks, 2006, 2009a; Kaanta and Perunen, 2013). The study of task-based interaction has been growing in popularity and in importance (Long, 1981; Littlewood, 2004, 2007). However, a number of pedagogical and empirical issues have arisen, one of which is the fact that the majority of studies in this area have looked at task-based interaction from a product-oriented perspective (Ellis, 2003). This is one of the points where this study departs from similar research efforts in TBLT. There is a need to look into the emic and dynamic reality of tasks. This research fills this gap by employing a conversation analytical approach to investigate task-based interaction. As one of its

tenets, CA adopts an emic perspective (participants' perspective) in the analysis and interpretation of social interaction. One of the components of the proposed model for analysing task-based interaction is Conversation Analysis. CA is used to reveal the details of the interactional processes.

A great deal of interaction takes place in language tasks as students are typically asked to do or make or enact something. The nature of task-based interaction makes it appealing to language and social interaction researchers who are trying to look into aspects of language or interaction generally. The purpose of examining this type of interaction in this way, i.e., at an emic level, is that an emic perspective can reveal the micro details of the interaction and show the moment-by-moment co-construction of the task details. During the progress of the interaction learners jointly construct the details of the task in a moment-by-moment fashion. An emic perspective is needed here if we wish to analyse these moments of interaction. Adopting this approach will be a very valuable component of the proposed model to analyse TBI. Task-based interaction is by nature fluid and dynamic and requires the involvement of pairs or groups of students to collaborate while attempting to achieve some language goal. This complexity and richness of interaction make analysing task-based interaction a difficult task. Any attempt to analyse TBI holistically has to include a detailed examination of the micro details of the task processes. Another component of the model that fits nicely with this emic perspective is the digital Tabletop. The Tabletop can allow students to interact face-to-face while engaging with the shared content in the digital environment and allows the analyst to track and record the interaction. It was expected that the use of the Tabletop and the adoption of the emic perspective in the model would make possible a holistic analysis of task-based interaction.

This section has reviewed the reasons behind the need for a holistic analysis of task-based interaction. The majority of previous TBLT research does not provide a holistic account of the interaction in a detailed manner. Furthermore, the model proposed in this study involves an important element of task-based interaction that is normally overlooked in TBLT studies, i.e., non-verbal communication. This element is a key component of the model which would allow it to capture the micro details of the interactional phenomenon. The next section elaborates on non-verbal communication research.

2.7 Non-verbal communication and interaction

This section reviews some published work on non-verbal communication. It highlights why we need to include non-verbal communication in the analysis of task-based interaction. Non-verbal communication is an important component of the proposed model for TBI analysis. The reason for this is that there is no holistic model for analysing TBI that involves looking at the non-verbal resources of the interaction. Gesture and non-verbal communication constitute a key element in this study. This section reviews studies that have aimed to investigate gesture and talk. It will also show how gesture is studied in the field of second language research.

Gesture and interaction have long been at centre stage in second language research, and numerous studies have been conducted in this area (e.g., Goodwin, 1979, 1986, 2000, 2003, 2007, 2011, 2013; Goodwin and Goodwin, 1986; Hayashi, 2003, 2005; Heath, 1986; Hutchins & Nomura, 2011; Hutchins and Palen, 1997; Kendon, 1972,1980, 1990, 1992, 1994, 2004, 2008a, 2008b; Murphy, 2005; Sidnell, 2005; Schegloff, 1984; Smotrova and Lantolf, 2013; Streeck, 1993,1994, 2003; Streeck et al., 2011). Such studies have shown how language and body mutually elaborate each other in the situated interactional processes and that non-verbal types of behaviour should not

be ignored in analysing face-to-face interaction. This line of research may still have a long way to go but it suggests that language, body and the configuration of the surrounding environment are interactively intertwined (Heath, 1986; Goodwin and Goodwin, 1987).

Kendon (1972, 1980, 1990, 1992) conducted careful analyses of how humans utilise their bodies systematically during their involvement in social interaction. He also indicates that gesture and posture show a systematic relationship with the organisation of the speaker's talk. McNeill (1992) classifies gestures into four types: iconic, metaphoric, deictic and beats. Unlike McNeill, who did not pay much attention to the dynamic, emergent nature of gesture in interaction, Heath (1986) showed how doctors and patients contingently used their bodily movements at particular moments to signal certain procedures to each other during their interaction.

Another seminal work on gestures was conducted by Goodwin (1979), who showed how gaze is immensely consequential in the construction of sentences in group interaction. Goodwin (2000) also indicated that gaze and posture affect how participants organise their responsive interactional moves. Various research studies (Goodwin, 1981, 2000; Goodwin, M., 1995; Schegloff, 1984, 1998; Heath, 1986; Kendon, 1990; McNeill, 1992, 2000; Streeck, 1993, 1994; Ford et al., 1996; Ochs et al., 1996; LeBaron and Streeck, 2000; Koschmann and Lebaron, 2002; Lerner 2002; Hayashi, 2003, 2005; Hayashi et al., 2002; Kita, 2003) have shown how participants' non-verbal behaviour is coordinated meaningfully with their talk. These studies show the importance of non-verbal elements in obtaining a better understanding of talk-in-interaction.

There is a growing interest in the study of non-verbal behaviour in second language research. This interest began in the 1970s, most notably with Tarone (1977)

and Faerch and Kasper (1983), amongst others. These researchers showed that L2 learners resort to gesture as a communicative strategy in the case of lower levels of L2 proficiency. Recently, more and more studies in language learning research are focusing on the role of gesture and non-verbal communication in language and talk (e.g., Gullberg, 1998; McCafferty, 1998, 2002, 2004, 2006; McCafferty and Ahmed, 2000; Lazaraton, 2004; Negueruela et al., 2004; Olsher, 2004; Mori and Hayashi, 2006). These research endeavours are indicative of this growing interest in studying non-verbal communication, especially in language learning contexts.

Several studies on talk and gesture have focused on how one accompanies the other. Olsher (2004) shifted the focus somewhat and showed how the completion of turns can sometimes be accomplished via embodied actions. He explored what he calls 'embodied completions', which take place when "launching a turn at talk, and then at a point where some trajectory of the turn is projectable, ceasing to talk and completing the action that had been initiated by the particular turn through gesture or embodied display" (Olsher, 2004: 221). He indicated that this practice of embodied completion can be deployed in different sequential units to achieve various social actions.

A similar study conducted by Mori and Hayashi (2006) examined the achievement of intersubjectivity through embodied completion. They tried to reveal the local interactional processes that can help participants to establish and explore shared communicative resources in order to establish intersubjectivity. Their study revealed only two cases of embodied completion and they made no claims for any generalisability of their results. However, they did make the claim that, based on these two cases, the embodied completion can be practised in actions that provide new information, to confirm the understanding of the talk recipient, or to show disagreement.

More recent research (Kaanta, 2010) has looked at the kinds of embodied action and semiotic resources that teachers resort to when they attempt to allocate turns and when they project repair in their classroom interaction. The study used Conversation Analysis and adopted Goodwin's views on interaction to analyse 376 turn-allocations and 34 repair sequences. The study conclusions indicate that teachers normally allocate turns to students by referring to the names of the students and by directing eye gaze at them. The study also showed that teachers also use head nod and gestures and other non-verbal behaviour to allocate turns to students. Furthermore, it indicated that the teachers' repair practices employed various semiotic resources, including cut-off body movement, motionless gaze and body orientation, or diverging gaze toward teaching materials or class.

The latter study is an interesting piece of research as it adds to the accumulating repertoire of research efforts to push toward more inclusion of non-verbal and multi-semiotic aspects of talk and interaction. It highlighted the important role that non-verbal and semiotic resources can play in social interaction. Talk is not the only the vehicle that humans employ to interact and achieve mutual understanding. It is just one part of the process. The focus of the study was on the teacher's allocation of turns and repair. A point where the current study differs from this lies in the fact that it examines a group of students interacting amongst themselves without the involvement of the teacher. Another point of difference is that the current study employed a new form of technology, the digital Tabletop, which is not normally found in a classroom. The focus was therefore shifted slightly toward looking at how this technology might enable a holistic analysis of task-based interaction which might necessitate examining non-verbal and other semiotic resources. This is in light of the fact that the Tabletop by nature

requires the use of movement and collaboration, which is what makes it a convenient fit for the study of group work.

Furthermore, it is worth mentioning that we should highly esteem the immense contribution of Charles and Marjorie Goodwin to studies of interaction and gesture. Their work inspired this research, since it was influenced by CA, which is a theoretical foundation for the current study. They used video data to look at other modalities of interaction, not limiting themselves to talk alone. They conducted studies that took into account body positioning, gaze and gesture (Goodwin, 1979, 1980, 1981, 2000). These modalities are present in a digital Tabletop environment. The Goodwins' studies in this regard illuminated this research and have proved very useful for studies of gesture and non-verbal interaction. This research thus had as its foundation CA and Goodwin's (2000, 2003) views on interaction. The analysis of data in this research took into account the non-verbal aspects of interaction from a perspective that treats interaction as a situated dynamic and reflexive process underpinned by various semiotic resources.

With the exception of a very few studies (Olsher, 2004; Taleghani-Nikazm, 2007; Seo and Koshik, 2010), the majority of CA-informed research on gesture and non-verbal communication has focused on the gestures that accompany talk. There has been little emphasis on gestures that are talk-independent: gestures that can have functions in the ongoing interaction. In a conversational analytic study, Seo and Koshik (2010) studied gestures that initiate repair in ESL tutoring sessions. This study is one of the few studies that have investigated how gestures function without the accompaniment of talk. They looked specifically at two gestures that they claim can trigger repair in interaction. The first of these is a head turn or tilt to the side with persistent eye gaze on the other party. The other is a head poke forward with a forward movement of the upper part of the body. They believe that the existence of such gestures in their data does not

necessarily reflect embodied representation of incomprehension or confusion, and instead claim that such gestures systematically perform certain functions and have sequential consequences and entail particular types of response. They point out that the two types of gesture they studied could have pedagogical implications as triggers of self-correction.

The number of studies looking at non-verbal communication, whether accompanied by talk or not, is increasing. Various threads of research suggest that non-verbal communication performs particular functions in the ongoing interaction and has an impact on the organisational mechanisms of the interaction. The studies mentioned above show the important contribution that non-verbal behaviour makes in interaction. The aim in the current study was to build on these studies by examining task-based interaction taking into consideration the non-verbal aspects of communication. The reason for this is that task-based interaction as a variety includes more than spoken words. More importantly, it involves the deployment of non-verbal resources. The literature shows that this issue is not properly addressed in TBLT research. Therefore, to understand task-based interaction fully, it is necessary to understand the nature of the non-verbal communication that accompanies it. What makes this task achievable is that non-verbal types of behaviour in TBI are not analysed segmentally but are included in a holistic model. That is, non-verbal communication is one part of an overall model that portrays task-based interaction holistically. Combining various elements in one model allows us to see the interplay of the different elements – talk and non-verbal communication, and how they impact the learning process in TBLT.

An additional reason for looking at non-verbal communication in analysing task-based interaction is the problem of relating talk to the performance of the task. Most tasks involve some forms of non-verbal action that cannot be properly depicted by

transcripts of talk. As we have seen in a previous section (2.3), task-based interaction is generally indexical and difficult to understand. One can only make sense of the interaction when one knows what the students are physically doing with the task. Gaining access to the non-verbal element during interaction makes it possible to portray the whole task-based process. The proposed model achieves this holistic view of TBI by relating non-verbal communication and the physical performance of the task to the details of the talk.

Since non-verbal communication represents a key component of the proposed model for the analysis of TBI, it should be noted that the analysis of non-verbal communication is facilitated by the environment where the data are collected. That is, the digital Tabletop makes it possible to capture in great detail the non-verbal resources and actions that the participants deploy. The rich information gathered is then fed into the model for analysis. Along with the video recordings the Tabletop represented an important addition to the model, in the sense that it became possible to capture much of the action that takes place during task-based interaction.

In this section I have reviewed some research related to non-verbal communication which is relevant to the aim of the present study. I have explored various research efforts that have examined different aspects of non-verbal communication and interaction. It has also been shown why there was a need to include non-verbal communication in the proposed model to analyse task-based interaction[5]. In the following section I will discuss another element of the proposed model: Conversation Analysis. CA is the tool used to scrutinise the interactional work within the model.

[5] It was shown in the pilot study (Seedhouse and Almutairi, 2009) that learners rely heavily on non-verbal communication to solve the task.

2.8 Conversation Analysis (CA)[6]

This section provides a justification for the use of CA in the proposed model and gives an overview of CA through a review of relevant literature. It also sheds some light on some of the studies that have used CA to investigate non-verbal communication. This creates a link and a basis for the inclusion of CA and non-verbal communication in the model that was developed in this study.

The main theoretical and methodological framework used in this study is Conversation Analysis (CA). CA was used in this research as part of the holistic model for the analysis of task-based interaction because it can reveal the micro details of the interaction. This in turn would enable us to link the level of detail to the non-verbal communication, which could then reveal how TBI was organised. This was crucial in order to understand how interaction can be linked to the learning processes in TBLT.

Conversation Analysis was introduced in the late 1960s by Sacks, Schegloff and Jefferson, who were inspired and influenced by Goffman's ideas on interaction (Goffman, 1963, 1964, 1967). These pioneers were also influenced by Garfinkel's notion of ethnomethodology (Garfinkel, 1967). CA aims to explicate peoples' naturally occurring social interaction as they perform their daily activities (Heritage, 1984; Psathas, 1995).

As CA played a key role in the analysis in this study, it is necessary to define what it means in the context of this research.

Heritage (1984: 241) summarises a primary aim of CA as follows:

> Conversation analysis—like the other research streams of ethnomethodology—is concerned with the analysis of the competences which underlie ordinary social activities. Specifically it is directed at

[6] See chapter 3, section 3.3 for a discussion of CA analytical methods and procedures.

> describing and explicating the competences which ordinary speakers use and rely on when they engage in intelligible, conversational interaction. At its most basic, the objective is to describe the procedures and expectations in terms of which speakers produce their own behaviour and interpret the behaviour of others.

CA provides a detailed, moment-by-moment explication of the nuances of talk-in-interaction in an orderly and sequentially organised fashion. It shows how an individual action is sequentially enacted to form larger actions that are mutually achieved by participants' collaboration (Goodwin and Goodwin, 1992; Heritage, 1984; Drew, 2005; Schegloff, 2007). CA aims to show how participants:

> understand and respond to one another in their turns at talk, with a central focus on how sequences are generated. (…) the objective of CA is to uncover the tacit reasoning procedures and sociolinguistic competencies underlying the production and interpretation of talk in organized sequences of interaction. (Hutchby & Wooffitt, 1998, p. 14)

CA examines the micro level of interaction through the investigation of turn-taking mechanisms, repair practices, adjacency pairs, and the sequential organisation of social interaction. The overall aim of the CA project is to reveal the methods and practices that participants use in order to achieve intersubjectivity in their social interaction from an emic perspective. CA involves the application of a rigorous analytical mentality on the part of the researcher (Markee and Kasper, 2004; ten Have, 2007).

CA is a tool that looks in detail into the everyday reality of social interaction using 'a dynamic, empirical, bottom-up approach' (Seedhouse, 2004). It exposes the contingent and emergent nature of the human interaction in a moment-by-moment fashion. It pays attention to all details; no detail is regarded as irrelevant to the explication of naturally occurring interaction. There are two distinct loci of social interaction that form the focus of CA researchers: ordinary conversation and institutional talk. Early CA work focused on ordinary conversation and attempted to

tease out the fundamental practices that make up mundane conversation, such turn-taking, repair and sequence organisation (see Drew, 1997; Jefferson, 1984, 1993; Pomerantz, 1978, 1984; Sacks, 1987, 1992; Sacks et al., 1974; Schegloff, 1987b, 2007). CA-inspired research on institutional talk has revealed different interactional practices in various settings, such as doctor-patient interactions (Heath, 1986; Heritage and Maynard, 2006; Silverman, 1987), news interviews (Heritage, 2002a, 2002b), classroom interactions (Lerner, 1995; McHoul, 1990; Macbeth, 2004) and courtroom interactions (Atkinson and Drew, 1979; Maynard, 1984).

2.8.1 CA investigating the classroom

Early CA researchers were interested in everyday 'mundane' conversation rather than institutional types of talk (see Heritage, 1984, pp. 238-240). However, this interest has gradually moved toward institutional settings like classrooms, courtrooms, hospitals and newsroom interaction. Drew and Heritage (1992) conducted several studies that used CA to investigate talk in institutional settings. Hester and Francis (2000) claim that studying institutional settings using CA can reveal the differences between interaction in everyday and institutional conversation in systematic ways. One example of this variation is the mechanism of turn-taking. Turn-taking in ordinary conversation is locally managed and all parties in conversation have equal rights to take the floor, whereas in a classroom the mechanism is different as the teacher plays a superior interactional role (McHoul, 1990). With regard to the two main lines of research perspectives, i.e., everyday vs. institutional, this study is situated within an institutional context as its subjects were students interacting in a classroom.

Conversation Analysis, with its well-defined epistemological stance and rigorous methodological practices, has been gaining in momentum and significance and

has been used to investigate second language learning and use (Gardner and Wagner, 2004; Lazaraton, 2002; Markee, 2000, 2004a; Richards and Seedhouse, 2005; Seedhouse, 2004). CA has predominantly been used to investigate ordinary conversation and institutional interaction among speakers of the same language. However, there is a growing interest in using CA to study second language conversation and interaction (e.g., Carroll, 2000, 2004, 2005a, 2005b; Firth, 1996; Firth and Wagner, 1997; Gardner and Wagner, 2004; Hauser, 2003, 2005; Hosoda, 2000, 2006; Hosoda and Aline, 2010, 2012; Kasper, 2004; Kidwell, 2000; Kurhila, 2004, 2005, 2006; Markee, 2000, 2004a, 2004b; Mori, 2002, 2003; Seedhouse, 2001, 2004; Wagner and Firth, 1997; Wong, 2000a, 2000b). Some researchers have gone further and used CA methodologies in an attempt to define and show evidence of learning as change over time (Brouwer and Wagner, 2004; Hellermann, 2006, 2007, 2011; Hellermann and Cole, 2009; Markee, 2008; Young and Miller, 2004).

Recent research has revealed strong evidence for a potentially valuable contribution made by CA in the language classroom. Numerous researchers (Firth and Wagner, 1997; Markee, 1994, 2000, 2004b; Mori, 2002, 2004; Seedhouse, 1998, 2004) have indicated that CA can contribute immensely to our understanding of some of the key aspects of language interaction that are not taken up properly by mainstream second language research studies, which focus principally on the cognitive aspects of learning. These researchers, among others, emphasise the importance of the social and interactional dimensions of language. They oppose the idea that language learning is solely a cognitive process that takes place in the minds of individuals (Long, 1996). They call for the inclusion of "socially distributed practices" (Markee, 2004a). The debate is still going on as to whether CA can provide the appropriate tools for understanding language learning or not. Markee himself (2005b) indicated that

Conversation Analysis is indeed "under increasing pressure to demonstrate how and why an understanding of social structure per se illuminates SLA [second language acquisition]" (p. 211). In this debate one dividing point is the view both parties take on competence. From a conversation analytical perspective competence is believed to be in the "situated practices rather than psycholinguistic models of learning processes and knowledge structures" (Schegloff et al., 2002, p. 13).

The study of embodied actions from a conversation analytical perspective has been the topic of a small number of studies. The role of gaze and gesture in repair practices was mentioned in some studies (Goodwin, 1981; Schegloff, 1984) but not systematically examined. Participants in conversation use non-verbal and embodied actions to repair their interactional practices. Some studies that investigated word searches took repair and embodiment as the topic of research. When a speaker has trouble coming up with a specific word he or she uses repair, which is sometimes accompanied by embodiment such as eye gaze or other non-verbal means (Goodwin, 1981; Goodwin and Goodwin, 1986; Streeck, 1995). Such studies show that participants rely on non-verbal resources during word searches. They jointly accomplish this task in a moment-by-moment fashion during interaction. Carroll (2005b) examined the collaborative construction of turns and repair in ESL interaction. He explored the role of embodied actions in word searches in second language conversations. He identified instances where the participants in his research relied only on embodied actions to initiate backward-oriented repair. He also showed that in cases of forward-oriented repair, participants' embodied actions co-occur with or before some other audible repair initiators.

The above discussion has revealed various ways in which CA has been used to study language in the language classroom. Some studies have used this micro-analytical

method to investigate non-verbal communication in second language interaction. The present study builds on this line of research by examining second language interaction using a holistic model. Therefore, it will further our understanding of classroom interaction by furnishing insights into the nature of task-based interaction.

The use of CA methodology and multimodality will fundamentally broaden our understanding of task-based interaction. We will be able to see a clearer picture of the indexical nature of task-based interaction. Such a multimodal use of CA will definitely shed light on non-verbal communication in the classroom. The non-verbal aspects of interaction are vital in TBI. They reflect a key part of the task process and even have an impact on task completion (see Seedhouse and Almutairi, 2009).

This section has introduced Conversation Analysis as the main tool for analysing interaction in this study. Some historical background on CA has been provided. The section has also listed a number of studies that have used CA to investigate classroom interaction. The last part of this section shed some light on the connection between some of the components of the proposed model, i.e., CA and non-verbal communication. Some studies that have looked at non-verbal behaviour in the classroom have also been explored. In the following section an overview of Computer Assisted Language Learning (CALL) is provided, and the main technology used in this thesis, i.e., the digital Tabletop, is introduced, showing how it fits into the area of CALL.

2.9 Computer Assisted Language Learning (CALL) and Tabletop

This section provides a brief overview of CALL and situates the Tabletop within this area of research. The use of technology in the language classroom has long been restricted to the use of computers. However, the digital Tabletop represents a major shift

in the use of technology in the classroom. This section explores the reasons for this and the contribution that the Tabletop can make to the study of task-based interaction.

2.9.1 A brief history of CALL

The computer has been used for language teaching since the 1960s (Warschauer and Healey, 1998). Warschauer and Healey (1998) have divided the history of CALL into three stages: behaviouristic CALL, communicative CALL and integrative CALL. The first stage was dominant in the 1960s and 1970s and was informed by the behaviourist model of learning. During that stage CALL use was in the form of repetitive drills. The computer performed the role of a mechanical tutor. Warschauer and Healey (ibid.) indicate that mainframe technology was an example of this stage. The second stage, communicative CALL, gained momentum in the 1970s and 1980s. This stage was in line with the move toward communicative language teaching that emerged during that period. In this stage computers offered more possibilities for the language user. The focus was similar to the general concern of communicative language teaching, i.e., the real use of the target language, the implicit teaching of grammar. In this stage computer application for language learning used text reconstruction and simulation. The example these authors give for this stage is the Personal Computer technology. The aim in the third stage, integrative CALL, is to integrate language skills (listening, speaking, reading and writing) and to incorporate the technology in the learning process (ibid.). According to the authors, in this stage learners use a variety of technological tools as part of their learning of the language. The example they give for this stage is the multimedia networked computer.

Recent trends in CALL technology include the use of mobile technology (e.g., Kondo et al., 2012) and video and virtual environments for language learning (e.g., Hampel and Stickler, 2012). The huge capabilities of communication technology have

opened the door for new forms of CALL tools and application to emerge. Fast broadband made it possible to use video over the Internet so that students and teachers can now communicate at a distance. Additionally, mobile technology and the development of handheld devices allowed students and teachers to have access to endless resources on the move. Undoubtedly, these forms of technology will affect the future direction of CALL. New forms of language learning applications will continue to emerge.

This section has provided a brief introduction to and history of CALL. The next section will introduce a new form of CALL technology that educators are starting to use in language teaching and research: the digital Tabletop.

2.9.2 A new form of CALL technology: the digital Tabletop

In this section an important component of the proposed model for the analysis of task-based interaction, the Tabletop, is described. The Tabletop is the main tool in the model. It is the arena where task-based interaction takes place. It is also the tool that helps keep track of the action during task-based interaction.

We live in a rapidly changing and developing world; new technologies are emerging at an escalating rate. Nowadays, multimedia tools are becoming increasingly important for language learning and teaching purposes. In addition to providing easy access to information over the Internet, such tools are in line with the current interest and emphasise the significance of collaboration and communication in educational contexts in general.

To this end, these tools allow for the immediacy of communication and allow users to share ideas and information in no time. Such capabilities can function as a rich

resource for fostering effective language teaching and learning through, for example, designing educational tasks or collaborating on particular problem-based activities.

Digital Tabletops represent this type of novel technology that is transforming face-to-face communication by introducing a digital space shared by the interactants.

Figure 2.1 The Tabletop

As shown in section 2.9.1, until recently the application of technology in CALL has been confined to the use of a single computer per user. That is, the focus and use of technology was in the form of a learner using a computer independently. As the technology evolves, new forms of technology are increasingly being introduced into the classroom. One example of this technology is the digital Tabletop technology. What makes this technology distinct from other forms is its capability to accommodate pairs or groups of students interacting and collaborating using one technological tool simultaneously. This multi-user orientation that the Tabletop allows is a big advantage in many ways. First, it goes in parallel with the need for language learners to communicate and use the target language, as is the case in TBLT. It also provides a much needed tool for studying task-based interaction in depth.

Tabletops are horizontal multi-user digital displays that allow multiple concurrent inputs from participants. A digital Tabletop can accept input from three participants using stylus pens simultaneously. The table can sense which pen is doing what at any given point in time[7]. It keeps track of how the participants are manipulating and completing the task. Of course, not all classroom teaching and learning involves moving physical objects on a table. However, the potential for designing different types of task for the Tabletop is huge. Having in mind a pedagogical goal, a task can be making a story out of mini video clips on the Tabletop interactively, or it can be exchanging digital objects on the table with movement constraints and feedback.

All activities and movement on the surface of the Tabletop are digitally recorded for analysis. In other words, the Tabletop can keep a record of who does what on the surface of the Tabletop. This is combined with the audio and video recordings of the participants' non-verbal behaviour. All of these elements are regarded as important components of the proposed model for analysing task-based interaction.

Generally speaking, digital Tabletops seem to fulfil Wilson's (1992) requirement of what an interactive multimedia learning environment should look like. He pointed out that such an environment should allow:

> the electronically integrated display and user control of a variety of media formats and information types, including motion video and film, still photographs, text, graphics, animations, sound, numbers and data. The resulting interactive experience for the user is a multidimensional, multisensory interweave of self-directed reading, viewing, listening, and interacting, through activities such as exploring, searching, manipulating, writing, linking, creating, juxtaposing, and editing. (Wilson, 1992: 186)

[7] Chapter 5 shows how this feature facilitates the analysis of data.

The following section presents a review of research conducted using the Tabletop technology with an emphasis on the educational use.

2.9.3 Research involving the use of the Tabletop

Digital Tabletops have one strong feature, which is the ability to allow and support co-located collaboration and face-to-face communication at the same time (Hornecker, 2005; Rogers et al., 2009; Shen et al., 2006; Scott et al., 2003). This feature offers a new perspective on the way humans interact in groups. They still maintain the visual elements of the face-to-face communication and at the same time they have access to the power of technology through the electronic shared space. More recently, the use of Tabletops has grown (see Buisine et al., 2012 for a recent discussion on Tabletops and collaboration). For instance, in the field of computer science various Tabletop applications and designs have been developed in a variety of topics ranging from classification tasks, photo browsing, map exploration, planning tasks, games, interactive exhibits for museums, and drawing (Scott and Carpendale, 2006; Shen et al., 2006). Some studies have described patterns of collaboration such as turn-taking around a digital Tabletop (Shaer et al., 2010). Other researchers have investigated non-verbal types of behaviour that promote mutual awareness among users (Conversy et al., 2011). As the Tabletop creates a collaborative environment, the issue of role assignment strategies (Tang et al., 2010) on this digital surface has been of interest to some researchers. Other research projects have investigated collaborative learning mechanisms such as negotiation, suggestion process, joint attention and awareness maintenance (Fleck et al., 2009).

Educational Tabletop applications have recently been used for EFL learners. Morris et al. (2006) indicate that designing innovative user interfaces for digital Tabletops represents a potentially powerful tool for facilitating particular pedagogical

goals. They designed several applications (MatchingTable, PoetryTable, ClassificationTable) to handle specific educational tasks in EFL settings. Rick and Rogers (2008) showed how they adapted a single user application to be used in a shareable collaborative learning environment. Recent research has investigated how shareable spaces might enhance group participation (Rogers et al., 2009) and whether the use of tangibles on such surfaces could promote learning (Marshall, 2007). Digital Tabletops are also found to allow more contributions from all participants in the group and encourage more equal involvement, especially in decision making and problem solving activities (Rogers et al., 2004).

Furthermore, as a new form of technology, the Tabletop represents an engaging environment for students because the shared space is digital and visible to the whole group. What happens on the surface is the digital manipulation of artefacts. This makes any digital move noticeable by all the participants around the Tabletop. Groups of participants can work together around the Tabletop and can immediately get engaged with the task at hand, since communication, things and actions are visible for the whole group (Rogers et al., 2006).

Kharrufa (2010) explored the potential benefits of Tabletops. He indicated that Tabletops preserve peoples' past experience of interacting around tables. He points out that this technology maintains the traditional experience of table interactions and extends our assumptions and conceptions concerning tables. He also indicated that Tabletops allow the direct manipulation of objects on the surface, pointing out that "...this stands in contrast to traditional desktop interaction where a user performs actions using an input device, such as a mouse, and perceives output on a different space (the screen)" (p. 11). This perspective on interaction that allows direct engagement with the task elements, besides being highly engaging for the participants (Benko et al., 2009),

also makes the interaction in the digital Tabletop environment fluid and easy to capture (see section 2.9.4 for a detailed discussion).

Seedhouse and Almutairi (2009) conducted a micro analytical study using digital Tabletops in an attempt to suggest a framework for analysing TBI. Since task-based interaction is a relatively complex and highly indexical process, they tried to analyse holistically the multimodal interactions by ESL learners. They provided a holistic framework to describe and analyse TBI. Their framework takes into account Breen's (1987) three phases of tasks: task-as-workplan, task-in-process and task-as-outcome. Their study indicates the importance of looking at the various multimodal perspectives along with scripted task talk and progress of the task simultaneously, in order to see how these elements interrelate. With regard to the relationship between that work and the current study, that work was based on a pilot study I conducted in 2009. The model presented in this thesis is more complete than the earlier work.

Seedhouse and Almutairi (2009) suggest that during task-based interaction a significant amount of learners' attention is concentrated on coordinating verbal elements with non-verbal elements of interaction and with task-related actions in a precisely timed fashion. These non-verbal elements have not previously been visible in TBLT research as the technology and methodology were not available. The framework developed by Seedhouse and Almutairi has the potential for revealing a significant advantage of Task-Based Language Teaching (TBLT) as it can portray the detailed complexity of task-based interaction.

Embodied action in collaborative groups around Tabletops is gaining more and more ground. By definition, the Tabletop is a shared space that is a normal place for interaction, which could possibly include embodied interaction. The enhancement of the

normal table offered by the digital element and the juxtaposition of the digital element to the table make it a unique environment for embodied interaction. Numerous studies have attempted to explicate the nature of this interaction. Scott et al. (2003) indicate that the Tabletop should support natural interpersonal communication by making use of gesture. Hornecker (2005) defines 'embodied facilitation' as the physical and spatial features of interactive artefacts which can facilitate certain collaborative actions. A similar study (Marshal et al., 2009) investigated embodied interactions by children manipulating physical and digital artefacts. They looked at how collaborators around the Tabletop share or prevent access to resources on the table. They conclude that the features of the interactive interface and physical objects affect the children's embodied actions around the table as they fight for control of objects, and they show how this might impact the design of applications for shared digital spaces. The researchers in this study analysed video recordings of children working on an interactive Tabletop. They then selected some sequences for transcription and analysis.

This section has provided an overview of some research conducted using the digital Tabletop. The majority of the studies mentioned above were conducted from a computer science perspective in terms of the methodology and analysis of data, and none of the above-mentioned studies looked at task-based interaction from a holistic perspective. As the technology is fairly new it has not been used to analyse TBLT classroom interaction holistically. The only exception is Seedhouse and Almutairi's study, which used a conversation analytical perspective. This section has shown that the Tabletop is an emerging technology that is gaining increasing momentum, especially in educational research. It represents a promising tool for the analysis of TBI. The added value of the Tabletop is that it captures in great detail task process and how the task is

accomplished. The next section explores how the Tabletop can contribute to the analysis of task-based interaction.

2.9.4 Relevance of the Tabletop to the analysis of TBI

The digital Tabletop can be of enormous benefit to educational settings. Its strength lies in the way it combines face-to-face interaction with the use of information resources. This is particularly relevant to task-based learning and teaching, as it requires pairs or groups of students to communicate and tackle a task. This can be mirrored in what typically happens around a Tabletop.

The Tabletop is an important component of the proposed model for the analysis of TBI. The purpose of the model is to analyse the interaction holistically by revealing the details of TBI and by depicting the accompanying non-verbal communication. The Tabletop plays a key role in the model because it enables us to keep a record of who does what at every single moment. As has been established above (section 2.3), task-based interaction is a complex and highly indexical phenomenon. The Tabletop can play a crucial role in unravelling the complexity of TBI. The Tabletop, along with video recordings of the task, can help analysts relate task-related activities to participants' talk and non-verbal communication.

The proposed model, which includes the Tabletop, CA, video and audio recording and transcription, enables us to relate non-verbal communication and performance of the task (movement of objects on the Tabletop). The participants' non-verbal communication is captured separately using video recording. Meanwhile, the movement of objects on the surface of the Tabletop is captured using screen capturing of the Tabletop. Although these two elements are captured in two separate ways, they are put together in the model to be analysed simultaneously using Transana (see chapter

3, section 3.8.2). It can therefore be seen that the proposed model, including the Tabletop, can be used to examine in micro detail the process of task-based interaction.

This section has shown the advantage of using the Tabletop as part of the proposed model to analyse task-based interaction. The Tabletop's tracking of the details of the interaction can be incorporated in a multimodal analysis of TBI.

2.10 Summary

The aim of this chapter has been to position this thesis within the relevant literature and to pull different strands from the literature to build an argument for the need to analyse task-based interaction holistically. Research relevant to the proposed model in this study has been outlined and discussed. That included a review of research on TBLT, task-based interaction, CA, multimodality, and the digital Tabletop.

Section 2.2 set the stage and introduced research related to Task-Based Language Learning, showing its significance in language education. In section 2.3 a detailed overview and discussion of task-based interaction was provided. TBI is an important element of the present study. This section provided a review of research that has revealed the main characteristics of task-based interaction.

Section 2.6 presented the justification for the need to analyse task-based interaction. Building on the discussion in the previous section (2.3), this section argued for the need to analyse TBI holistically. A review of relevant research in TBI was provided showing the gap that the results of this study will help to fill. In this section research that has examined TBI from an emic perspective was also reviewed. As this study adopted a micro analytical approach to analysing the data it was necessary to

examine similar research in TBLT that employed this method of analysis. It was also shown how this orientation fits well with the use of the Tabletop in the model.

In section 2.7 a review of non-verbal communication was presented and it was explained why it is an important element in the holistic model for analysing TBI. Some studies that have examined gesture and non-verbal communication in language classrooms were reviewed.

Section 2.8 provided an overview of the underlying methodological tool for the analysis and interpretation of data, CA. A brief introduction to and definition of CA was presented. A review of studies that have employed CA to study language and interaction was included in this section. This section also provided a summary of studies that have indicated that CA can contribute to our understanding of some key aspects of language interaction that are neglected by mainstream second language research studies which focus mainly on the cognitive aspects of learning.

In section 2.9 a brief history of CALL was provided and it was shown how the Tabletop fits within this area. A description of what the Tabletop is was given, and some research that has involved the Tabletop was reviewed. In the last part of this section the usefulness of the Tabletop to the current study and to the analysis of task-based interaction was outlined.

CHAPTER 3: RESEARCH METHODOLOGY

Since the main aim of the present study was to suggest a model for the analysis of task-based interaction, the methodological aspect of the model is a crucial element that will show whether or not the model can achieve its goal. This chapter outlines the methodological basis, tools and procedures used in this research. The focus of the study is re-established along with the research questions (section 3.1). The methodological foundation for this research is also described, indicating the research paradigm and epistemological position taken in this research (section 3.2). The main analytical tool, Conversation Analysis, and the additional value it brings to the model are discussed (section 3.3). Since this study involved the analysis and discussion of non-verbal communication, a brief discussion of multimodal analysis is provided in section 3.4 to show how embodied actions in the data are treated. The rationale for conducting this research in the manner presented in this chapter is also presented (section 3.5). A detailed description of the main study is presented in section 3.6, and the digital task used in the study is also described in detail in this section. Section 3.7 contains an overview of data collection procedures. The data were very rich because I used various resources in order to capture as much detail as possible about task-based interaction. Section 3.8 describes how the data in this study were prepared for analysis using the model. That included digitising the video data, transcribing the participants' talk and feeding all resources into Transana. A brief description of the data analysis is provided in section 3.9. It is also shown how the proposed model would allow a holistic analysis of task-based interaction data. The different stages of analysis are also shown in this section. The chapter concludes with a discussion of reliability and validity, and of

ethical issues related to this research. Lastly, the limitations of the study are considered in section 3.12.

3.1 Focus of the study and research questions

This aim of this research was to develop a model for the analysis of task-based interaction holistically, a model that is composed of the following elements: TBLT, CA, the Tabletop, multimodality, and video recording of TBI processes. The goal in designing and using the model was to realise its potential for analysing task-based interaction in detail. The model would work as a multimodal lens that sheds light on the details of the interactional phenomena in task-based interaction. Verbal and non-verbal communication along with recordings of visually observable physical actions are combined in one location and seen from a single analytical perspective.

The study seeks to address the following questions:

- Is it possible to develop a holistic model that facilitates the analysis of task-based interaction?
- Does the model enable a holistic analysis of task-based interaction?

The research questions relate to the design and implementation of the model and to whether it is able to provide a detailed look at task-based interaction. The first question is related to the design process of the model which is discussed in detail in the next chapter. The focus is on the different components of the model and how they combine to enable a holistic analysis of TBI. A holistic view of TBI is needed in order to capture the full details of TBI, as discussed in the previous chapter. The answer to the first question is discussed thoroughly in chapter 4 through a characterisation of the model and its various components. The second question relates to the implementation of the model and to whether it does actually enable a holistic analysis of TBI. This was determined by using the model to explore how the participants in this research managed

their interaction around a digital Tabletop. Chapter 5 demonstrates in detail how the model was used to analyse data in this setting.

3.2 Methodological foundations

The main theoretical and methodological framework for this study is ethnomethodological Conversation Analysis, which is essentially concerned with studying interaction through the description of the social actions people perform in their everyday mundane social activities (Heritage, 1984; Psathas, 1995). The epistemological basis of CA is ethnomethodology (Heritage, 1984), which is located in the phenomenological paradigm. The ontological position of ethnomethodology is associated with constructionism, which is the belief that "social phenomena and their meanings are constantly being accomplished by social actors" (Bryman, 2001: 18).

Ethnomethodology is concerned with the common-sense methods that people use to make sense of their experiences and establish the social reality (Garfinkel, 1967). As Garfinkel points out,

> in contrast to certain versions of Durkheim that teach that the objective reality of social facts is sociology's fundamental principle, the lesson is taken instead, and used as a study policy, that the objective reality of social facts *as* an ongoing accomplishment of the concerted activities of daily life, with the ordinary, artful ways of that accomplishment being by members known, used, and taken for granted, is, for members doing sociology, a fundamental phenomenon. (ibid., p. vii, emphasis in original)

In ethnomethodology, it is considered the job of the analyst to find ways into people's common-sense thinking and to understand their actions from their perspective (Bryman, 2001). Conversation Analysis grew out of ethnomethodology and shares with it the importance of concepts like reflexivity and indexicality.

Reflexivity and indexicality are two central concepts in ethnomethodology and have clear relevance in CA methods. These two concepts are brought into the discussion here as they played a significant role methodologically, providing theoretical and epistemological support for the analysis and interpretation of the data in this study. These two concepts were relevant to this research as they relate to the ways in which participants interact and build intersubjectivity and mutual understanding of the ongoing interaction. Reflexivity refers to an understanding of the normative rules and procedures that participants follow during the interaction process. Indexicality, on the other hand, is the notion that the meaning of talk in interaction is context-bound, embedded in its local context. Participants in interaction employ reflexivity to establish and make accountable the temporal understandings of any interaction they are involved in (ten Have, 2007). This reflects an 'emic', i.e. participants', perspective, rather than an 'etic', i.e., outsider's, perspective in describing social behaviour. In task-based interaction a great deal of indexical interaction takes place. Thus, it is necessary to analyse such interaction from an emic perspective and this is why this local perspective is adopted in the proposed model.

The notion of indexicality is considered a key principle not only in ethnomethodology but also in CA. In interaction, people do not explicitly exchange the full range of their intended meaning but rely on the background context (Seedhouse, 2004). The meaning of what people say when they converse is largely embedded in the context they are talking within. There is no need to repeat all the accompanying and taken-for-granted information as they talk. When people talk they establish a basis, or 'context', for mutual understanding that they refer to as they interact. Ten Have (2004) states that "… on all occasions, all expression and actions are in fact indexical" (p. 21). This reflexive relationship between the talk and the context provides an analytical

resource and underlies the insistence in CA that we invoke contextual features in analysis only when it is evident from the details of the interaction that the participants themselves are orienting to such features (Seedhouse, 2004: 7). The indexicality of interaction is one reason why we need a holistic model to examine in detail what students do during tasks. To achieve this, we need to see how they co-create their mutual understandings in the emergent contingencies of the local context. The model proposed in the present study involves several components that furnish us with different types of data. CA methods are used to interpret the enormous amount of data that task-based interaction generates.

In this section the theoretical basis for CA methodology has been described. The following section sheds light on the procedures of data collection and analysis in Conversation Analysis.

3.3 Conversation Analysis methods and procedures[8]

Conversation Analysis plays a key role in the proposed model for the analysis of task-based interaction. It is the component that allows us to make use of the combination of sources of data in the model. CA is the analytical tool that reveals the details of the interaction in TBI. CA is a qualitative approach that examines naturally occurring interaction to explicate how interactants establish mutual understandings and meaning making processes. This is achieved by looking closely at the sequences of interaction that people jointly build in a moment-by-moment fashion when they are involved in interaction. A methodological requirement for CA is that the data collected have to be naturally occurring data. This means that the interaction has to be recorded in some way - audio/video - while it is taking place in its local context. CA treats the

[8] The current chapter discusses the methodological aspects of CA, namely, how data are collected, analysed and interpreted using a CA mentality. CA is introduced and defined in section 2.8.

interaction in a special way: it has its own principles and procedures. Seedhouse (2005) summarised these principles:

- There is order at all points in interaction
- Contributions to interaction are context-shaped and context-renewing
- No order of detail can be dismissed a priori as disorderly, accidental, or irrelevant (Heritage, 1984, p. 241)
- Analysis is bottom-up and data-driven (pp. 166-167)

The aim of CA is to uncover the organisation of social order (Sacks et al., 1974) that is embedded in the local indexical social action. It seeks to "describe, analyse, and understand talk as a basic and constitutive feature of human social life" (Sidnell, 2010, p.1, cited in Sert and Seedhouse, 2011). The study of interaction in CA terms is achieved by adopting an emic perspective, i.e., any reference to the data must be based on the participants' perspective (Markee and Kasper, 2004). Unlike other research methodologies, CA does not accept predefined categories for or hypotheses concerning the social phenomenon. The starting point for analysis should be the local order that is constructed in the details of the interaction. CA as a methodology has its own analytical tools, such as turn-taking, adjacency pairs and preference organisation, which can be employed to uncover the details and processes of social interaction.

3.3.1. Data collection in CA research

In order to collect CA data, recordings of naturally occurring interaction are made. Recording of talk-in-interaction takes place in its local environment without any distortion or intervention, although the presence of equipment can sometimes have an impact on the naturalness of the data collected. The data are normally compiled from recordings of audio and video data. Video technology has allowed CA researchers to

study not only talk but also non-verbal communication. In the present study, technology played an essential part in the processes of data collection and analysis. First, when collecting the data a new form of technology, the Tabletop, was used to collect fine-grained details about the interaction. Second, another form of technology, Transana, was employed during the analysis process to interpret the data collected.

In CA research the focus is always on naturally occurring interaction. The interaction must be captured as it is taking place in its local context. Thus, experimental theorising and prior categorisation is not an accepted method for CA data collection; since to impose our presuppositions a priori would distort the phenomenon we are studying. It would also endanger the emic perspective that CA researchers always strive to maintain. Collecting data by relying on pre-formulated categories or theories would go against the insistence on the importance of the local context in CA.

After collecting the data, mainly audio data, the process of transcription starts. Transcribing the data using CA conventions is a time-consuming and laborious task. The transcriber should include as many details as possible, as no part of the interaction is regarded as irrelevant. As shown above, social interaction is reflexive and indexical, so in order to understand the meaning-making processes of interaction we should include as much detail as possible. Generally speaking, in CA research, transcripts are regarded as an important part of the analytical process. CA analysts identify the various phenomena of social interaction through multiple viewing and inspection of transcripts and recordings.

As the present study adopted a CA perspective, when designing the model particular attention had to be paid to detail when collecting the data. All the different components of the model: the Tabletop, CA and video recordings, are capable of

capturing the micro details of interaction. Consequently, this could be the most appropriate tool for providing a better understanding of task-based interaction.

This section has described the methods and procedures underlying Conversation Analysis methodology. This is an important part of the proposed model, since it establishes the analytical tool and dictates how the data are analysed. The next section will discuss multimodal analysis and will demonstrate why it should be incorporated in the proposed model.

3.4 Multimodal analysis

Goodwin's view (2000, 2003) of social interaction also constituted part of the analytical apparatus in this study. Goodwin (2000: 490) proposes that "the construction of action through talk within situated interaction is accomplished through the temporally unfolding juxtaposition of quite different kinds of semiotic resources". CA methodology and the analysis of embodied actions in interaction play a key role in the proposed model for analysing TBI. This multimodal micro-analytic methodology is employed in the model to capture the details of the interactional data as talk and social action temporally unfold in a locally situated manner. A number of studies have used this micro-analytic perspective to investigate the sequential analysis of talk-in-interaction and its close connection with various multimodal resources (Goodwin, 1981, 2000; Hayashi, 2005; Heath, 1986; Mondada, 2007a; Schegloff, 1984; Sidnell and Stivers, 2005; Streeck, 1993, 1996).

Since the main aim of the study was to capture holistically the details of task-based interaction, it became necessary to look into non-verbal communication. This is why video recordings were the main source of data for the study. Multimodal analysis was regarded as a key component for many reasons. First, analysing various modes gives more insights into any phenomenon. Second, the nature of the task used in this

study required a heavy reliance on non-verbal communication. In order to reveal the details of task-based interaction in such a setting it is necessary to include the analysis of these non-verbal resources. Third, the model proposed in the present study involves the tracking and recording of extremely rich data, including non-verbal communication. Finally, a holistic analysis of task-based analysis would necessitate an examination of non-verbal communication in order to capture the full details of the processes of TBI. Relating non-verbal communication to task talk would give a clearer picture of TBI processes.

This section has presented multimodal analysis, which played a key role in the current study, since the proposed model involves the collection and analysis of visual data. In the next section I will discuss the justification for using CA and multimodal analysis to analyse TBI data within the proposed model.

3.5 Rationale for using the methodology

The proposed model adopts a CA micro-analytic perspective for the analysis of the data. The reasons for adopting this method include the fact that the aim of the study was to develop a model that makes a detailed analysis of task-based interaction possible. To achieve this goal, a close look at the details of the interaction is needed. Such attention to detail cannot be achieved using quantification of categories as the majority of research into TBLT, which has adopted the Input Hypothesis, has done. It should be noted that this research is informed by the theoretical underpinnings and principles of CA.

In the present study the amount and depth of the data collected was immense. More specifically, the data collected included audio, video, text and gesture data of the same task as it was taking place. To subject this myriad data resource to rigorous

analysis we needed a methodology that could mirror the same level of attention to detail. CA and ethnomethodology provide the appropriate tools to examine closely the micro details of any interaction, i.e., indexicality and reflexivity. Their emic perspective can help us to examine closely the fine-grained details of task-based interaction.

In this study, the proposed model involves the analysis of multimodal resources oriented to by the participants. The perspective taken to make sense of these multimodal actions was therefore Goodwin's (2000, 2003) approach, since his approach views the interaction as interactively and dynamically developed and locally situated. He examines how multimodal resources become relevant to the ongoing interaction as the task unfolds temporally. Non-verbal communication in the study is treated as part of the interactional phenomenon in order to see a clearer picture of task-based interaction. This combination of CA methods and multimodal analysis gives synergy to the proposed model. The major focus of CA research has long been on talk with a lesser emphasis on non-verbal communication. Furthermore, this methodology matched the requirements of the task at hand. That is, analysing task-based interaction holistically and uncovering its complex processes necessitates an approach that can investigate interaction in its local and situated context, paying attention to the different aspects of the phenomenon, including non-verbal communication.

This section has presented the justification for choosing the methodological tools mentioned above. CA and multimodal analysis of the data matched the requirements of the proposed model, the aim of which is to depict TBI processes holistically. In the following section the main data collection process of this research is discussed in detail.

3.6 The Study

3.6.1 Research Setting

The main aim of the present study was to develop a model for the analysis of task-based interaction. Therefore, part of the task involved collecting some data that would be incorporated into the analytical model later. The setting for this research was a classroom at Newcastle University in the UK. The classroom was fitted with a digital Tabletop, which was placed in the middle of the classroom. Two video cameras were used to capture the interaction from two different angles. The setting in this research was therefore not a normal classroom setting but more of a semi-experimental environment. However, the existence of the digital table and cameras did not seem to have any intrusive effect. When I spoke to the students after the task they indicated that they had felt comfortable, and it was apparent that they were involved enthusiastically in the task.

3.6.2 Participants

The participants in this study were 29 international postgraduate students at Newcastle University (see Appendix B for more details). They performed the task in groups of three and there was one pair of students. A total of ten groups took part in the study (nine triads and one pair of students). The age range of all participants was from mid-twenties to mid-thirties. The participants were from different disciplines (e.g., Education, Engineering, Computer Science, Medicine, Architecture, Business, Agriculture) and from different countries (Egypt, Germany, Libya, Saudi Arabia, South Korea and Thailand). The groups were at almost the same level in terms of their mastery of English as determined by their IELTS results. They were all in the process of doing their Masters' or PhD studies and they had all achieved the minimum IELTS score required by the university. This information is presented here simply for reference, since

CA does not take such variables (e.g., gender, field of study, country of origin, L2 proficiency) into consideration in the analysis of data unless such information is made relevant by the participants' interaction.

Each group consisted of two or three participants, as the Tabletop used allows a maximum of three people at the same time. This could have been an advantage in terms of data collection and transcription as it made it easier to capture a better quality of audio recording of the interaction. Each participant performed the task on the Tabletop using a stylus pen of a specific colour. This was helpful in the transcription and analysis of data to identify who was doing what.

3.6.3 The task

The task in this study was a jumbled text: a typical L2 classroom task aimed at generating interaction between students. The story was directed at upper intermediate to advanced level English language learners. The task was a story that had been cut into 23 pieces, and the participants' task was to try to put the pieces together in order to understand the story and thus answer the main question that they had been asked at the start of the task. The story was digitised and embedded in the Tabletop. The application throws the pieces randomly where the learners can manipulate them. They can move, rotate and maximise the size of the pieces. The learners need to discuss among themselves how to reconstruct the story and put the pieces in a certain order to rebuild the narrative.

In terms of the distinction between convergent and divergent tasks (Duff, 1986), the main task used in this research represents a convergent task, as the learners' aim is to come to an agreement with regard to the appropriate order of the pieces. This ordering of the pieces that they are looking for can help them make sense of the story so

that they can agree on an answer to the question posed at the start of the task. They have to interact and negotiate various possible solutions to the problem presented at the start. They try to make sense of the story by rebuilding the narrative of the story. They put the pieces into the order that will bring them closer to a plausible answer. Although the assumption is that the main question might direct them toward a limited number of possible solutions, the fact is that as the task unfolds as a task-in-process (Breen, 1987) this initial main goal orientation might lead to various acceptable answers as the participants negotiate and debate ideas and issues. The design of the task will quite possibly generate a great deal of interaction and discussion. Participants will have to discuss, argue and negotiate their moves on the Tabletop to move from one step to the next. This will trigger a great deal of interaction that can be looked at in the proposed model to reveal what actually happens in the moment-by-moment orchestration of task-based interaction. The next section will expand further on the task used in this study, detailing the stages of the task.

3.6.4 The stages of the task: Solving a mystery

Since the task was a jumbled text, the participants needed to negotiate how to reconstruct the original story to make sense of it. The story was divided into twenty-three pieces.

The following figure shows the prompt that comes up at the start of the application. This is a prompt for the participants showing them what to do with the task in the first stage.

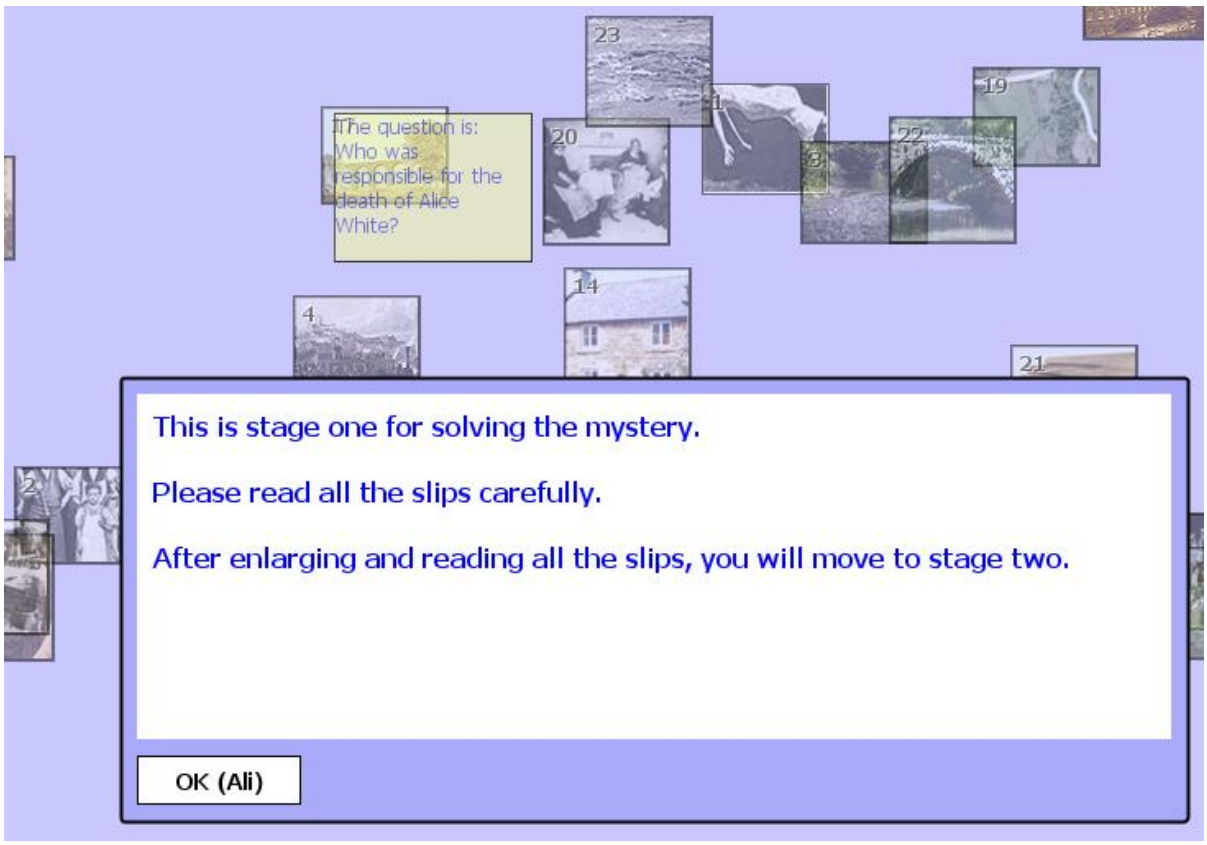


Figure 3.1 Instructions at the start

The next figure shows the guiding question in the specific story which I used in the data collection. It also shows that each piece had three levels of representation, i.e., sizes. Piece 10 was maximised to the large size, while pieces 17 and 4 were of medium size. The remaining pieces, 23, 20, 3, were small.

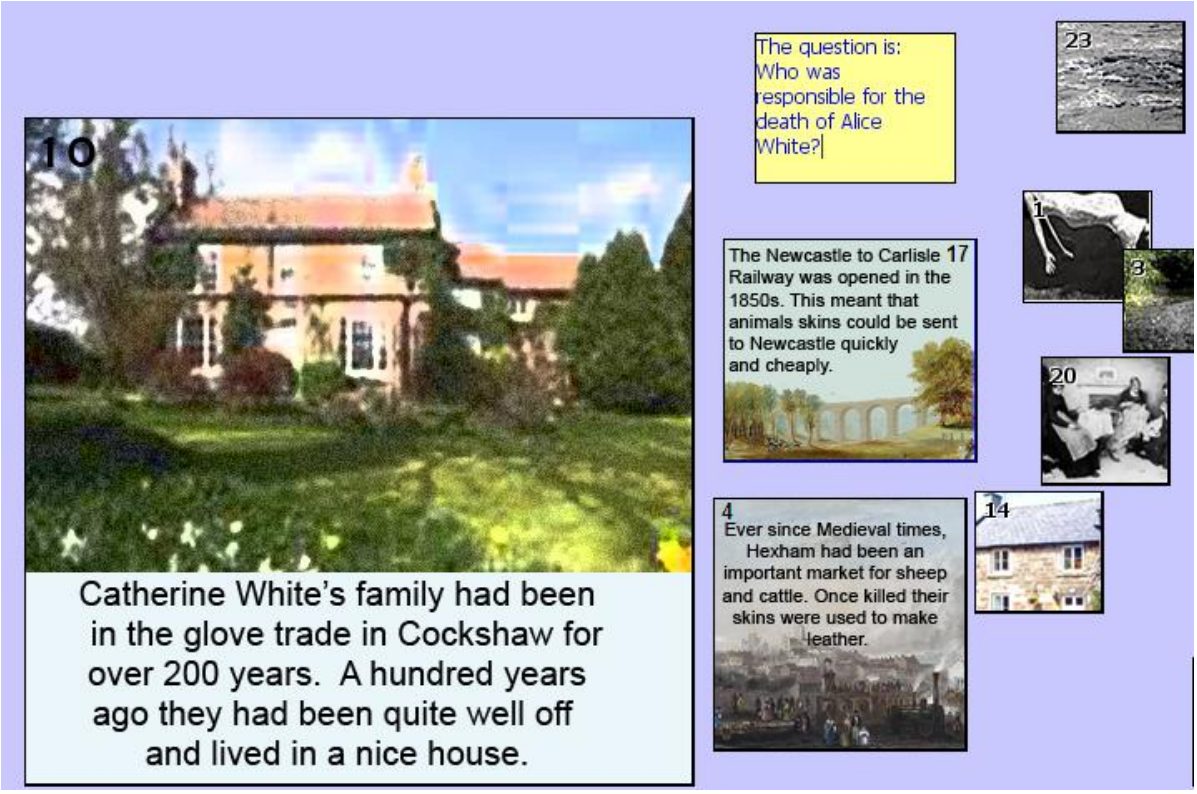


Figure 3.2 The main question of the task

The participants had to check every piece to make sure they had read the whole story before moving to the next stage. The system can sense when all the pieces have been read by the change in their size and thus allows moving to the second stage.

Figure 3 below shows the instructions given at the beginning of stage two of the task. After reading all the pieces, the participants now sorted them out by grouping them. They could not move to the final stage of the task before assigning all the pieces to groups. In the second stage they also needed to write a sentence or two describing their groups.

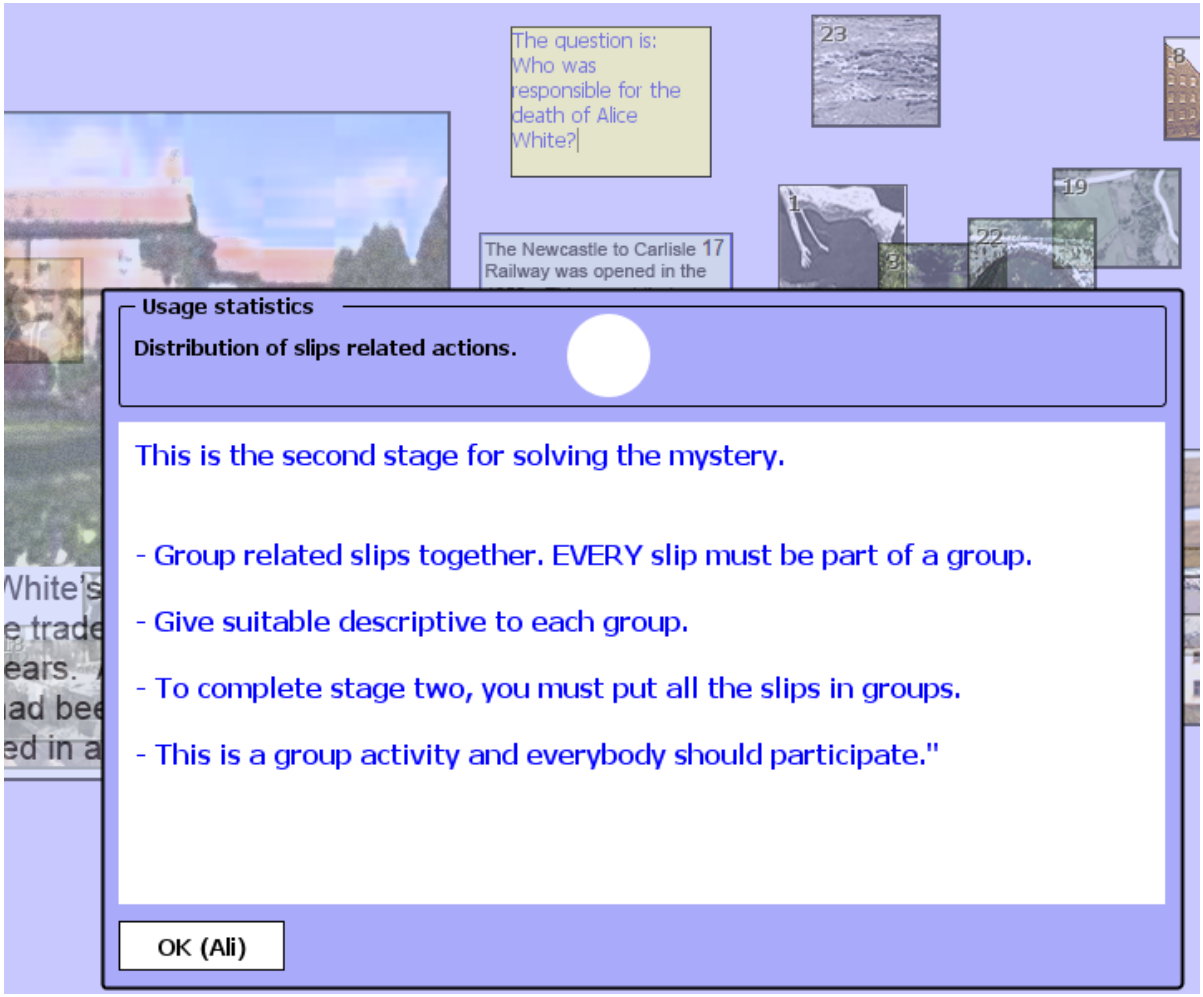


Figure 3.3 Instructions at the start of stage 2

The next figure (4) shows the start of the second stage of the task. The figure shows the three groups: one group for each participant. This gives the participants the chance to sort things into themes if they want. The figure shows the features and affordances of the Tabletop that the participants can use. As shown below, they can use the virtual keyboard to write things on the Tabletop. They can also use the tools in the circle, i.e., the sticky tape to connect pieces and the notes icon to write notes on the surface. The third icon is the exit button, which is needed when they want to move to the next stage.

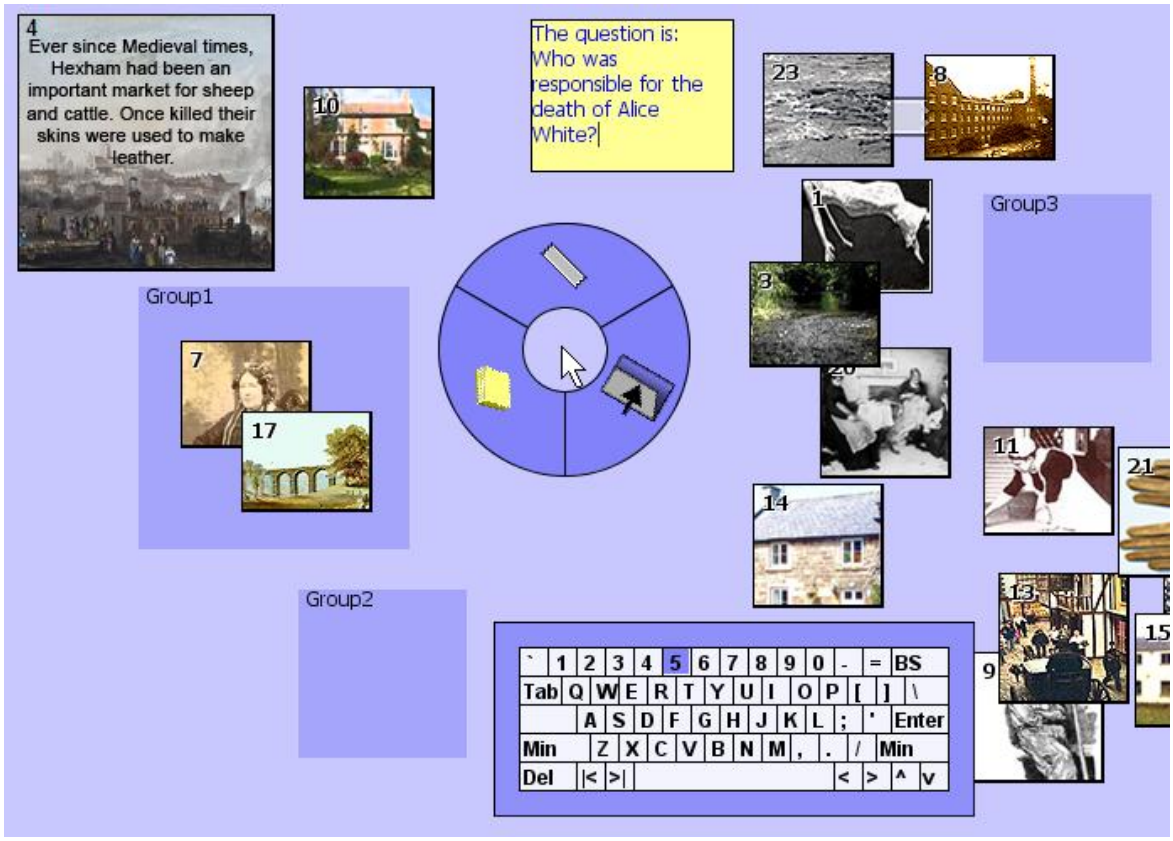


Figure 3.4 Stage 2 of the task

The following figure shows the end of stage two before participants move to the final stage of the task. As the figure shows, all the pieces are in groups and a summary of one of the groups has been written. They can move on now.

Figure 3.5 End of stage 2

The following figure shows the instructions given before the start of the final stage of the task. The participants must use the Tabletop's affordances and tools to connect the pieces; that is, they need to demonstrate visibly, on the surface of the Tabletop, how they are reconstructing the story in order to answer the main question.

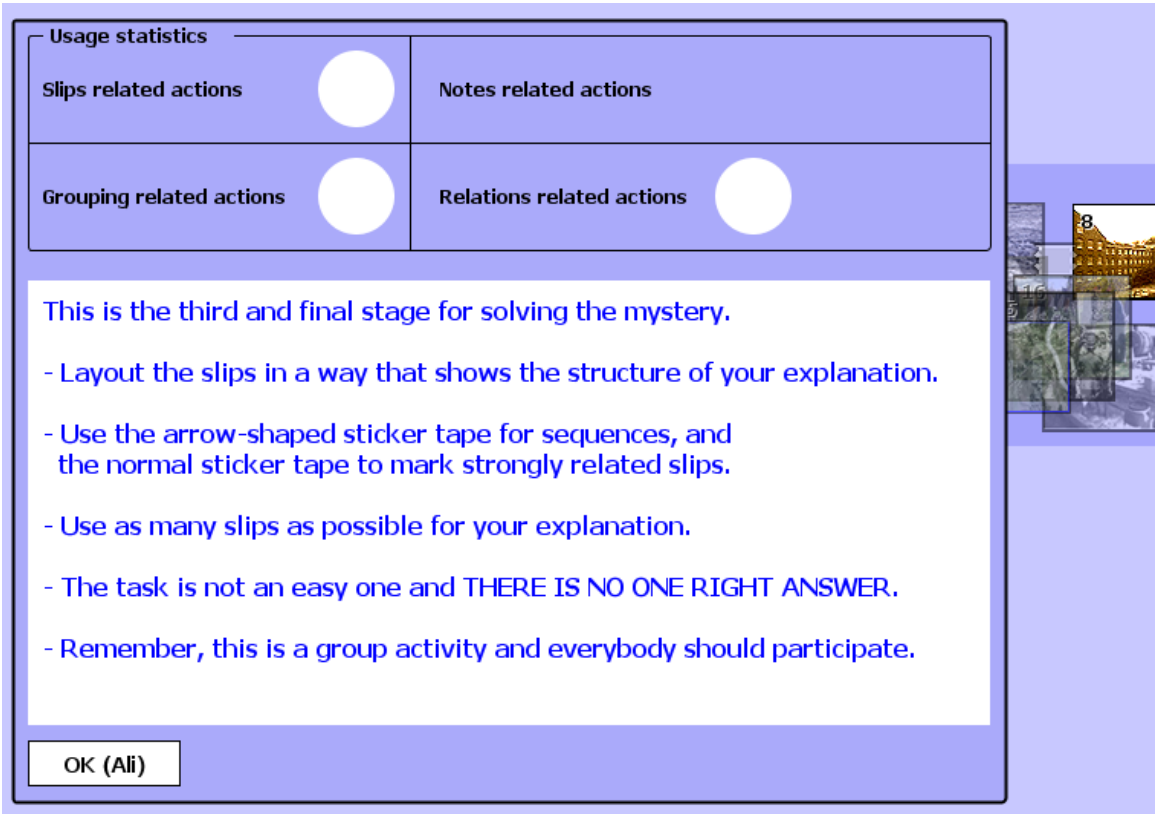


Figure 3.6 Instructions at the start of the final stage

The figure below shows an example of the final configuration of the task. What happens usually is that the participants lay out the pieces and connect them in a way that builds a meaningful sequence of events.

Figure 3.7 End of the task

The reason for choosing this particular task is that it nicely fit the study of task-based interaction in light of the proposed model. That is, the task requires a lot of discussion, negotiation and movement of the task artefacts. Participants have to move the pieces of the story on the surface of the Tabletop as they interact. This makes the task details become visible and corresponds with the tracking affordances of the Tabletop. This type of task exposes the details and progression of the task processes. From an analytical standpoint, this type of task provides the proposed model with a window on the micro details of the visual aspects of interaction.

This section has presented in detail the main data collection process in this research. An overview of the research context, the participants, and the task used has been provided. This section has also included visual illustrations of the digital task used in the study. It was important to do this in order to give the reader a closer look at the

details and procedures that were involved in the digital task. The following section covers the data collection procedures.

3.7 Data collection procedures

The study was conducted in a classroom at Newcastle University which was equipped with the tools necessary to conduct the study. A digital Tabletop was positioned in the middle of the room and a video camera was also used during the jumbled task. The video camera was used so that I could capture talk and non-verbal communication by the participants as they interacted with each other or as they used the Tabletop. Screen capturing was used to record the movement of the pieces of the story on the surface of the Tabletop. In groups of three, the participants were introduced to the digital table and the task using a dummy task. Before they performed the task I explained my research to them and asked them to read carefully and sign the consent form. When everything was in place and the equipment was ready I turned on the Tabletop task, the video cameras and the screen capturing. I left the scene, as the presence of the researcher might have affected the way the participants acted during the task. I did, however, sit in a nearby classroom in case the participants wanted my assistance with technology failures. They were given the freedom to take as much time as they wanted to finish the task.

The participants were contacted in various ways. First, I sent email messages to prospective participants asking if they would like to volunteer. I also passed the email to friends and colleagues to forward to their friends. I also made some phone calls to colleagues asking them if they would like to take part and explained to them, in general terms, what the project was about. The grouping of participants was done according to their availability and convenience. Each group was given a specific time to meet. Some groups were made up of friends who knew each other and decided to come together.

Other groups were composed of participants who did not know each other. All groups were given the time to finish the task. On average, each group took approximately an hour to do so.

The following figure shows the different sources of the data captured during the data collection stage. The figure also shows how these sources fit nicely into Transana (see section 3.8.2) for the purposes of data transcription and analysis.

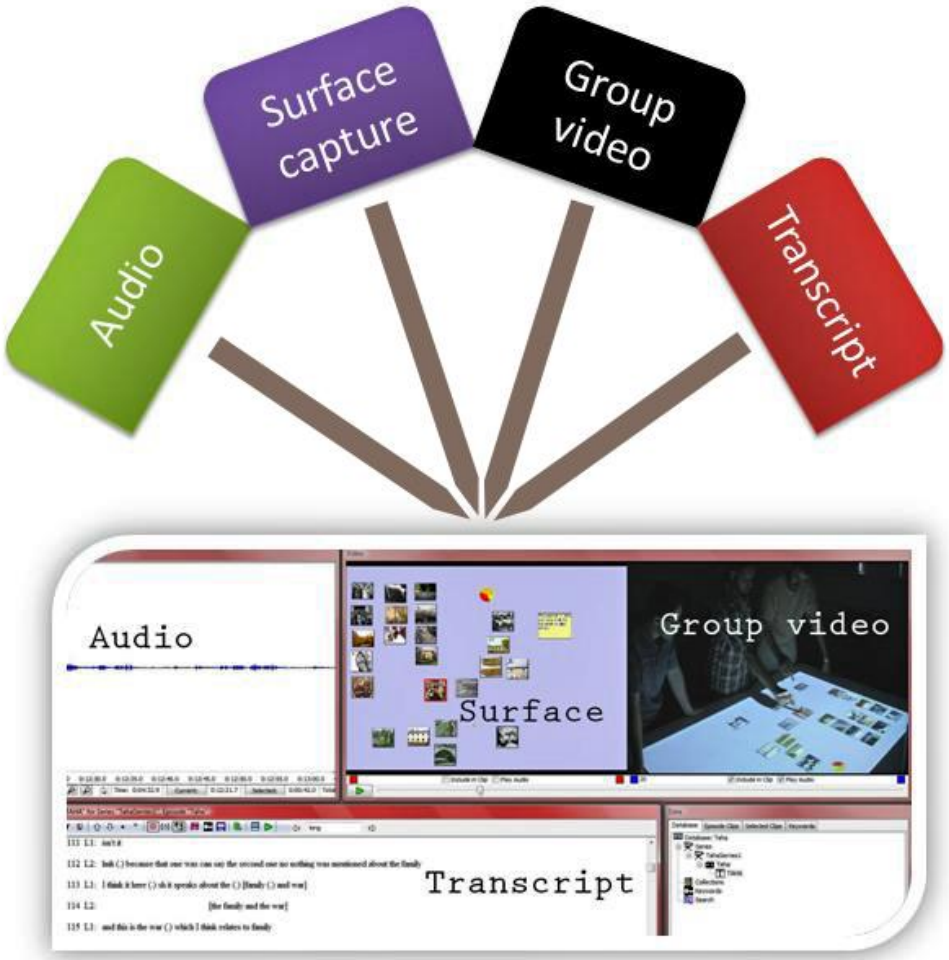


Figure 3.8 Data sources

This figure shows the different sources of data: audio, surface capture, group video, and transcripts. Data from the first three sources were collected simultaneously,

while the transcripts were produced later. The amount of data collected in this study was approximately 11 hours of video data recorded from the group camera. On average, each group spent around an hour doing the task. Another 11 hours were recorded from the screen capture at the same time as the task was being performed. These two sources of video data were combined and synchronised in Transana for analysis. Video from the group camera and video from the screen capture were synchronised, so when the video is played, the screen displays the two video sources simultaneously.

3.7.1 Audio data

Audio data were collected in the study along with the video footage. The camera that captured the group video also captured their talk. Audio data are extremely important because they provide access to the participants' talk and interaction, i.e., use of language. They also give us access to the emic, or participants', perspective on how they are co-constructing the processes of task-based interaction. The audio data were extracted and imported into Transana (see section 3.8.2) to be transcribed and synchronised with the data from the other sources.

3.7.2 Surface capture

Surface capture is the screen recording of the Tabletop as the participants use it. The surface of the Tabletop works like a giant computer screen, so it is possible to use the screen capture feature which is built into the Windows operating system. This capturing of the surface gives a video account of what takes place on the surface of the Tabletop. Obviously, what is recorded here is the digital surface of the Tabletop; the physical use of the Tabletop is captured by the group video (see next section). The reason for capturing the surface of the Tabletop is to keep a moment-by-moment temporal and sequential account of the details of the task. Since the task required movement of the pieces of the story, the best way to see how this was done was to

capture the surface on video. The participants used stylus pens of different colours; thus it was possible to identify who was doing what by looking at the coloured arrows in the recording. The screen capture gives a very clear account of how the task is handled and worked out from start to finish. This is justified by the need for a closer look into the details of task-based interaction. It is this level of detail that can reveal exactly what happens in TBI.

3.7.3 Group video

The group video was taken by the camera set up in the room to film the participants as they were performing the task. The camera was set up in such a way as to capture the participants and parts of the Tabletop. This was necessary for the analysis of the data because we would be able to connect the participants' actions at a particular moment to how they were using the surface of the Tabletop. As mentioned in the previous section, the screen capture keeps a record of the digital manipulation of the surface, so the picture would not be complete unless we have access to how the participants align themselves around the Tabletop and how they use non-verbal communication in their interaction. The group video provides such access.

3.7.4 Transcripts

The transcripts were another source of the data collected for this study. The transcripts were produced from the audio/video recordings on the group video. After recording all the groups the audio data were transcribed using CA conventions (see Appendix A). The transcripts were fed into Transana and synchronised with the relevant video recording.

As has been shown above, various sources of data were used in the present study. These different sources complement each other to give a holistic view of the

details of task-based interaction. The group video provides access to the non-verbal communication that the participants engaged in. It also shows partially how they used the Tabletop physically. The screen capture completes this picture of non-verbal work by showing what exactly was happening to the pieces on the surface of the Tabletop. The audio data provide access to what was being talked about and said while performing the task. Furthermore, the transcripts give a detailed depiction of the participants' verbal communication. All of these elements converge together to provide a powerful representation of the task-based interaction as it was taking place in a moment-by-moment fashion. It is noticeable that the combination and complementarity of the different sources gives a clear and detailed picture of TBI processes. That is precisely what the proposed model aims to achieve.

Finally, in this study I collected naturally occurring audio and video data. Later on transcripts were produced. This approach to collecting data is regarded as a cornerstone of CA. Other approaches to data collection, such as questionnaires, interviews and observations, are not usually accepted in CA research as the focus is always on interaction that takes place in-situ. Such approaches may not provide us with an explication of the local indexical nature and orderliness of task-based interaction. Another issue with interviews is that participants' accounts of what they think they did may not necessarily reflect exactly what happened during the interaction.

This section has presented the different sources of the data collected in this study. As shown in figure 3.8 above, data from the various sources were combined in one place for the analysis. This placing of all the data from the various sources into one location for the purposes of analysis is a key feature of the proposed model for analysing TBI. The reason for pulling different sources of data together is to enable a holistic view of TBI through the model. The next section will provide an overview of

the data analysis procedures used in the proposed model.

3.8 Data preparation

In this section I will show how the data from the different sources were prepared and assembled for the analysis. The proposed model is composed of various components; when these are put together the analytical process can take place. These various elements make the model holistic and comprehensive. The first step in the data preparation was to digitise the video data. After making a collection of video files the data were transcribed. Special software, Transana, was used to transcribe the data.

3.8.1 Digitising video data

In this study, there were two types of video data. The first was video from the group camera and the second was the screen capture. The group video was recorded using a Sony camcorder. After collecting the data the tapes were digitised and saved. I used Adobe Premier to pull the files from the tapes and also to cut and save selected episodes later on. The screen capture video was already saved on the Tabletop's machine. For each group I saved the relevant two video files in one folder along with the relevant transcript. When recording the data from the tapes onto the computer I kept the original resolution of the video in order to maintain the same quality of video. This resulted in large video files, but there was enough capacity to save this amount of data.

3.8.2 Data transcription

After collecting the data, I started the process of transcribing the interaction. I followed CA conventions (Atkinson and Heritage, 1984; see Appendix A) to transcribe the audio data. The aim of this process was to obtain a written account of the interaction while the participants were performing the task. As is always the case in CA transcription, careful attention was paid to the micro details of the interaction: i.e.,

pauses, overlaps, non-verbal actions. I used Transana[9] software (see figure 9, below) to transcribe the data. Transana, as described in its website is:

> "…software for professional researchers who want to analyse digital video or audio data. Transana lets you analyse and manage your data in very sophisticated ways. Transcribe it, identify analytically interesting clips, assign keywords to clips, arrange and rearrange clips, create complex collections of interrelated clips, explore relationships between applied keywords, and share your analysis with colleagues. The result is a new way to focus on your data, and a new way to manage large collections of video and audio files and clips."

The following figure shows the main screen of Transana. The main screen consists of four windows numbered as shown in the figure below.

1. Audio window: this window shows the audio file in a waveform. This helps in the transcription process by making possible the selection of segments of the audio file and by making it possible to zoom in on a particular section to see the detail of the audio segment.

2. Video window: in this window the video is displayed and synchronised with the audio. Transana makes it possible to have more than one video file at the same time. This facility was not available during the time of the initial stages of this study and the solution I used was to combine two video files into one file through video editing and then importing the resulting file into Transana. The figure below shows two synchronised files of video data.

3. Transcript window: this window shows a text editor where researchers can transcribe the audio/video data. It is also possible to import ready-made transcripts done somewhere else into this screen. As one transcribes the data in

[9] A program for the qualitative analysis of video and audio data developed at the University of Wisconsin-Madison Center for Education Research, USA. For more information see http://www.transana.org/

this window it is possible to link the text to the relevant audio or video frame. At the end, when the audio/video is played, the matching text is highlighted. This makes it possible to navigate through the data with ease, and is also useful for the analysis of the data. When one clicks on any part of the text the matching video frame is displayed.

4. Data window: this window is the place where the data are organised. Video files and text files can be organised and made into collections.

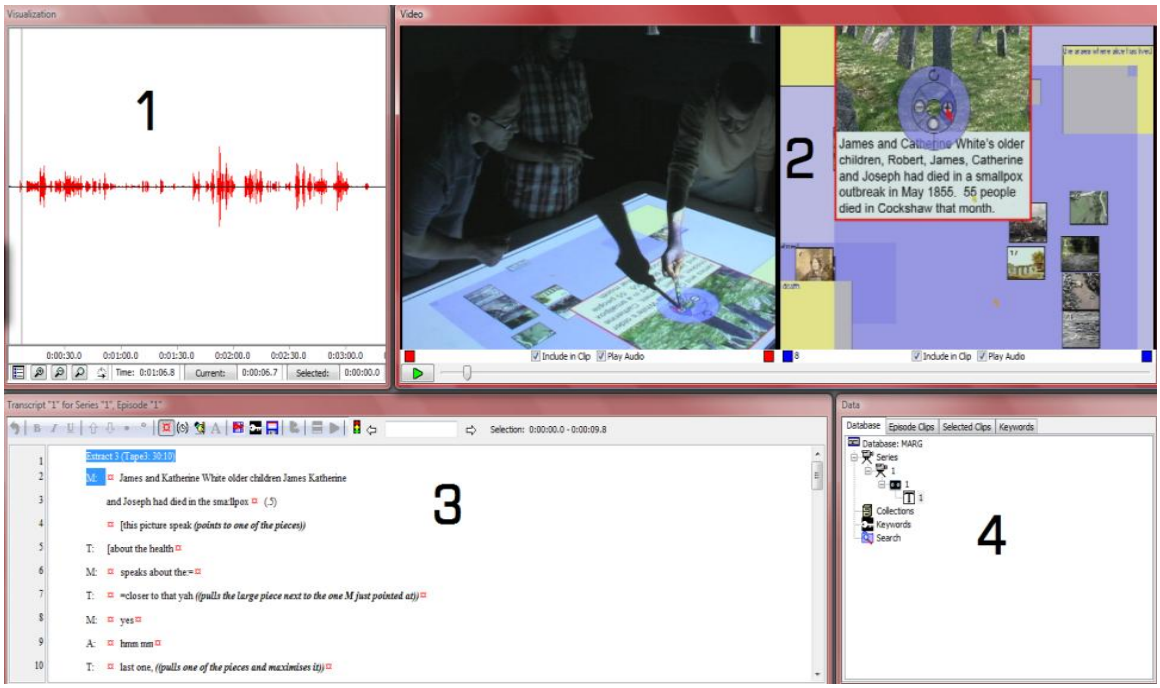
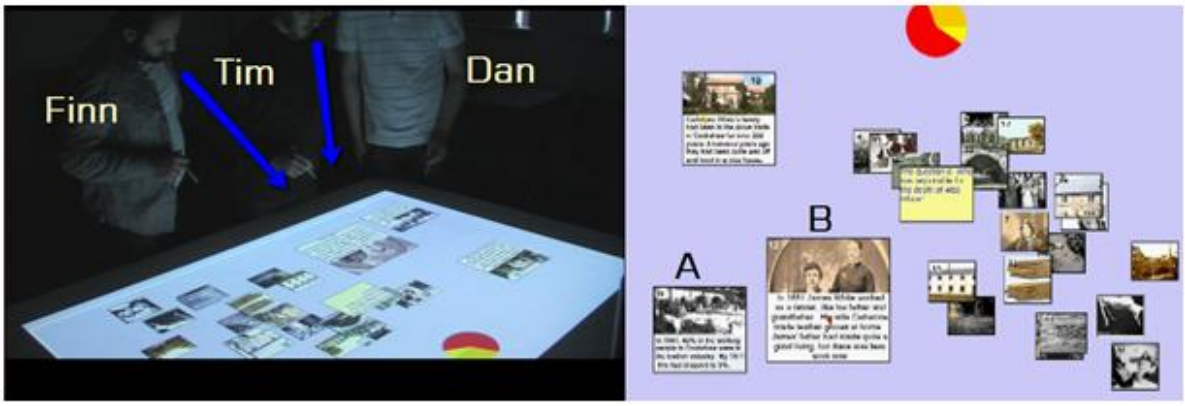


Figure 3.9 Transana window

It should be noted that the transcription of the episodes selected for detailed analysis included adding graphic annotations and snapshots from the video recording, following the work of Goodwin (2000). The video snapshot shows two different sources of video synchronised to show what was happening at that specific moment in the interaction. The transcripts also included descriptions of embodied actions. This was done in order to capture in detail the embodied aspects of the interaction and the

physical use of the Tabletop by the participants. The following figure shows an example of a transcript with the accompanying details:



unknown lexical item

Extract:

1	Finn:	°so Katherine White's family have been okay [( )
2	Dan:	[in the (.) <glove> (.) trade
3	Finn:	[°A hundred years ago they had been quite well off] and lived in a nice house okay°
4	Tim:	[*((maximizes one of the pieces))*]
5	Dan:	*((aligns himself so that he can read by moving closer to Tim))*
6 →	Dan:	James White worked (.) as a tinner, what's a tinner↑
7	Tim:	tinner↑ [tanner] *((looks at the relevant piece))*
8	Finn:	[tanner] er ( ) *((looks at the relevant piece))*
9	Tim:	°°whats a tanner°° *((reading the relevant piece))*
10	Finn:	°ah his brother began ( ) tanner° *((surveying the tabletop))*
11		*((all participants surveying the Tabltop))*
12	Dan:	*((leans forward while reading silently))*
13 →	Dan:	ah >maybe< er so:meone who i:s ah::m (.) >preparing< the (.) leather. *((Demonstrates with*
14		*hand movement))*
15	Finn:	*((looks at Dan's embodied demonstration))*

Figure 3.10 An example of a transcript

During the transcription stage, the use of Transana made it possible to look at the two video sources at the same time and thus made it somewhat less difficult to capture the details of the participants' interaction. It is worth noting here that the two files produced for each group give two different perspectives on what it is happening in the task. When all these modalities (video 1, video 2, audio) are combined in one place

the transcription of talk becomes less difficult. This is also regarded as a great advantage for the analysis of TBI, as will be seen in the next section.

3.8.3 Combining data sources

As shown above, in this study different sources were combined and used to gain a holistic view of TBI through the proposed model. This was achieved by looking simultaneously at the task processes as they were being performed by the participants. This synergy was made possible by the use of Transana. In other words, the two video sources (group video and screen capture) were fed into Transana. Besides that, the audio was automatically extracted by Transana and shown in the audio window. The fourth source was the transcripts, which were linked and synchronised to the audio.

The combination of the different sources and the synchronisation of audio, video and text makes all these sources available simultaneously for multimodal analysis. This combination is essential for any multimodal analysis of task-based interaction because it gives a holistic as well as a detailed view of the moment-by-moment enactment of task processes. Furthermore, this presentation of the data gives the analyst the convenience of being able repeatedly to examine all aspects of TBI simultaneously. Analysts can examine talk, non-verbal communication and task-completion actions simultaneously using the proposed model. This could reveal the interdependence of these aspects of TBI. Conducting the analysis of the data from the different resources discussed above is extremely time-consuming and complex. However, there is a need for this type of research as it reveals all aspects of the process of language learning through tasks. The next section provides an overview of the data analysis in this study.

3.9 Data analysis

In section 3.3 I discussed the procedures that are typically used for CA analyses of data. In this section I will show how the data are analysed in the proposed model. It will also be shown how a multimodal perspective is taken into account so that we can analyse non-verbal communication and manipulation of the environment.

The aim of this study was to propose a model for the analysis of task-based interaction (see the next chapter for more details). It was thus necessary to establish how the different elements of the model interrelate and depend on each other to constitute a powerful model for the analysis of task-based interaction. The data compiled for analysis in this study came from various sources (see previous section). Once the data had been collected and transcribed, the various components of the model became ready for the next stage, i.e., analysing the data using the model. In this research, the analyst was faced not only with transcripts but also with much detail about TBI. In the model I am proposing in this thesis, transcripts and visual representations of phenomena are made accessible to readers and analysts. Typically in CA research, transcripts are representations of the data that are open to scrutiny by other readers and analysts. This is a strong feature of CA research which also sometimes gives access to raw data. It will be shown next how the data are analysed in the model.

3.9.1 A holistic model for TBI analysis

The figure below shows the different components of the proposed model (the model is explained in detail in the next chapter). It highlights the various elements that are taken into consideration in order to enable a holistic analysis of task-based interaction. The model takes into account the three phases of a 'task' in TBLT (task-as-workplan, task-in-process, task-as-outcomes). This perspective on tasks is maintained

while analysing the data in the model. Throughout the analysis an eye is kept on how the details of TBI processes are made relevant to task completion.

The model also shows that multimodal Conversation Analysis is performed to obtain clearer insights into the details of the processes of task-based interaction. The use of Transana makes it possible to look at data obtained from different sources and aspects at the same time. Task-relevant actions are related to talk and analysed along with non-verbal communication simultaneously. Such a holistic view of the interaction will arguably shed light on some aspects of TBLT that it has been difficult to reveal in the past.

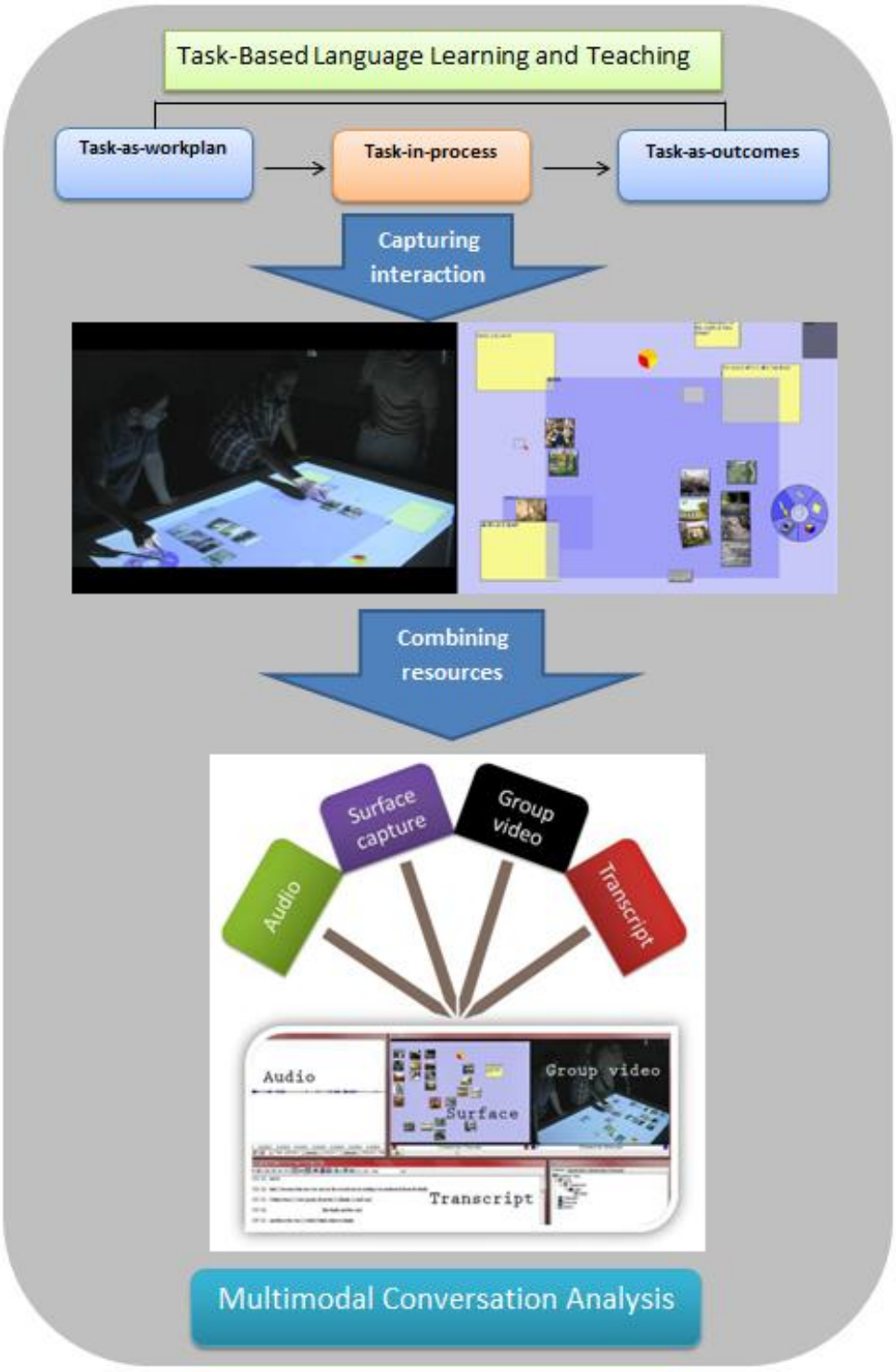


Figure 3.11 A holistic model

3.9.2 Stages of the analytical process

The development of the model and the combination of the various sources of data represent the main purpose of this research, since the main research question asks

what such a model would look like. The first step was therefore to develop a model and then use it to analyse some data to see how effectively it revealed the details of TBI. The analytical process in the model is begun by conducting multiple viewings of the synchronised video data along with the transcripts. This is done to familiarise oneself with the data and to see the full picture of the task processes as the interaction is unfolding. Second, in this study, the repeated viewings of the video data in the model resulted in the selection of a number of cases for further analysis. These cases seemed relevant to the second question of this research regarding whether the model is able to reveal how the participants manage their TBI in detail. In other words, it appeared that these cases had the potential to demonstrate whether or not the model was successful in revealing the multimodal complexity of Task-Based Interaction. The selected cases were then analysed in detail in the model by looking at all the aspects of the interaction: i.e., verbal and non-verbal communication and the use of the Tabletop environment. The use of Transana made this process relatively easy. That is, Transana enabled me to look at all these aspects simultaneously.

As discussed earlier (see chapter 2, section 2.7) Goodwin's (2000, 2003) approach to the analysis of social interaction was employed in this research. That is, the interaction was looked at as locally situated and dynamically developed by the participants using a variety of non-verbal resources. Uses of embodied resources and the immediate environment were taken into account where they seemed relevant in the temporal unfolding of meaning-making processes in the task. The analytical process in the proposed model regards non-verbal resources as a key element in revealing the micro details of the task processes and in showing the relevance of various embodied actions to the interaction and the progress of the task.

In analysing the data, the video, the transcripts, and the screen capture data are analysed simultaneously by looking at them in Transana. These types of data complement each other as they provide textual and visual representations of the task. From an analytical point of view, this was a key issue in this study as it gave a clear picture of the various elements of the task at the same time in a video format. One of the strong features of Transana is that it can play multiple video sources and show the relevant text simultaneously. This gives the analyst immediate access to the various elements of the ongoing interaction. I paid careful attention to the transcription process, since it is crucial in capturing the micro details of the interaction. Transana made it possible to crosscheck the accuracy of the transcription as all the data sources were being played concurrently. As I listened to what the participants were saying, I also had to have access to what they were doing with the surface of the Tabletop, since this would make it possible for me to capture the link between verbal and non-verbal actions. Throughout the analysis of the selected episodes of data every effort was made to expose the details of the interactional phenomena, including non-verbal communication. Psathas and Anderson (1990) note that transcription is a key element of data analysis, not simply a clerical job. This attention to detail would allow us to see if the proposed model is able to show in detail how participants manage their interaction around the Tabletop. This depth of detail and the use of CA methodology would potentially reveal how participants together coordinate verbal and non-verbal resources to accomplish their learning tasks.

As the above discussion shows, the analytical process is complex and time-consuming. It involves the analysis of talk, non-verbal communication, and the use of the digital environment, which is a complex but necessary process if we wish to conduct a holistic analysis of task-based interaction. The model has to involve looking at the

task as a whole as well as at the micro details of the interaction. Furthermore, the non-verbal element added another layer for analysis. This is crucial for the proposed model, the aim of which is to analyse TBI holistically. It is equally important for the second research question, regarding whether the model can successfully be used to reveal the micro details of TBI by examining how participants manage their interaction in the Tabletop environment.

This section has summarised the process of analysing the data. I have described how the data are analysed in the holistic model proposed in this study. It was also shown why multimodal analysis is an important feature of the model in revealing the details of non-verbal communication in task-based interaction. The following section will explicate the concepts of reliability and validity, their relevance to the current study, and how they are conceptualised in this research.

3.10 Reliability and validity

This section describes how the concepts of reliability and validity are applied in CA research. As the data analysis in this research was based on CA methods, it is necessary to see how these concepts are treated and viewed from a CA perspective.

CA is a qualitative research methodology that seeks to develop an emic (participants') perspective on naturally occurring interaction. Hence, the majority of its assumptions and practices are radically different from other research methodologies in the field, especially quantitative research. The concepts of reliability and validity are generally used in quantitative 'positivistic' research. However, such concepts are of interest to CA researchers as well.

Perakyla (1997, cited in Seedhouse, 2004) indicates that reliability in CA research is concerned with the selections of recorded data, the quality of recordings and

the adequacy of transcripts. Since CA research adopts an emic perspective, the analytical process relies on the specific episodes selected for analysis. Recordings in CA research capture interaction in great detail, and usually the selection of particular episodes is based on multiple listening to/viewing of the data. A high quality of recordings is essential to ensure maximum reliability of the data because the minute details of interaction can affect the analysis of any given item of data. High quality video and audio recordings can help the analyst to capture the details of what is happening in any moment of interaction.

A key issue in reliability is the repeatability and reliability of results and observations. This issue is treated somewhat differently in CA research. Reliability is not achieved as in positivist approaches where the aim is to see if a measurement of some phenomenon remains the same when tested repeatedly. In CA research another aspect of reliability emerges, because readers and other analysts are given access to the primary data so that they can test the reliability of the analytical procedures that the researcher used. The process of analysis is transparent and accessible to the reader because both transcripts and analytical processes are made available for scrutiny. Thus, CA-based research makes transcripts and other forms of data available for the reader. The data in this thesis are video data. Thus, the visual aspect of the data is made available for analysis and scrutiny. Transcripts also represent one of the basic sources of data in this study and extracts from the video data will be made available online.

The concept of validity is related to the credibility and integrity of research findings. It is concerned with whether the data prove the analytical claims that the researcher makes. In CA-based research, the researcher's main concern is to ensure validity while trying to maintain an emic perspective. Researchers strive to keep this emic orientation. Analysts have access to this perspective because, as Seedhouse puts it:

> … participants document their social actions to each other in the details of the interaction by normative reference to the interactional organizations. We as analysts can access the emic perspective in the details of the interaction and by reference to the same organization. Clearly, the details of the interaction themselves provide the only justification for claiming to be able to develop an emic perspective. Therefore, CA practitioners make no claims beyond what is demonstrated by the interactional detail without destroying the emic perspective and hence the whole validity of the CA enterprise. (2004: 255)

Generalisability is one of the controversial issues in CA literature. Generalisability is the extent to which research findings can be generalised to other contexts and settings. Qualitative research has always been criticised for being context-dependent. It might seem difficult to extrapolate generalisations when one is looking at the micro-context and eschewing quantification. CA researchers believe that analysing individual instances of the interactional phenomena will unveil the underlying mechanism that produces them (Benson and Hughes, 1991). CA can go beyond the micro-details of social interaction to the macro aspects of the social world (Seedhouse, 2004). The study of individual cases of interaction and the interpretation of these cases rely on the emic perspective, the participants' understandings and the normative expectations of the social world. Analysing individual occurrences of the interactional phenomena will lead to a deeper comprehension of these understandings and of the normative expectations of the social world in general. In CA terms, generalisability is not of particular concern for researchers (Schegloff, 2009, 2010). The aim is to understand the local details of the social phenomenon in the specific environment where the social action is taking place.

However, previous research that has adopted a CA perspective has shown that some general characteristics of task-based interaction do exist. For example, Seedhouse (1996) has shown that generally teachers withdraw after assigning the task to the

students, so it is left to the students to manage the interaction. He also indicates that the students have to communicate in order to do the task. Another aspect that he pointed out was that the interactional focus is on the accomplishment of the task, not on target language use. The analysis of the data in this study produced findings similar to those of Seedhouse (ibid.) concerning what can be generalised about task-based interaction. It can be seen throughout the data that the interaction in the task given to the participants is very indexical and can only be understood by reference to its local context and environment. In this study it was observed that the participants created particular speech exchange systems which involved a lot of non-verbal communication that was relevant to and constitutive of the process of completing the task. It was also observed that the participants precisely synchronised verbal and non-verbal resources to accomplish the task at hand. Another point which was made clear by going through many hours of video data is that the nature of the interactional phenomena is shaped by the nature of the pedagogical task. The task in this research required a lot of movement on the surface of the Tabletop. This resulted in long periods of silence and a great deal of action performed non-verbally.

This section has discussed the methodological concepts of reliability and validity and explained how they are understood in the context of this research. Generalisability issues in the study have also been examined.

3.11 Ethical issues

Since this study involved looking in detail at video recordings of students' interaction, a few ethical issues had to be taken into consideration. The students were informed that participation in the task was voluntary. The students who agreed to take part in the tasks were assured of anonymity and all signed consent forms. Some of the students agreed that their video recording could be used for publication and shown at

conferences, while others were prepared to allow me to use the data for transcription and analysis purposes but not to present them at conferences or in publications. The participants were also given pseudonyms in the transcripts and in the screen captures to protect their identity. They were given names that shared only the first letter of their real names to make it easier for the researcher to track who was doing what when analysing the interaction.

3.12 Limitations of the study

This research is informed by CA methodology that looked at the details of the interaction. The focus in CA methodology is on the observable details of the micro context and thus the methodology is limited within that micro context. This is one of the criticisms of CA as a research methodology. That is, it is too narrow and cannot depict the whole macro social world. Insisting on the emic perspective excludes elements that are deemed important in the social world, elements such as gender, power, age and ethnicity. The technology used in this study gives a densely rich exposition of the interactional phenomena. It might be tempting to use experimental designs and quantification to look, for example, at the advantages and disadvantages of the Tabletop and its impact on task-based interaction. This sort of research might yield across the board generalisations but will ultimately lack the attention to detail that CA can provide. Thus, the current study offers a close look at the interactional practices around the Tabletop but will remain limited in generalisability until enough similar studies have been conducted so that quantification can be employed.

Another aspect that could limit the applicability of the model proposed in this study is the fact that the data analysis in the model is time-consuming and hard work. As the model includes various components it takes time and effort to prepare the data for analysis and to conduct the analytical procedures. Analysing transcripts along with

two video sources and examining the details of the interaction at a level that satisfies CA requirements is very complex and takes enormous amounts of time to accomplish. It is necessary to spend long periods of time transcribing and examining long hours of video data. Transcribing and analysing talk alone takes a great deal of time and effort, even before one considers including non-verbal communication in the analysis. It may not be possible, for example, to analyse large amounts of classroom data. However, sometimes what is needed to study a phenomenon is depth and great detail, and the model certainly provides these aspects. A number of studies of this sort are needed in the field to gain a detailed holistic view of task-based interaction.

In this research the model was used to analyse data from one task only, i.e., a puzzle. This was owing to the technical difficulty and time limitations. It would take time and effort to design other types of task because the task has to be designed, programmed, and embedded in the Tabletop. Other types of task might yield different results. I made the assumption that this type of task would be suitable for the type of technology and methodology I was using to study task-based interaction (see section 3.6.4).

Another aspect related to the use of the proposed model to analyse task-based interaction is that the model is data-driven. It cannot claim to analyse all types of classroom phenomena. It can, however, shed light on some aspects of task-based interaction that have long been difficult to capture.

3.13 Summary

This chapter has described the methodological foundation of this research. It also explicated the rationale behind using this methodology in the present study. The main tool for analysing the data, Conversation Analysis, was described in detail.

Multimodal analysis, another aspect of the process of data analysis, was also described. An overview of the main study and its context and technical configuration has been provided in this chapter. As technology represents an important element of this study, a detailed description of the digital task was provided as well. I also described the methods of collecting the data and showed how they can be analysed in the proposed model. Furthermore, I explained in detail how data were collected from various sources and how the data were prepared for analysis in the model. This lengthy process included the digitisation and transcription of many hours of video data. The analytical procedures in the proposed model were also described in this chapter, along with a description of the stages of analysis. The chapter concluded with a discussion of the issues of reliability and validity, and ethical issues related to this research. Lastly, the limitations of the study were considered in section 3.12.

This chapter has therefore set out the methodological foundations of the study and the tools used for data collection and analysis; the next chapter will discuss in detail the proposed model and its components.

CHAPTER 4: PRESENTATION OF THE MODEL

The aim of this chapter is to describe the proposed model for the analysis of task-based interaction. In the first section (4.1) a brief discussion of the model is provided. It emphasises the fact that the model is holistic in the sense that it looks at the task before it starts and while it is performed as well as at the resultant outcome. It is also holistic in the sense that it examines not only talk but also non-verbal communication and use of the physical environment. Each of the various components of the model is discussed and explained in section 4.2. Each component contributes to the analytical power of the model. Combining all of the components together adds to the resulting synergy. In section 4.3 I demonstrate how the model works, describing the various steps that an analyst should follow to conduct a holistic analysis of task-based interaction.

4.1 Describing the model

The model proposed in this thesis is informed by CA micro-analytical mechanisms and involves a process of analysing tasks holistically, including the aspects of non-verbal communication and physical use of the environment. Several components make up the model, and this creates a new methodology for analysing holistically the micro details of multimodal task-based interaction - a methodology that tracks how the details of the interaction are linked to the pedagogical focus of the task. The model is holistic in nature since it takes into account the task as a whole; this includes looking at the task as a plan before its implementation and analysing the task performance of the participants. Additionally, the task outcomes are also considered in the analysis. The task-in-process itself is subjected to a thorough analysis using CA methods to portray the micro details. Multimodal analysis is also employed to depict the non-verbal aspects of the interaction. These elements combine to make the model holistic and capable of

providing a more comprehensive look at task-based interaction than has previously been possible. The impetus for this particular design was derived from the recognition of a gap in the related research (see chapter 2 for details). As discussed in chapter 2, it has not yet been possible to acquire a detailed understanding of task-based interaction processes, especially one that is based on the details of interaction. There is a need to see how TBLT processes unfold in real contexts (Swan, 2005; see chapter 2, section 2.6 for more details). The claim made in this thesis is that the proposed model will enable researchers to obtain a more comprehensive picture of TBI in naturally occurring settings.

This section has presented an overview of what is meant by a holistic model to analyse TBI. The following section will present the various components of the model.

4.2 Components of the model

The model is composed of various components that together create a powerful tool to analyse the micro details of multimodal task-based interaction. The model entails examining the pre-task stage and requires a detailed description of the task-as-workplan. Breen's conceptualisation of task phases is also taken into account in order to track and match the pedagogical focus of the task with the details of interaction and what comes out of the task as a product. The proposed model is illustrated in the figure below. This is followed by a brief description of each component.

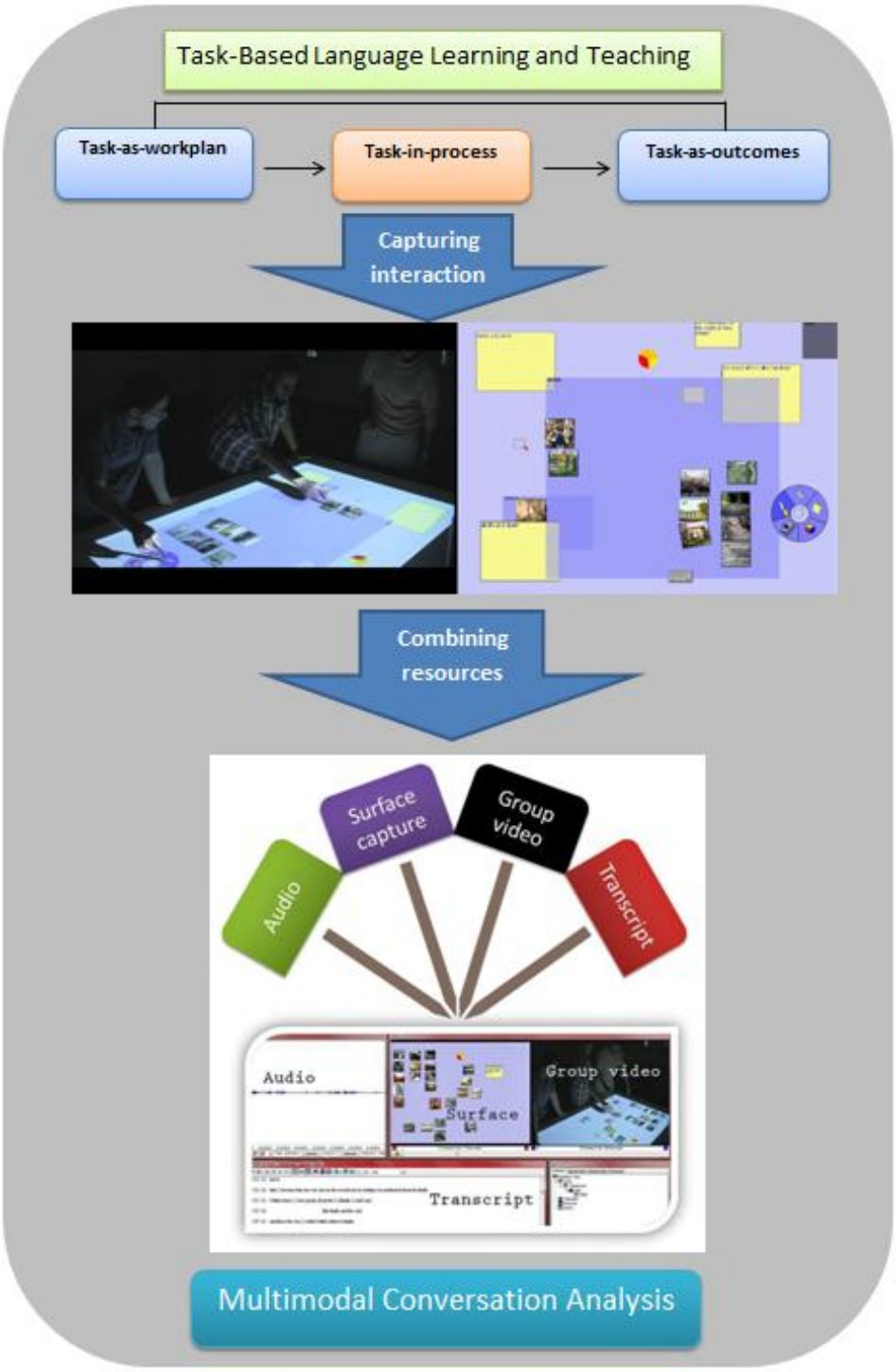


Figure 4.1 The model

4.2.1 Task-Based Language Learning and Teaching

The model is intended to analyse task-based interaction. This is the reason why its use in this research was situated in a TBLT framework. Inherent in the TBLT approach is the requirement that participants communicate in order to accomplish the

task, and this is essential if we wish to study task-based interaction. The interaction that takes place amongst participants in TBLT classrooms is an ideal place for collecting interactional data for analysis. This is exactly what TBLT allows us to do. More specifically, the type of task that was used in this study to examine task-based interaction was a convergent task. This type of task was chosen because convergent tasks give students a sense of goal orientation, and they collaborate in order to find a single solution to the problem. This makes tracking the pedagogical goal easier and enables us to relate the task goal to the patterns of interaction.

4.2.2 Phases of task

Breens' (1987) conception of the three stages of a task was taken into consideration in the development of the model. One aspect of the holistic nature of the model is that it takes into account the different stages of the task. The task-as-workplan should be described in detail. This stage is the plan of what the pedagogy should look like. It is necessary to see the teacher's plan and how he or she presents the task to the learners. It is equally important to see how teachers interpret the task, as this will affect how the learners interpret it. The second phase is the task-in-process. Looking at the task-in-process is a crucial element in the model because this is the phase where the action takes place. It is also the phase where the interaction amongst the learners happens. The details of task process and enactment can be seen in this phase and thus the majority of the data are collected during this phase. The task outcomes are whatever product the learners come up with at the end of the task. This is taken into account as it can tell us whether or not the learners were successful in achieving the pedagogical goal. Taken together, all of these phases will undoubtedly inform the holistic analysis of task-based interaction.

4.2.3 Conversation Analysis

CA is another crucial component of the proposed model because it provides the micro-analytical support for the analysis of task-based interaction. CA was chosen because it enables a closer portrayal of the local moment-by-moment actions that take place during task interaction. The use of CA makes it possible to see how the learners establish mutual understanding and meaning making processes in a detailed manner. This is important from an analytical point of view, because the model seeks a high level of detail in order to analyse task-based interaction, and CA appears to provide this level of detail. From a methodological perspective, CA seems to add great value to the model because of its insistence on using naturally occurring data. This requirement was of interest to this research as I was attempting to see how TBI works in real contexts. This area has not received much attention in the literature (see chapter 2, section 2.6).

4.2.4 The digital Tabletop

The digital Tabletop is a key component of the proposed model. The reason for selecting it was because it facilitates the tracking and recording of detailed interactions during the task process. It also provides a visual platform that tracks and saves the learners' actions on the surface. This gives rich data on the learners' behaviour during the task and thus represents a valuable resource for the analysis of this behaviour. This novel technology can transform the way tasks are designed, tracked and analysed.

4.2.5 Multimodality

This component was essential in order for the model to be holistic. The model could only be holistic in its analysis if it incorporated multimodal aspects of interaction. By multimodality I mean analysing the different modalities that accompany task-based interaction, such as non-verbal communication and use of the physical environment, i.e., the digital Tabletop. The task used in this thesis required a lot of movement of

digital artefacts on the surface of the Tabletop. Therefore, participants were not only talking to each other during the task but also had to use a great deal of non-verbal work. This made it necessary to include other modalities in the analysis.

This section has discussed the various components of the model and how they interrelate. The following section will show how the model works in order to analyse TBI data holistically.

4.3 How the model works

The analysis of the task-based data in the model includes various steps. The following is a brief description of each of these steps.

1. *Understanding the task*: the process of analysing task-based interaction begins before the task starts: that is, by knowing what the nature of the task is while it is still a plan. It is necessary to have as much detail about the task as possible. This will help to make possible a holistic analysis of the task. This is the stage where the task-as-workplan is fully understood.

2. *Capturing interaction*: as the task starts data are collected. As shown in figure 4.1, several sources are used to collect data. One source is the audio/video recording of the participants as they perform the task. Another source is the video capturing of the surface of the Tabletop. This multiple source recording process tracks and keeps a detailed record of the progress of the task. This capturing of the interaction takes place in the task-in-process phase of the task.

3. *Transcription of data*: after capturing the interaction, the process of data transcription starts. Participants' interaction, which is extracted from the video recording, is transcribed using CA methods.

4. *Combining sources*: after collecting and transcribing the data, the data from all the sources are then combined in Transana for analysis. This is one of the strengths of the model. All the data from all the sources can be examined in one place. Analysts can have access to the different modalities of the task data, including audio, video, text and physical manipulation of the surface of the Tabletop. These types of data complement each other as they show the textual and visual representation of the task.

5. *Synchronisation of sources*: at this stage the two video sources are synchronised along with the relevant transcript. Transana allows the synchronisation of audio and multiple video sources. It also links the transcripts to the relevant video frames. The synchronisation of these sources is a key element in the analytical process. It allows the analyst to gain access to different angles of the moment of interaction simultaneously. Looking at a segment of interaction from different aspects will undoubtedly inform the analysis and make it easy to link talk and non-verbal behaviour in a moment-by-moment fashion. Besides synchronising the different sources, it is also possible to play back the synchronised data repeatedly to get a better look at the interaction.

6. *Multimodal analysis*: analysis of the synchronised data takes place, including the analysis of non-verbal data and the physical manipulation of the digital Tabletop. In this step task-relevant actions are related to talk and analysed simultaneously with the non-verbal communication.

7. *Task outcome*: the model takes into account task outcomes. It seeks to see whether or not the outcomes are aligned with the plan.

8. *Quantification*: this step can be used after carrying out the qualitative analysis of interactional phenomena. Seedhouse (2005) indicates that it is possible to quantify the analysed interactional data after conducting a qualitative analysis, while at the same time ensuring construct validity. It should be noted that this step is optional.

9. *Synthesis*: in this step the three phases of the task are examined again to see how the task as a plan unfolded, to determine whether it has achieved its pedagogical goal, and to identify what issues arose along the way.

It should be noted that the analysis is not linear in all its steps. The analytical process starts with the initial viewing of the data and the transcription of audio material. In step 6 the data are looked at again in Transana. Such multiple viewings of the data enhance the accuracy of transcripts and the truthfulness of data representation in CA studies.

As can be seen from the above description, the use of this model can be complex and time-consuming. This is owing to the fact that it involves the analysis of various aspects of task-based interaction. The analysis is not limited to talk but also includes non-verbal communication and the digital environment. It is true that it is a complex process, but it is also an important endeavour that could result in a holistic portrayal of the complexity of task-based interaction.

The model is an ambitious attempt to reveal the multimodal complexity of task-based interaction. It is intended to examine tasks as a whole and at the same time investigate the micro details of the interaction. This aim made it necessary to include the analysis of non-verbal communication in TBI, as much work takes place beyond the spoken word.

4.4 Summary of the chapter

This chapter has presented the model that this research was centred around. A brief description of the model was provided, followed by a presentation and discussion of each of the components of the model. The chapter concluded with a discussion of how the model works in analysing task-based interaction. The next chapter will illustrate how the model was used in practice during the research to analyse participants' interaction while performing a particular task.

CHAPTER 5: DATA ANALYSIS

5.1 Introduction

The aim of this chapter is to show how the proposed model can be used to analyse task-based interaction. The model is used in this chapter to analyse data excerpts to see if it can enable a holistic analysis of TBI. Additionally, the model will be used to see whether it can reveal any features that are characteristic of task-based interaction. This analytical chapter will illustrate how the model works, focusing on steps 2 – 6 (*Capturing interaction, Transcription of data, Combining resources, Synchronisation of sources, Multimodal analysis*) for reasons of space and time limitations.

Section 5.2 attempts to demonstrate how the proposed model can give deeper insights into the analysis of task-based interaction. It will be shown how the model can reveal the mutual interplay and synchronisation between the verbal and non-verbal elements of task-based interaction. The holistic analysis using the proposed model seeks to show how the participants develop unique speech exchange systems that involve a great deal of non-verbal communication to accomplish tasks in the Tabletop environment (section 5.3). Furthermore, the analysis in this chapter attempts to show how the model is able to portray the complexity of task-based interaction (section 5.4)

The chapter concludes with a discussion of the characteristics of task-based interaction (section 5.5). It will be shown how analysing the data using the proposed model enables the researcher to gain a deeper insight into the micro details of task-based interaction. The following section will show how the model reveals the precise synchronisation of verbal and non-verbal elements by the participants in order to accomplish the task they are involved in.

5.2 Synchronising verbal and non-verbal resources:

The main point of this section is to show how the participants precisely synchronise verbal and non-verbal resources to accomplish the task. The multimodal analysis conducted in this study reveals the mutual interplay between verbal and non-verbal resources and shows how these resources are used to organise action. Since the model gives a clear and highly detailed picture of the interaction, it is possible to pin down moments where participants employ and synchronise non-verbal elements with talk to aid in accomplishing the task at hand.

Around the digital Tabletop participants usually do things collaboratively, and sometimes they spend time reading the pieces on the Tabletop while looking for connections in the puzzle. It was interesting to see how the students who participated in the current study approached a problem and how they collaborated to solve it by looking for the best matches and coordinating the process through verbal and non-verbal communication. Extract 5.1 below shows how this process was collaboratively talked into being and how the students conjointly worked out that process, employing verbal and non-verbal resources. It shows how they managed collaboratively to pull out the correct sequence and rearrange the pieces of the story accordingly. In this example the participants are arranging the pieces of the story to solve the task. They come across the phrase 'these two' and they try to locate the reference to this phrase.

Extract 5.1

1	C:	he told a story of his ancestor James Boyter who in [eighteen cent]
2	A:	[ninetee eighteem]
3		transferred the Atlantic
4	C:	yeh yeh [trans]ferred the Atlantic Ocean from Scotland with his older brother Alec
5	A:	[here] older [brother Alexander]
6	→C:	[and then two of] they two of thems (.) right

7	A:	yeh
8	C:	yeh the story I think the story went on that these two is an attempt to escape
9		the law right↑
10	A:	the law [and my]
11	C:	[because] two people=
12	A:	yeh::=
13	C:	just been like=
14	A:	=yes
15	C:	James [Boyter and Alexander]=
16	A:	=yes [together yes] yes=
17	C:	em

As shown in extract 5.1 above, the students were able collaboratively to locate the reference to ‘these two’. Figure 5.1 below shows how this was done.

Figure 5.1 Sorting out the ‘these two’ problem

As seen in extract 5.1 and figure 5.1, Participant C suggests (line 8) that piece 3 can be aligned with piece 2 as it mentions two people. The reference to ‘two people’ can

be seen in line 6, where she clearly indicates the existence of two people involved in that event (she uses two of her fingers). She then pulls piece 3 toward piece 2 while indicating in lines 11 – 16 that the two people referred to in piece 3 are James Boyter and Alexander, and shows that piece 3 should follow piece 2. The way she is able successfully to bring these two pieces together reveals how the participants managed to collaborate interactionally using verbal and non-verbal means. Lines 7, 12, 14 and 16 show how Participant A was intensely involved in the moment-by-moment ratification of C's proposals and reasoning. His utterances 'yes/yeh' were repeated in every line, indicating his orientation to what she was saying. In line 16 he also uses two fingers; this mimicking of Participant C's actions by Participant A indicates the close coordination between the two students at this point. Participant Y, although not seen in the transcript, was also involved in this process and showed orientation to the other participants' agreement that the two people were James Boyter and Alexander. She nodded and looked at the piece that was the focus of talk. Together the participants were able to orchestrate this process of putting things together and reached a consensus on the justification for bringing these two pieces together.

Using the various elements of the model it is possible to see how all the participants are collaborating and taking part in the task processes, not necessarily verbally but also by using non-verbal resources. It can be seen how they constantly orient to each other's actions and ratify them in precise timing. It is also possible to see how the participants conjointly synchronise verbal and non-verbal resources at the right moments in order to navigate their way through the task.

In extract 5.2 and figure 5.2 below, the students are trying to locate the 4th piece to fit after 'to escape the law'.

Extract 5.2

18	A:	=the law and my grandfather didn't know he was either no not this one (.) the law=
19	C:	the story went on that these two is an attempt to escape the [lawr] (.)
20	Y:	fled=
21	C:	ye:::h fleed to the United States oh very good [well done]
22	A:	[yep you] make progress

Extract 5.2 shows another interesting example of the participants collaboratively succeeding in overcoming a problematic point by synchronising verbal and non-verbal resources. In lines 18 – 19 there is an accumulating momentum where all the efforts are focused on finding piece 4 to go after 'the law'. They had examined this piece before and had not been able to find a match for it, as we saw in extract 5.1. In these two lines (18-19) all the participants are busy surveying the Tabletop while at the same time maintaining their orientation to each other.

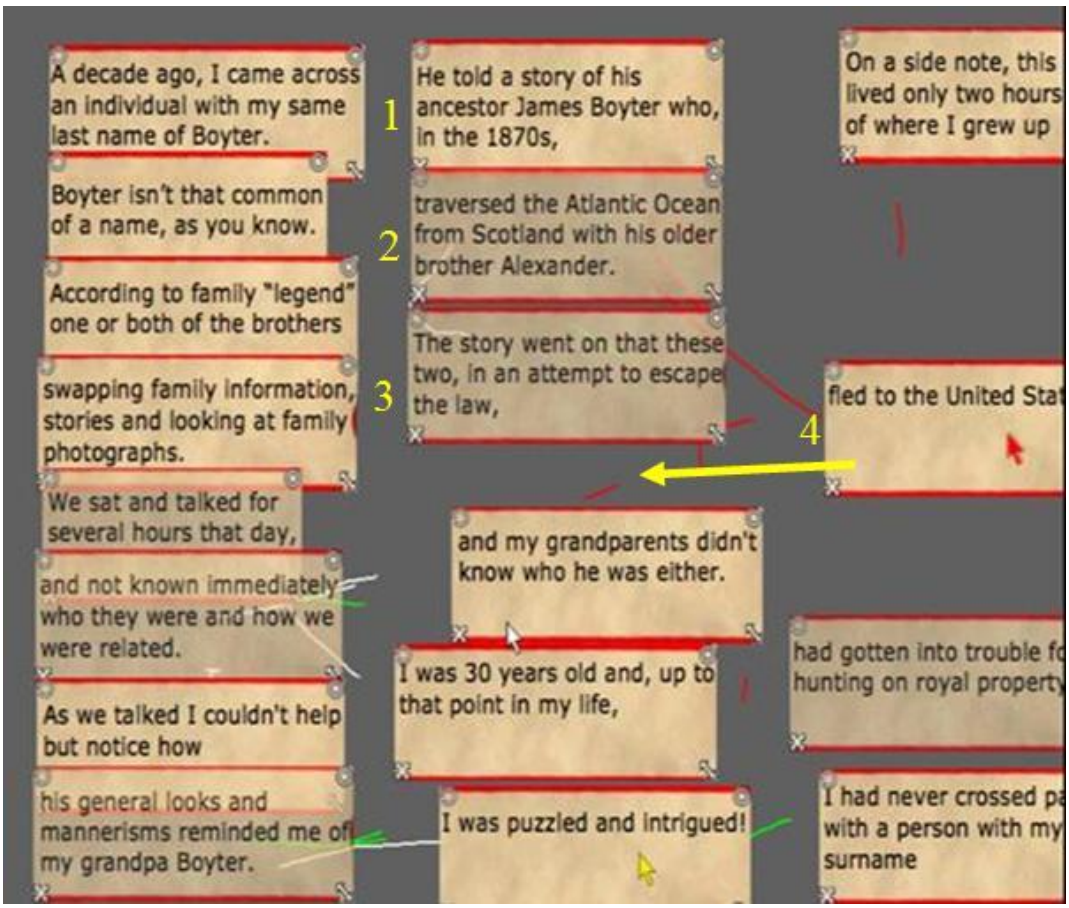


Figure 5.2 Resolving a problem (line 20)

In line 20 the students' efforts converge as A and Y reach for the same piece, illustrating the cooperative process of sorting out problematic moments. The interesting event that shows clearly how this dynamic process is achieved occurs in line 20, after Participant C has provided a standing reminder for the other participants while they search for things on the table (line 19). Participant Y has spotted piece number 4 and immediately suggests that it could be the next item in the sequence. This might seem unremarkable, but the video data reveal that something else was going on at the same time, indicating that she was not alone in this process.

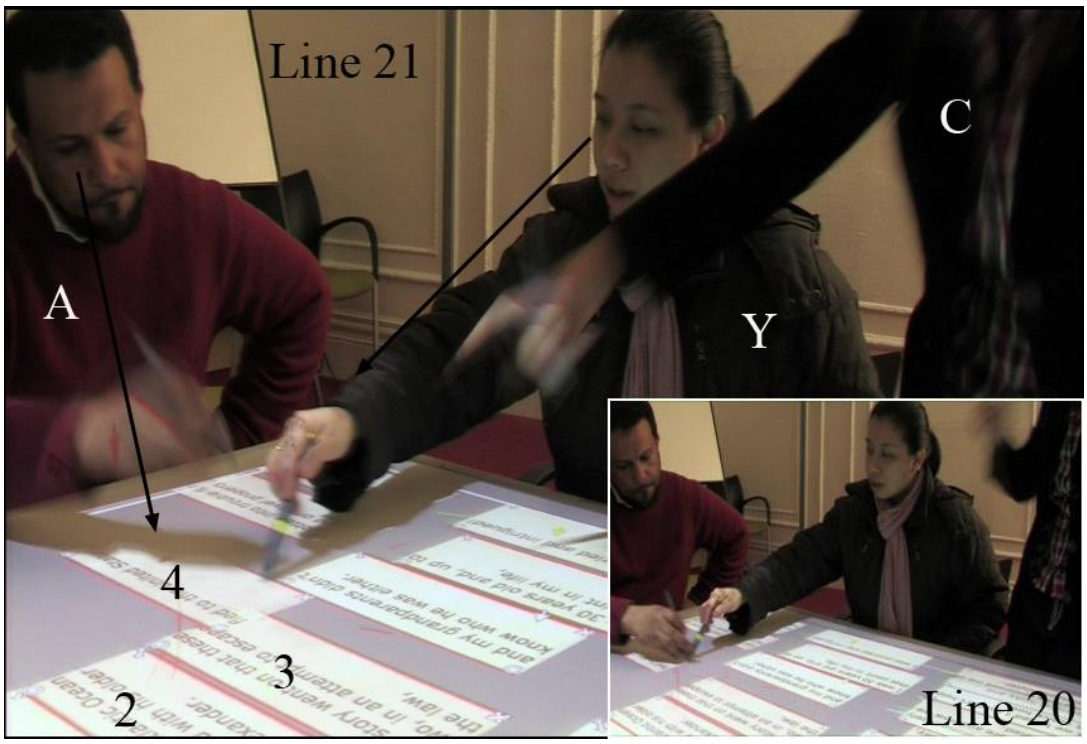


Figure 5.3 Conjoint efforts

In fact, Participant A is there, looking at the same piece and pointing to it at the same time (figure 5.3). As Participant Y utters the word ‘fled’, his facial and hand gestures show that he was also involved in achieving the reached agreement on piece 4. Participants Y and A were touching the same piece with their pens which would fill the gap in the sequence of the story’s events. Participant C immediately joins in this collaborative effort by pointing to the piece and finally moving it into place (figure 5.3). Thus, Participant A initiated the move, Y moved the piece halfway, and finally C moved it into place. C verbalised her thought, since she was unable to reach over. Piece number 4 shows that the two brothers fled to the US, which indicates their intention to escape the law by travelling abroad. In the last three lines, Participant C immediately accepts this proposal and A also indicates that this is a good move. This shows that they were all involved at the same time in moving the story in the right direction at that

moment. This example also demonstrates how a minimal verbalisation, such as the one uttered by Y, can turn out to be an important contribution to the task.

The complete picture of this successful achievement at this intermediate stage could only have been captured and analysed fully using the proposed model (the video and screen capture data in addition to the transcript). These resources provide the tiny nuances of the precise timing involved as the problem is about to be solved. The transcript gives us the details of the interactional process while the video shows how the non-verbal communication supported and affected the course of the action and the talk itself. The screen capturing presents a rich illustration of the mobility of the pieces and of how particular arrangements of the pieces on the Tabletop have an impact on the detailed unfolding of task-based interactions. Using this model it becomes possible to show how things were collaboratively co-constructed, manipulated and aligned with the task goal.

The transcript alone was inadequate to reveal the details of the conjoint efforts to sort out the moments of confusion the participants encountered when trying to reconstruct the story. The three modalities (text, video, screen capture) together represented an excellent resource for examining these moments of collaboration in full detail. We were able to look at how the participants maintained their orientation and kept focusing on the same piece, and how they moved it at the same moment, as shown in figure 5.3. Extracts 5.1 – 5.2 and figures 5.1, 5.2 and 5.3 demonstrate how the participants were successful in negotiating and accomplishing a desired goal in this task. They managed to do this collaboratively, employing a careful orchestration of verbal and non-verbal elements. The strands of the answer came from all participants in a highly coordinated, sophisticated and dynamic manner.

The following figure 5.4 and extract 5.3 show the sort of dynamic interplay and synchronisation of verbal and non-verbal resources that occurred when the participants encountered a problem, in this case the problem of sorting out what a particular lexical item meant by relying solely on the available resources. The participants were discussing one of the pieces of the puzzle and trying to understand what it was saying about the story. They came across the word 'tanner' that obviously represented a trouble source, as some of them started asking the obvious question 'what is a tanner?' (line 6). This triggered an event that reveals how the participants employed non-verbal as well as verbal recourses in a precisely timed and multimodal dance to go about solving a problem.

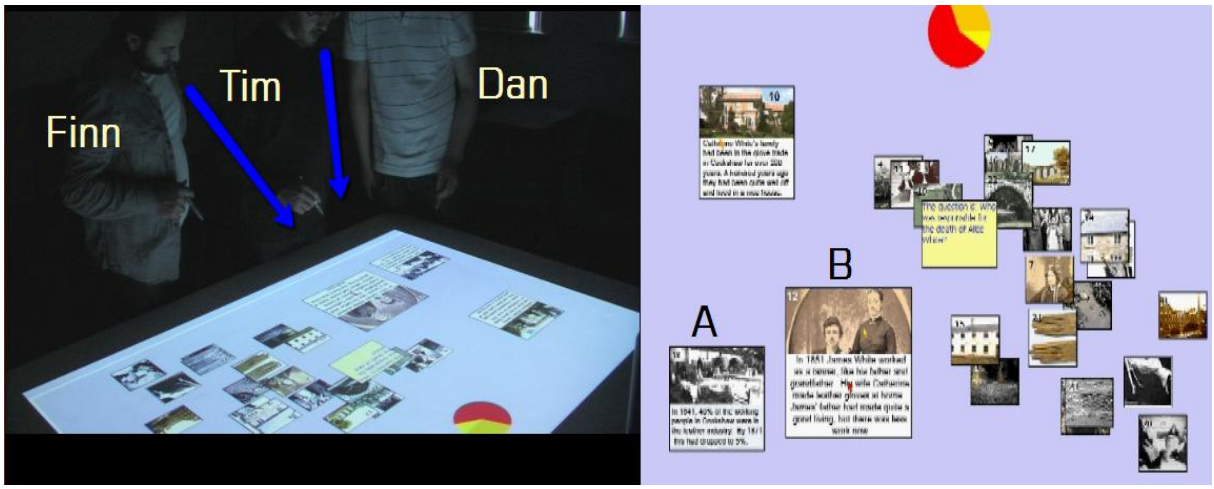


Figure 5.4 Unknown lexical item

Extract 5.3

1	Finn:	°so Katherine White's family have been okay [( )
2	Dan :	[in the (.) <glove> (.) trade
3	Finn:	[°A hundred years ago they had been quite well off] and lived in a nice house okay°
4	Tim:	[***((maximises one of the pieces))***]
5	Dan:	***((aligns himself so that he can read by moving closer to Tim))***
6 →	Dan:	James White worked (.) as a tinner, what's a tinner↑
7	Tim:	tinner↑ [tanner] ***((looks at the relevant piece))***
8	Finn:	[tanner] er ( ) ***((looks at the relevant piece))***
9	Tim:	°°whats a tanner°° ***((reading the relevant piece))***

10 Finn: °ah his brother began ( ) tanner° ***((surveying the tabletop))***
11 ***((all participants surveying the Tabletop))***
12 Dan: ***((leans forward while reading silently))***
13 →Dan: ah >maybe< er so:meone who i:s ah::m (.)>preparing< the (.) leather. ***((Demonstrates with hand movement))***
14 Finn: ***((looks at Dan's embodied demonstration))***
15 Tim: °yeah° [it's related
16 Finn: leather maybe[[ye:s ( ) made leather ***((points at the piece where it reads 'make leather'))***
17 Dan: [so he's er he's the hasband of Katherine.
18 Finn: yes

This extract starts with Finn reading one of the pieces (A) in lines 1 and 4, this piece being the focus of their attention at that point. The focus is shifted to piece B in line 4 when Tim maximises it. This maximisation draws Dan's attention immediately and he starts reading in line 6. He then comes across the word 'tanner' that seems problematic to him and immediately projects this word to the other participants by asking 'what is a tinner?' This causes a problem as the word is not picked up as 'tanner' since he has pronounced it with an /ɪ/, as seen in line 7. Tim repeats the word with the initial pronunciation 'tinner' while he and Finn are looking at the relevant piece to locate the target word. They both immediately spot the word and pronounce it 'tanner'. The fact that they pronounce it correctly at first appears to suggest that they know what the word means, but the subsequent turns show that neither of them knows what it means as they remain silent and continue to search the Tabletop for clues, and most significantly do not answer Dan's question. Up to this point, Dan's question as to what the word 'tanner' could mean has not been answered and is still forming a trouble source for the participants, as shown by the fact that Tim repeats the question in line 9. This problem causes a change in the course of the action as the focus now shifts toward finding the answer to the question. All participants start surveying the Tabletop looking for clues that might lead them to the meaning of 'tanner' (line 11).

In line 13 Dan initiates self-repair and displays an instance of a change of state using ‘aha’. Using gesture and embodied actions he attempts to explain what the word ‘tanner’ might mean. While he is involved in this process the two other participants are focusing their attention on what he is doing and on the target piece. Finn (line 14) glances at Dan’s embodied demonstration and shifts his gaze to the target piece. He then reads from the text on the piece and finds the phrase ‘made leather’ and agrees to what Dan is suggesting.

It should be noticed that in line 13 Dan uses a hand movement before he verbalises anything in an attempt to show the other participants what a ‘tanner’ might be (see Figure 5.5).

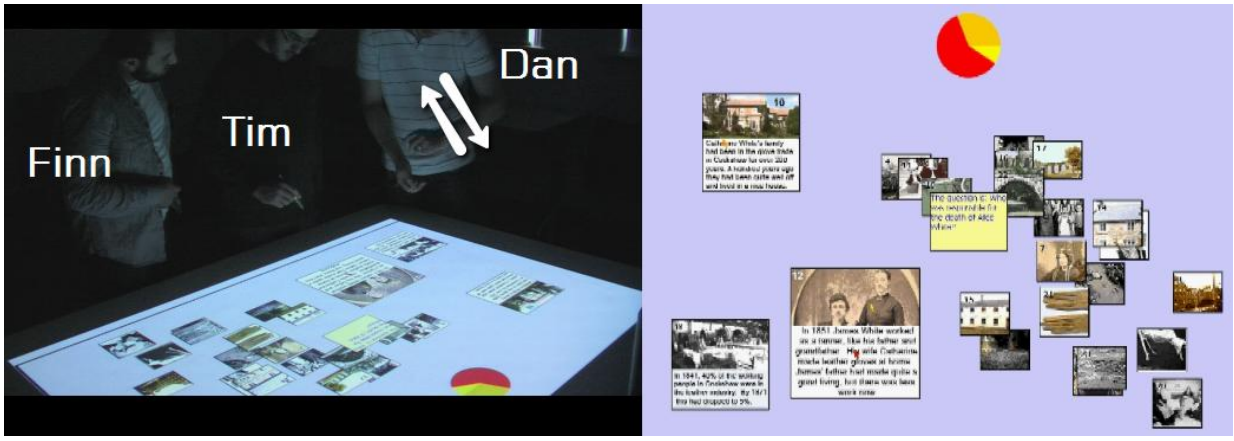


Figure 5.5 Non-verbal demonstration

After surveying the Tabletop and orienting to Dan’s demonstration the other participants show agreement with his suggestion of what the word could mean. Tim shows agreement in line 15 and indicates that the word ‘tanner’ is related to making leather. In line 16 Finn also shows agreement with Dan’s suggestion and specifies the piece on the Tabletop that contains the phrase ‘make leather’. At the start of this extract these two participants were not sure about the meaning of this word, but through collaboration the participants were able to work out the meaning. This orchestration of

verbal and non-verbal resources as well as the Tabletop affordances shows how dynamically and easily the participants coordinated their task-based learning. The model enables us to see this entire process in micro detail. The participants collaboratively sorted out the meaning of the word by relying on various resources, and the whole process reveals how the model dynamically allowed a holistic view of the minute details and inner machineries of the task

This section has shown that the model is able to reveal how participants in TBI settings employ and precisely synchronise verbal and non-verbal resources as they perform a task. The examples provided in this section show that the proposed model adds value to the analysis of task-based interaction and facilitates that process. Analysts can see in micro detail how participants collaborate and orchestrate their actions around the Tabletop to solve the task. This whole process is captured and seen in a moment-by-moment fashion.

The next section will demonstrate how the model reveals the unique speech exchange systems that the participants developed while working on the task in the Tabletop environment.

5.3 Developing unique speech exchange systems

In this research the participants had to solve a mystery task on a digital Tabletop. The task required the movement of pieces of the puzzle on the surface of the Tabletop. The nature of the task and the features of the digital Tabletop had an impact on the nature of the interaction. This impact can be seen in the ways in which the participants designed their turns in the interaction.

5.3.1 Verbal and non-verbal interaction

The analysis of the data using the model reveals that the participants developed unique speech exchange systems that involved a great deal of non-verbal communication to accomplish tasks in the Tabletop environment. An examination of the moment-by-moment details of task-based interaction reveals how much detail we can glean from the seemingly smooth work of humans interacting and conversing as a group. The participants' main focus was on the accomplishment of the task. They displayed shared attention to the visible digital environment and established their own way of exchanging communicative actions, whether verbal or non-verbal. Their speech exchange system was affected by the nature of the environment and the task. The model, as will be shown in the following extract, enabled us to see in detail how the participants interacted and adapted their interaction to the task at hand.

In figure 5.6 and extract 5.4 below, the participants are engaged in solving the mystery of 'what caused the death of Alice White'. They are grouping the pieces of the story into themes to make sense of it.

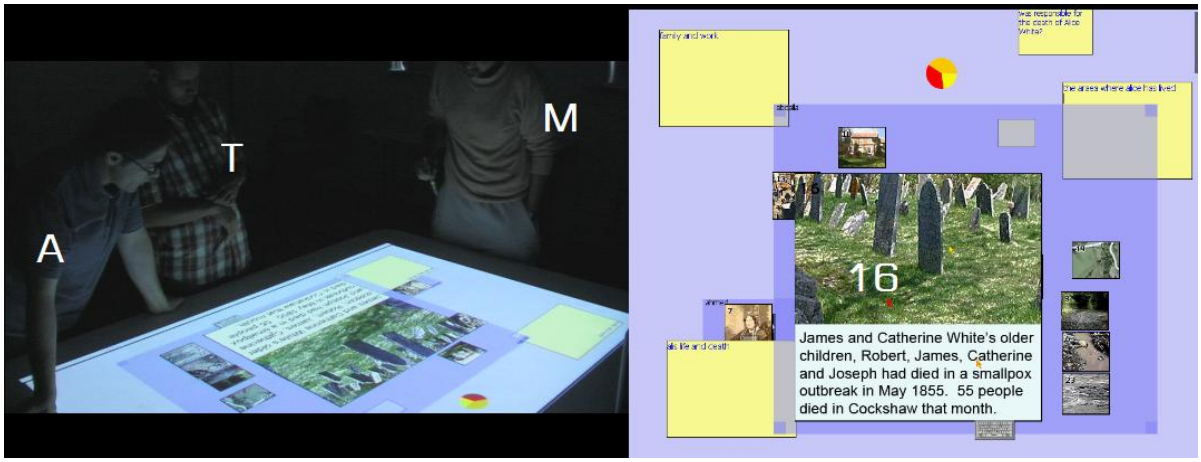


Figure 5.6 Verbal and non-verbal interplay, Line 1

Extract 5.4

01 M: James and Katherine White older children James Katherine
02 and Joseph had died in the sma:llpox [(.) this picture speaks ***((points to one of the pieces))***
03 T: [about the health
04 M: it's about the:
05 T: closer to that yah ***((pulls the large piece next to the one M just pointed at))***
06 M: yes
07 A: hmm mm
08 T: last one, ***((pulls one of the pieces and maximises it))***
09 M: Katherine White family had been the glo:ve (0.9) [trade ***((points at the text))***
10 T: [trade
11 M: and
12 T: over a hundred years
13 M: er gloves yes glove which ma:de of er >leather<
14 T : yes
15 M: so I think this is the industry ***((points at the industry group; in front of A))***
16 T: and this his will come the er as um the product after work ***((pulls the piece to one group))***
17 M: er about this one okay
18 A: ***((A is moving one of the pieces in circular movement as if trying to rotate it))***

This extract starts with one participant pulling one of the pieces and maximising it so that they can read the embedded text. This behaviour is enforced by the design of the Tabletop, as each piece has three levels of representation, a small size in the form of an image only, a medium size in the form of an image and a text, and a large size with a text and an image but on a larger scale (see chapter 3, section 3.6.4 for an illustration).

Making one of the pieces large places it in the line of sight of all participants and shifts their attention to this piece. This creates a shared focus and all participants orient to this piece verbally and non-verbally and by visible orientation of their body configuration and gaze. Their interaction becomes organised around this piece. The exchange of turns in such instances is of one participant starting to read the text while the others maintain silent orientation.

Figure 5.6 shows the start of this extract, as one of the participants has made one of the pieces (piece 16) into the large form. Immediately piece 16 becomes the

focus of their attention and they all orient to it as one of them (M) starts to read the text. It becomes obvious from what they do in the first few turns that they are organising the pieces around topics to make sense of the story (lines 2 to 6). In line 1 M seems to be skimming through the text trying to categorise the current piece. He seems to be seeking any clue in the text that might help them work out where the piece fits. This is possibly why he (M) does not read the full text, but when he reaches the world 'smallpox' he makes the assumption that the piece belongs to the 'health' group. He also points to where on the surface this piece should be placed. This is visible to the other participants and they agree with M. This can be seen in T's overlapping short turn in line 3, as he provides the group ('health') to which the piece belongs. They thus jointly reach the same conclusion.

The same thing can be seen in line 8 as T selects one of the pieces and maximises it. This embodied action pulls the interaction towards this piece and makes it the focus. Immediately M self-selects himself to read the text, as shown in line 9. When he reaches the word 'glove' it seems to attract his attention. This can be seen in the vowel lengthening and the short pause after the word 'glove'. At this point T's turn in line 10 shows that that they have spotted a clue that tells them where to group this piece. They stop reading the text and make a decision regarding where the piece should go. It is noticed that M's talk is accompanied by hand gesture to different places on the Tabletop (as in lines 9 and 15).

This extract (5.4) shows that the participants developed particular exchange systems in this digital environment relying largely on non-verbal means. The nature of the task and the digital environment might have had an impact on how the participants interacted. We can see that the interaction is constantly constituted through the participants' mutual exchanges of gestures and body language. The participants

alternate with one another in taking turns, which results in a lot of movement on the surface of the Tabletop and manipulation of the digital artefacts. Some turns are merely a movement of objects on the surface; others consist only of maximising a piece and this triggers a next turn by another participant.

An analysis of how groups of students interact while performing a language task around the digital Tabletop reveals a heavy reliance on non-verbal resources. The Tabletop attracts the attention of every member of the group and thus has an impact on how they orient to one another as the digital artefacts on the surface of the table mediate the interaction. Typically in interaction participants produce talk and build action while actively working to secure the orientation of a hearer (C. Goodwin, 1981), and speakers design the current action and utterance in fine detail, having in mind the current addressee (C. Goodwin, 1981; Sacks et al., 1974). What happens around digital Tabletops in terms of securing a hearer for a current stretch of talk or the sequential organisation of talk-in-interaction reveals interesting aspects of participants' deployment of talk and embodied action in this unique environment. The Tabletop, being a shared space, changes the way participants orient to each other and the way they handle shared resources. The process of securing a hearer for the next utterance, for example, becomes extremely complex and fluid.

This section has shown that participants develop unique exchange systems in this digital environment that rely largely on the use of non-verbal resources. Since such exchange systems are unique and heterogeneous, it is necessary to examine them in considerable detail in order to be able to analyse and understand them. The following section will show how the participants in this research dealt with long periods of silence during their interaction.

5.3.2 Action in silence

In this section the model is used to show how the participants designed their interaction so that long periods of silence were not treated as sanctionable. The analysis reveals that during silences embodied action was taking place. The participants oriented to each other's embodied contribution and then built on it.

The following extract illustrates how the participants' speech exchange systems accommodated pauses and silence in the interaction. As the task required the movement of digital artefacts on the surface of the Tabletop, the participants sometimes had to spend periods of time manipulating the pieces of the story in silence.

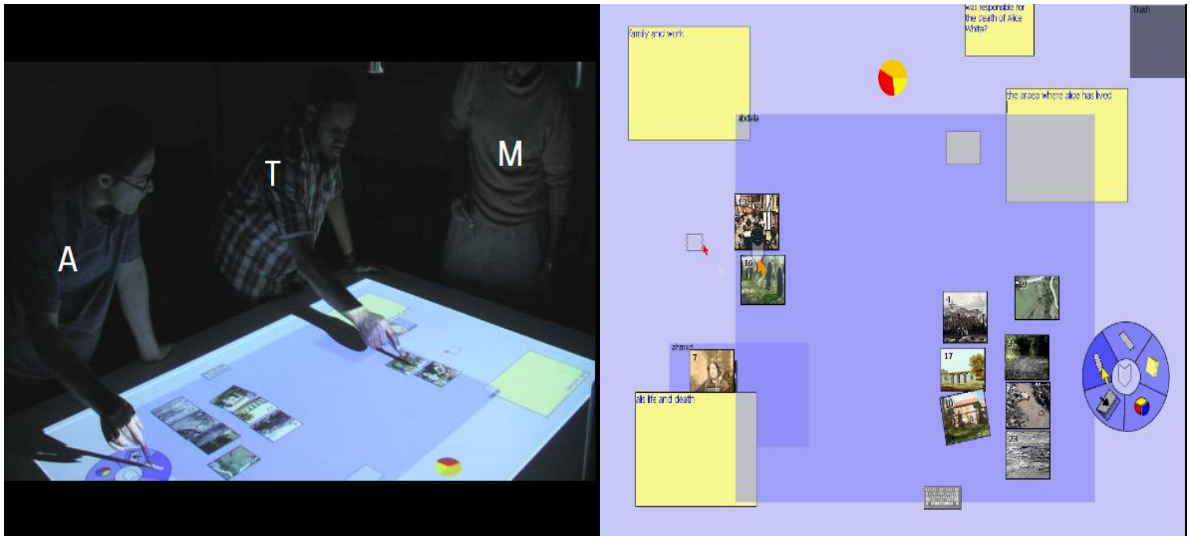


Figure 5.7 Silence in speech exchanges

Extract 5.5

19 T: now let us see how we ca:n (1.5) so no:w, ***((show the Tabletop's menu))***
20 M: okay we can use this one, ***((points to the sticky tape on the menu and pulls it))***
21 T: yeah °we have to°
22 M: to join this one
23 T: yeah ***((A is orienting to this action))***
24 M: t:::
25 T: oh
26 M: sorry I think you should

27 T: yes
28 M: °°yes this one°°
29 (4.0***) ((A is copying the action that he's just seen, invoking the menu on his side of the Tabletop)) ((T is creating more sticky tapes))***
31 T: oh (0.6) °so this is becoming there° (1.0) °okay° have another one, ***((a request to A))***
32 [yeh just do it like this as simple]
33 (3.0) [***((A is creating sticky tapes and connecting pieces together))*** **]**
34 T: hmm mm
35 (1.0)
36 T: and one is here also as well, ***((pointing to two pieces that need to be connected))***
37 (4.0)
38 T: think you can join it?
39 (4.0) ***((M is creating sticky tapes and connecting pieces))***
40 T: this one
41 (3.0)
42 T: and the relation between the
43 M: (I think it's uh) A's role
44 T: A what do you think↑

In this extract relatively long periods of silence seem to occur. For example, we can see long stretches of silence in lines 29, 33, 37, 39 and 41. These periods are not, however, treated by the participants as mere silences that should be attended to, but rather as an interactional resource. The participants continued to be oriented towards one other during the silent periods since they were usually performing some sort of embodied action related to the task. In line 29 there is a 4-second silence in the interaction. The fact is that a great deal of action was taking place during that period. Participant A was copying the action just performed by his colleagues: i.e., bringing up the menu on the Tabletop to create more sticky tapes. At the same time, Participant T was still involved in creating more sticky tapes and connecting the pieces of the story. This silence can therefore arguably be considered as part of the interactional phenomenon. That is, these periods are contributing to the interaction and occupy a space in the details of the interaction. The participants orient to each other during such silences, since everyone is involved in the task on the Tabletop. Participant M seems to

be aware of this long period of silence as he keeps orienting to his colleagues while they manipulate the artefacts on the Tabletop. He is not contributing verbally but non-verbally in this segment, as he configures his body posture and gaze toward what the other participants are doing.

Lines 33 - 41 of the above extract reveal how the participants developed a sort of interaction that involved long pauses and embodied actions. As may be seen from these lines, there are long periods of silence embedded within the verbal and non-verbal orchestration of the action. In line 33 Participant A is creating sticky tapes and connecting the pieces of the story (see the figure below).

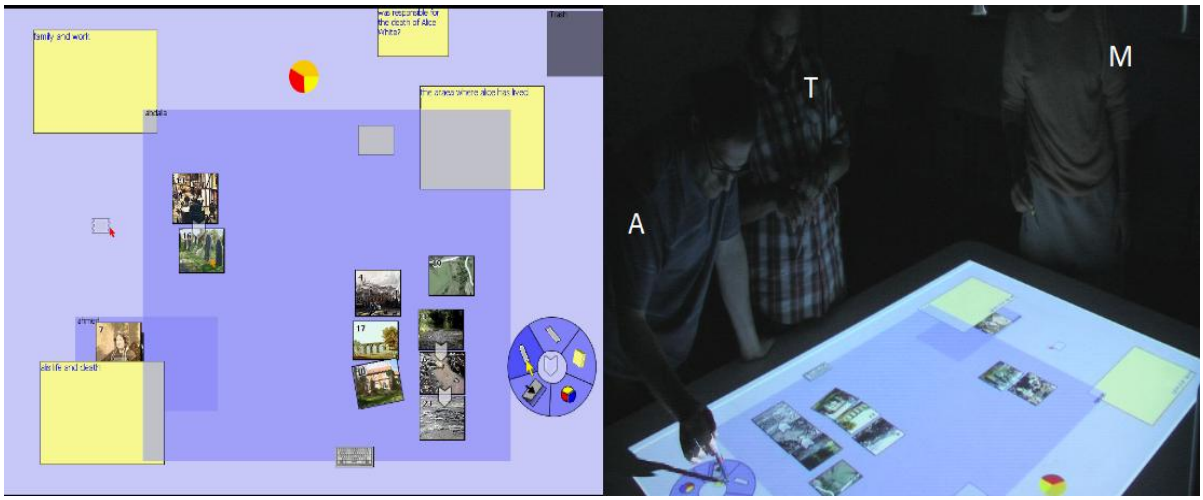


Figure 5.8 Action in silence

This process involves 3 seconds of silence. The two other participants are orienting to what A is doing without contributing verbally to the action. In line 34 T indicates agreement with A's continued effort to connect the pieces. This is followed by a one-second silence where embodied action continues to take place. In line 36 T points to two pieces of the story that need to be connected. The response to this turn can be seen in line 39, where a lengthy silent period occurs. In the meantime, M is creating sticky tapes and connecting pieces. The prominence of the pieces on the Tabletop makes

things visible to the participants. Consequently they can easily see the relevance of any movement on the surface. For example, in line 36, when T indicates that the two pieces need to be connected, the other participants immediately orient to this and become involved in an embodied action to connect the pieces. In lines 38 - 39 and 40 – 41 the same action takes place. T initiates a turn and the response is an embodied action performed by the other participants.

This pattern of interaction did not seem to be problematic to the participants. Regardless of how long the silence lasted there was always non-verbal action taking place. It is evident that the participants had a shared orientation and attention to the environment where the collaborative action was taking place. They were constantly displaying publically the focus of their current orientation during the interaction. This made the silence a legitimate part of the interaction for the participants. In this extract (5.5), Participant A demonstrates how he manages to use the local environment (the affordances of the Tabletop) non-verbally, in order to engage interactively in accomplishing the task. It is also interesting in this extract to see how A and his colleagues used embodied action and gesture to negotiate and move the task forward. Participant A does not verbalise in this extract, but he is contributing to the interaction and is able to lodge his embodied turns with precision within the patterns of the collaborative environment.

This section has shown that the model is able to tap into silent moments of interaction and reveal in detail the non-verbal interactional work that is taking place. It has been shown that participants orient to such silences and to the accompanying embodied action. The following section shows how the model can account for the details of silent contributions in task-based interaction.

5.3.3 Silent contributions

The analysis of the data using the model showed that throughout the task there were noticeable periods of silence. The previous section provided examples of actions during the task that were performed without verbal accompaniment. This resulted in silence amongst the participants, but because they were all orienting to the non-verbal work the silence was interwoven into the action. It may be argued that this was related to the nature of the task, since it entailed the physical manipulation and spatial placement of the pieces. This in turn affected the sequential organisation of the talk and gave rise to lengthy pauses in the interaction as the participants engaged in other activities, not seen through the transcript but by looking at the video data. Moments of silence were thus not devoid of action: the learners were actually involved in the practicalities of the task. They were not saying anything but they were moving things strategically and arranging relevant pieces together. These important nuances of interaction can only be captured and correctly analysed by using a model that looks holistically at the task. M. Goodwin (1980) indicates that:

> … participants utilise not only the possibilities of the turn taking system but also the resources provided by their co-present bodies to provide and ratify interpretations of silences, with the effect that silences are neither pauses or gaps but rather spaces that continue to be occupied with material implicated in the production of the speaker's talk. (pp. 314)

The following example shows that one participant was contributing 'embodied action' at a specific point in the ongoing task without making any verbal contribution. Using any other model of analysis, her contribution might simply have been perceived as silence, whereas the use of our model reveals that she was in fact involved physically in the interaction. In a similar fashion, embodied completion of turns has been documented in the literature. For example, turns in talk are sometimes brought to completion through embodied action (Olsher, 2004; see chapter 2, section 2.2)

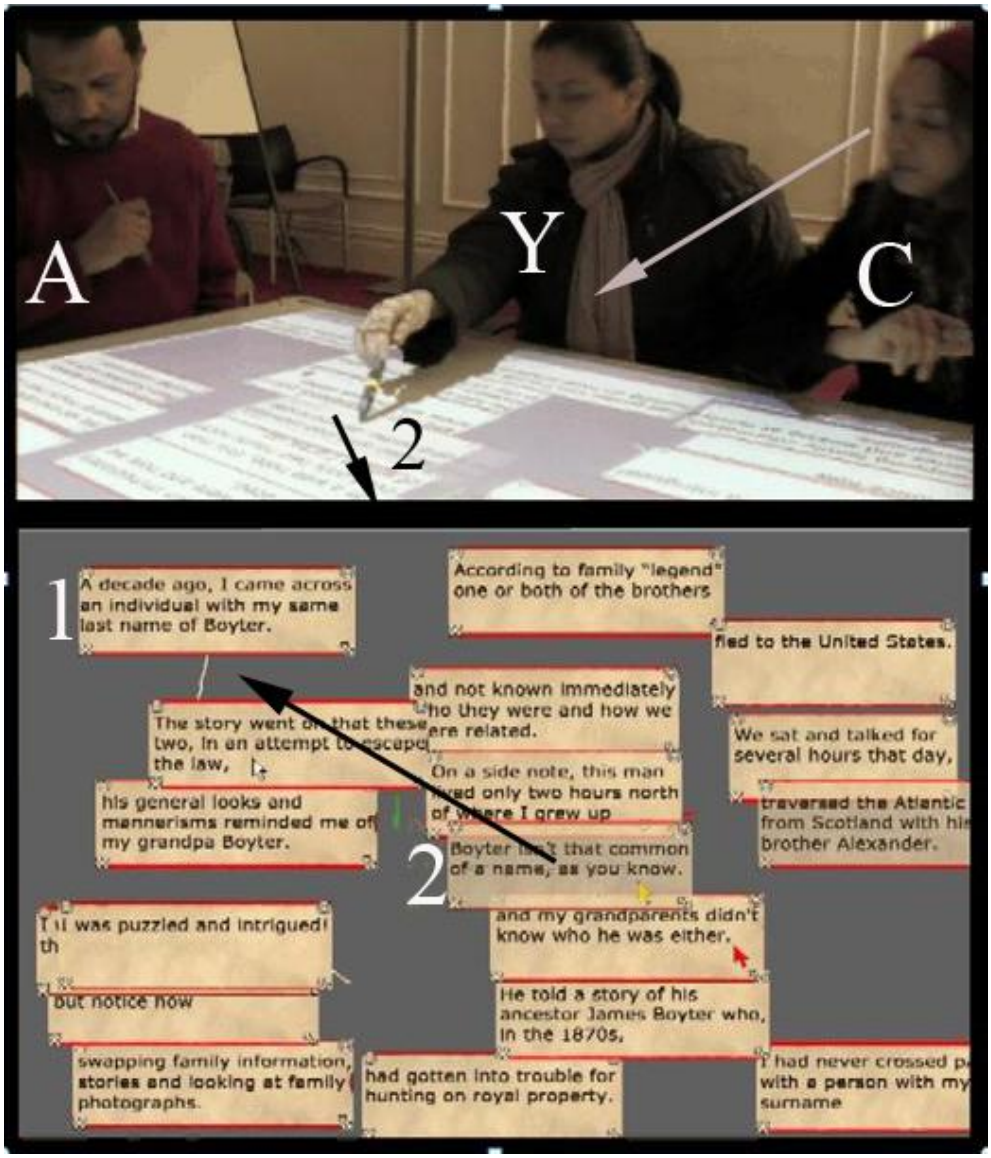


Figure 5.9 Silent contributions

From extract 5.6 and figure 5.9 it is clear that Participant Y is not saying anything. However, her manipulation of the pieces on the Tabletop does have consequences for the next move in the sequence of events. As Participant C finishes reading piece number 1 and looks for the next piece, Participant Y points to piece number 2 with her pen and moves it to her left without saying anything, as shown in figure 8. Moving the piece to the left is an indication that this piece should be the next one. This attracts Participant C's attention and C agrees that this is potentially the next piece, as shown in extract 5.6 (line 92); finally C moves it below piece number 1 where they are arranging the pieces.

Extract 5.6

90	C:	because he have to
91		(0.8)
92	Y:	**((*moves one of the pieces*))**
93	C:	yeh Boyter is °that common (0.7) ok here come on:↑
94		(1.1)
95		here we go:↑ good boy↑°

Without looking at Y's silent movement in line 92, it would be difficult to analyse fully the collaborative achievement involved in constructing the story. These manipulations of semiotic resources have important consequences for the outcome of the task. The selection of piece 2 and its introduction as the second piece in the puzzle takes the story in a particular direction and dictates the sequence of events that must follow. Y's turn in line 92 was an embodied action that was oriented to and built upon by the other participants.

The model clearly shows that such instances of silent manipulation in fact demonstrate the mutual interplay and relationship between gesture and language and how they contribute to the organisation of action. It also shows that the participants obviously do not ignore these semiotic artefacts but employ them as a key part of the

organisation of action. Participant Y's move, shown in figure 5.9 above, has a sequential impact on the interaction as it displays her orientation to and understanding of the context. These opportunities for analysing moments of silent contributions are made possible by using our model, since it provides a clear explanation of and justification for the course that the task took at that moment. It also gives a different impression of Participant Y, who did not verbalise much during the task. Figure 5.9 shows that the participants were able creatively to manage verbal and non-verbal aspects of task management - here Y is performing the physical movement and C is supplying the verbal accompaniment. Having access to the details of the interaction through the model made it possible to see the micro details of such silent contributions to the task interaction. As shown above, the participants sometimes contributed non-verbally to the task. Typically, in the analysis of TBI, such non-verbal contributions would be overlooked and ignored because it is not possible to pin down what they are or how they interrelate to the ongoing interaction.

As shown in the above discussion, the analysis using our model can also give us a different impression of a student who does not contribute verbally in tasks. A transcript could mislead us into thinking that the speaker is not engaged in the task. However, as shown above, students sometimes engage non-verbally in the ongoing action. More remarkably, their contribution to the task can be equal to that of other task takers. This clearly shows the added value of the model, as it portrays these aspects of task-based interaction which could not otherwise be seen.

We have seen in this section that the model can demonstrate how silent contributions are interwoven in the interaction and can also portray how such silences can have an impact on the organisation of TBI. This clearly shows that the model is able to shed light on the micro details of how the participants manage and enact their

interaction employing non-verbal and verbal resources. The next section will show how the model is able to reveal the complexity of task-based interaction.

5.4 Portraying the complexity of TBI

This section aims to present evidence from the data to support the argument that the model is able to portray the full complexity of TBI. What I mean by the portrayal of the complexity of TBI is the multi-layered representation of the interactional phenomenon. It is noticeable that in the digital environment participants use different modalities to deal with the task at hand. We can see that they use talk, gesture, hand expression, body orientations, and the physical environment. The complexity lies in the interrelatedness and interwoven nature of such modalities of interaction. Participants do not normally rely merely on talk in task-based interaction but also employ non-verbal resources in many ways. The intersection between talk and non-verbal behaviour in language studies has not been thoroughly explored. Thus, being able to analyse the interaction in such a dense and interactive environment will reveal the details of how such modalities interrelate and work together.

A simple look at the transcripts of talk will not yield much understanding of what exactly is going on at any given stage of the task. A great deal of accompanying information cannot be displayed, as transcripts show only one part of the interactional phenomenon. For example, in the extracts used in this research, one can easily notice extended periods of silence. It would not be easy to justify such pauses without having the visual element that shows the learners' orientation to the task and how the nature of the task might be affecting the shape of turns. It might be safe to say that the missing visual information would immensely enrich our analysis of the interaction. Bodily and facial gestures play a role in how interaction is constructed and understood in a moment-by-moment fashion.

The following extract and discussion demonstrate how the model can be used to reveal the details of a piece of interaction and takes us into the moment-by-moment solving of a problem that was confronting the participants. The extract shows a problem in communication that leads the learners down a false trail as far as task completion is concerned.

Extract 5.7

1	A:	((clears his throat)) [ok]
2	C:	[accor]ding to family legends one or both of the brothers
3		(1.1) were
4	A:	brothers:: wer[e::aah]
5	C:	[swapping] family information ○s[tory] and looking at○
6	A:	[yes]
7	A:	no this swapping
8		(1.8)
9	A:	○ok○
10		(3.1)
11	C:	○and looking at family photographs○
12		(1.0)
13	A:	and not (0.7) oh that's full stop (0.6)
14	C:	yeh (0.8)
15	A:	no (0.6) ok (.) [photographs]
16	C:	[what is this]
17		(2.8)
18	A:	ok
19		(5.4)
20	A:	the story went
21		(1.3)
22	Y:	the story went on yeh yeh yeh (.)
23	A:	huh (.) do you [think]
24	C:	[I think] so yeh why not
25	A:	ok go ahead
26		(1.8)

Extract 5.7 illustrates an interesting point that would normally be difficult to follow in a 'transcript-only' analysis. A misunderstanding occurs as one speaker contributes a word which is grammatically correct but which does not appear in the text and would not fit into the sequence of events of the story. In line 3, as she reads one of the pieces, Participant C says 'were', thus providing extra information that manifests

explicit knowledge of English linguistic forms. Having seen that the piece picked ends with the plural noun ‘brothers’, C appears to decide that the next word must be ‘were’ and looks for a piece that begins with that word. According to the next piece in the original story, the two brothers ‘had gotten into trouble for hunting on royal property’. However, the suggestion of ‘were’ by Participant C prompts the other participants to look for a grammatical structure that fits with ‘were’ and to choose ‘swapping family information’, as the potential next part of the story. The complete event (having ‘brothers’ + introducing ‘were’ + picking ‘swapping’) has caused this misunderstanding and led to an incorrect sequencing of the events of the story. Figure 5.10 below shows the whole picture.

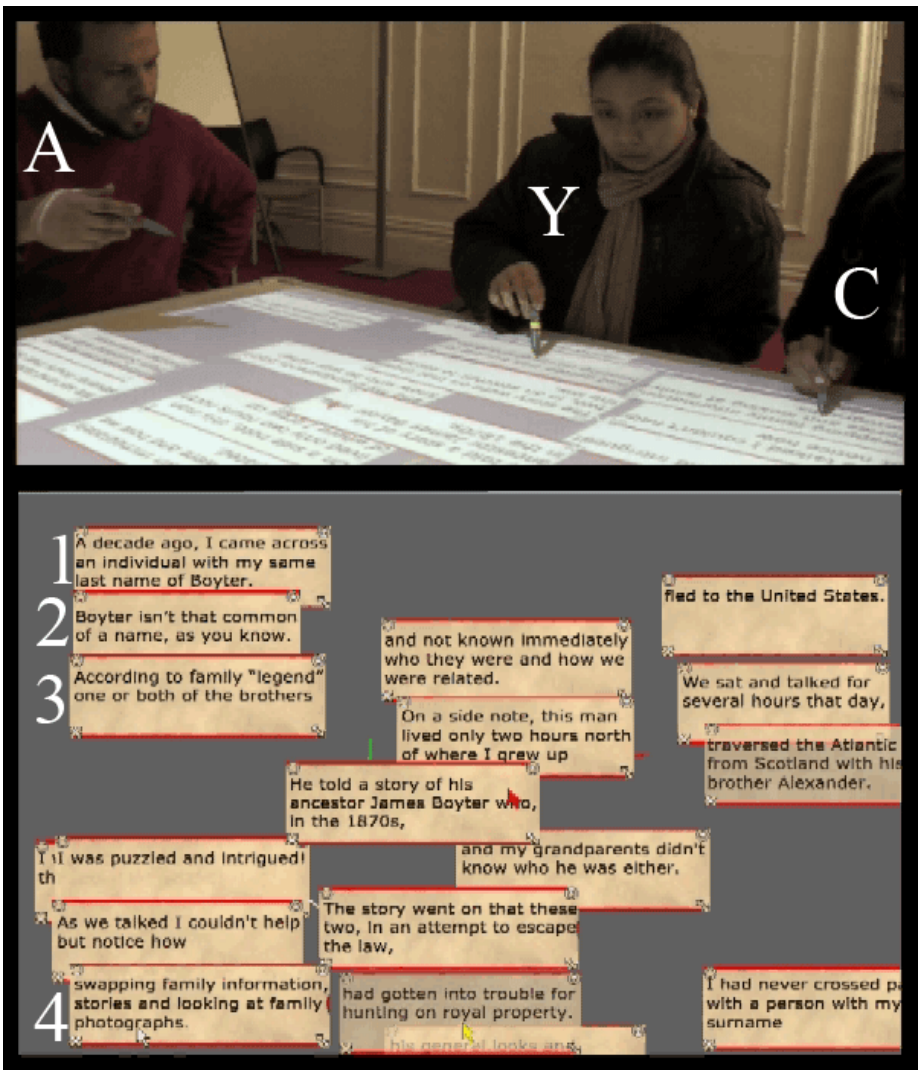


Figure 5.10 Introducing 'were'

This frame was taken at line 5, a moment after the misleading word 'were' had been introduced. It shows the arrangement of pieces 1-3 before the problem occurred. It shows the analyst where things were before that point in time.

It can be argued that if one looked only at the transcript, things would look normal and it would not be easy to see why 'were' did not fit in. It is only by employing the proposed model that one can see how this problem arose. Before C's utterance in line 3 the participants were looking for the next piece of the puzzle to follow pieces 1-3. Her utterance of 'were' was obviously influenced by the fact that the text on the previous piece ends with a plural noun. Spotting this grammatical resource she hastily

assumes that what comes next will start with ‘were’. This assumption is ratified by A’s agreement to take on this proposal in lines 4 and 6. Multimodal analysis shows how this problem has affected the local interactional context and influenced the participants’ subsequent move in the story line. Figure 5.11 below shows the learners’ final solution to the task.

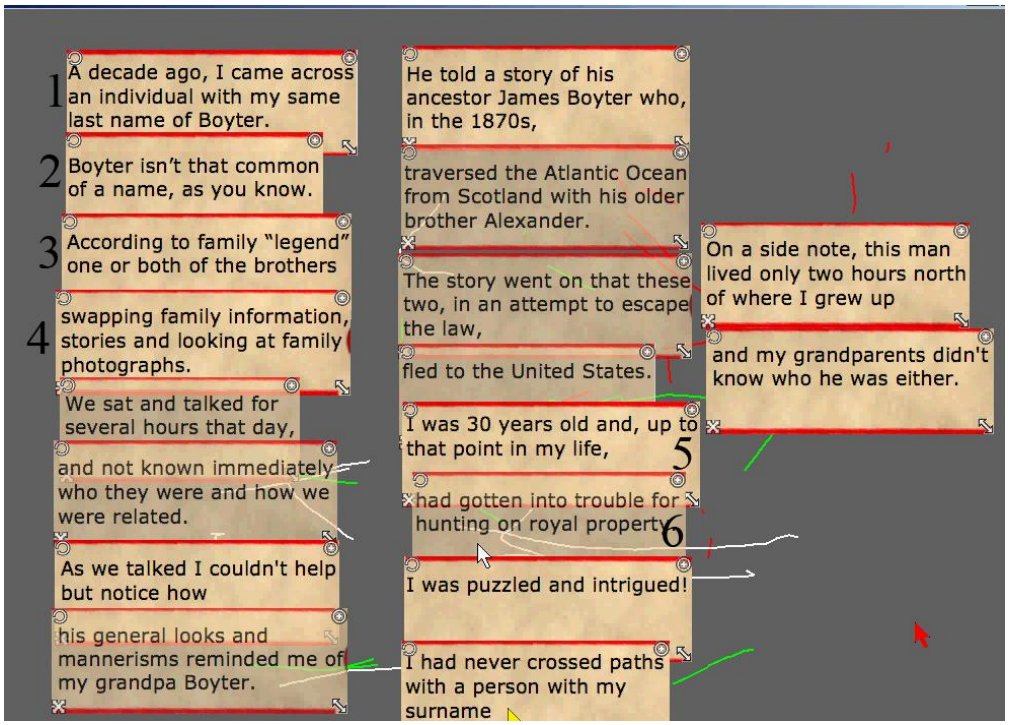


Figure 5.11 Final arrangement of the story

It demonstrates that all the participants were satisfied with the decision that piece 4 was the correct piece to follow piece 3, even though the two pieces together do not form a proper sentence. They also ended up putting pieces 5 and 6 one after the other. Piece 6 should actually have followed piece 3, but that did not happen either and the result was this final arrangement of the pieces.

This extract has shown how the multimodal analytical power that the model brings can shed light on the micro details of the interaction and give a clearer picture of

the verbal and non-verbal machineries that govern TBI. As analysts we have access to data on the surface of the Tabletop as well as to the physical configuration and manipulation of the environment, so it is possible to see the full picture of what participants are orienting to when they negotiate their moves and the decision-making process they collaborate to construct.

The following example shows that the model can reveal the complexity of TBI by portraying the details of a repair sequence during interaction. Interactants resort to repair as an important interactional resource to solve problems in speaking, hearing and understanding in communication. Repair is a key element in the achieving of intersubjectivity among interactants in a conversation (Heritage, 1984: 254-260; Schegloff, 1992).

The example below shows how the model can help us to see the participants' moment-by-moment orchestration of verbal and non-verbal resources to solve a problem in communication. The analysis shows that the use of gesture and embodied actions during repair were very noticeable at this point. The participants utilise the Tabletop and other embodied actions during the repair sequence. The processes of repairing the trouble source seem complex in terms of the different modalities and the sequential organisation of the interaction. Turn by turn the participants employ talk, non-verbal resources and the Tabletop to sort out the problem they are facing. The model is able to show the details of this complex process very clearly.

Extract 5.8

1 Finn: °so Katherine White's family have been okay [( )
2 Dan : [in the
3 (.) <glove> (.) trade
4 ***((Tim maximizes one of the pieces))***
4 Finn: ( ) White were( ) okay°
5 Dan: James White worked (.) as a tinner, what's a tinner↑

6 Tim: tinner↑ [tanner] ***((looks at the relevant piece))***
7 Finn: [tanner] er ( ) ***((looks at the relevant piece))***
8 Tim: °°whats a tanner°° ***((reading the relevant piece))***
9 Finn: °ah his brother began ( ) tanner° ***((surveying the tabletop))***
10 Dan: ah >maybe< er so:meone who i:s ah::m (.)>preparing<
11 the (.) leather.
12 Tim: °yeah° [it's related
13 Finn: leather mayb[e [ye:s ( ) [made leather
14 Dan: [so he's er he's the hasband of Katherine.
16 Finn: yes

This extracts starts with Dan and Finn reading one of the pieces (lines 1-3). When Tim maximises another piece, the other participants' attention is drawn to this newly maximised piece of the story. Dan moves physically closer to that piece and starts reading. In line 5 he comes across a trouble source (the word 'tanner'). He then asks a direct wh-question ('what is a tanner?'). The other two participants orient to this trouble source and Tim repeats the word as they heard it (with a short vowel). However, they immediately pronounce it with a long vowel (lines 6-7). In line 6 Tim's repetition and Finn's focused gaze on the piece signal that they are having a problem understanding the trouble source. At first, their response seemed to be a display of their knowledge of what the word meant and thus suggested that a repair turn would follow. However, the two turns in lines 6-7 show that the participants' proper pronunciation of the word 'tanner' did not mean that they knew what it meant. This is confirmed by the subsequent lines, as they are unable to establish other-repair, and by T's turn in line 8 when he repeats the question 'what is a tanner?' In line 8 Tim starts reading the piece that contains the trouble source while Finn looks around and scans the Tabletop for clues. The interesting point here is that when Dan encountered this trouble source he did not establish mutual gaze with the other two participants but rather kept looking at the target piece for clues (figure 5.12). The interaction in lines 6-9 fails to provide repair for the problem.

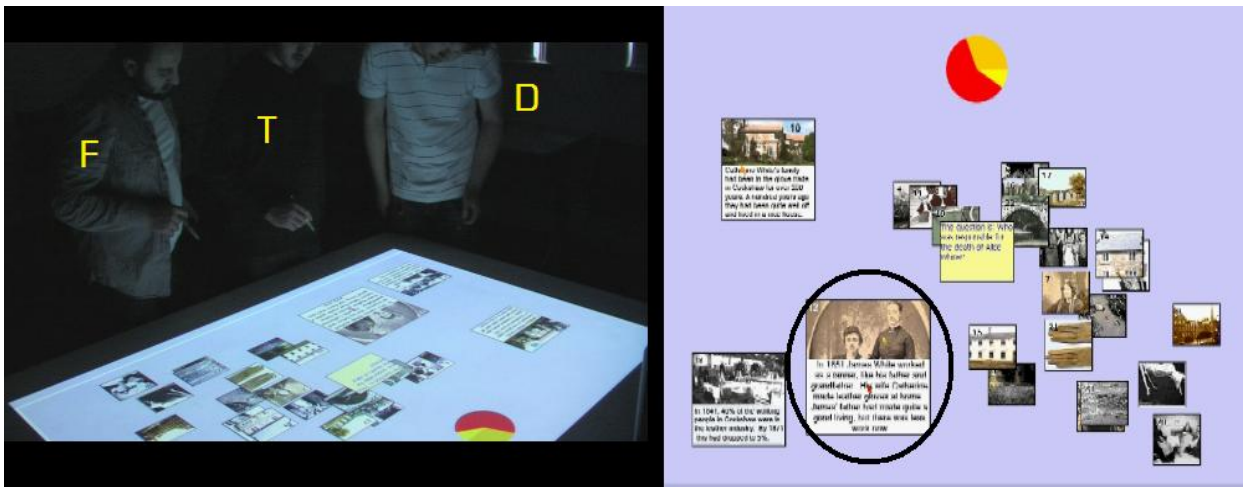


Figure 5.12 What is a tanner?

In line 10 Dan finds a clue and initiates a self-repair by suggesting that a tanner could be a person who prepares leather. The process starts with an embodied action by Dan trying to explain what a tanner does (figure 5.13). The embodied action is oriented to by Finn while Tim is still looking at the target piece.

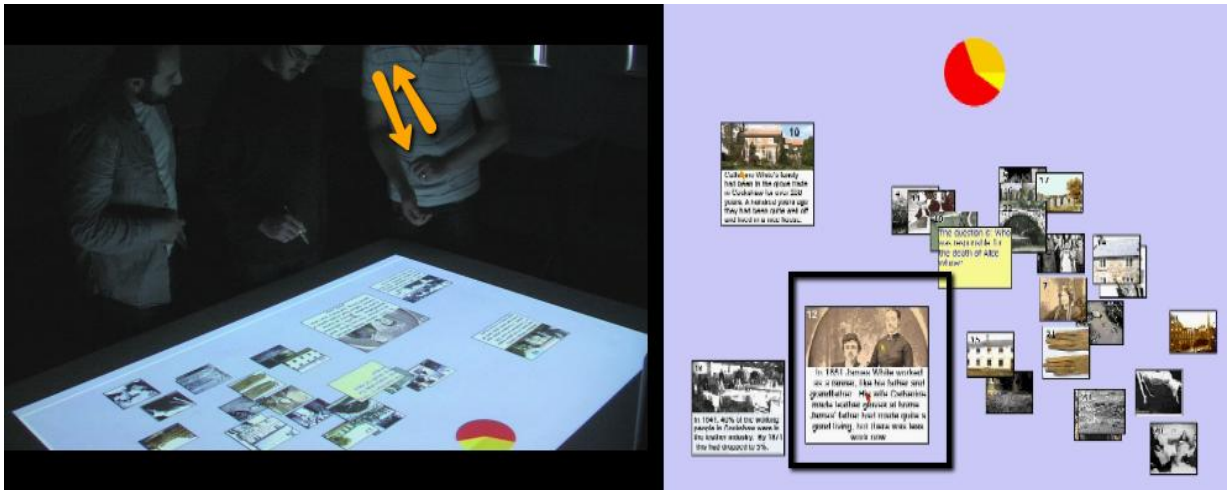


Figure 5.13 Embodied action - line 10

This extract shows that when managing repair in the Tabletop environment the participants used a large amount of non-verbal communication and made use of the physical environment in front of them. Since this environment is characterised by a rich use of movement and interactivity, the participants had to rely on these salient features

to resolve occurrences of trouble. The immediate environment is so salient that the participants did not take any other route to resolve the trouble source. For instance, they did not become involved in a side talk to try to work out what the word meant or check a dictionary; rather, they engaged with the environment and walked through the resolution process looking for clues on the surface. The constant prominence of this digital environment (the Tabletop is such a large and interactive space that is constantly attracting the participants' attention) means that the participants have to adapt the way they manage their interaction while performing the task. For example, in lines 12 and 13, although there is a trouble source that remains unresolved, the participants spend some time in silence engaging with the Tabletop to search for clues.

The handling of this occurrence of trouble shows how complex and fluid TBI can be. Various elements and factors mingle to form what seems to be a neat and straightforward interaction. However, in reality the interaction is not as simple as it might seem. It includes the use of not only talk but non-verbal elements as well. The orchestration of non-verbal elements and the synchronisation of movement and talk make the interaction extremely difficult to analyse. This is why this model has been developed: to disentangle these elements and to reveal how TBI works in micro detail.

The point that this section has attempted to make is that the model can shed light on the micro details of TBI. It can show not only talk but also non-verbal communication and the manipulation of materials within interaction. It gives an accurate representation of the details of task processes and reveals the precise timing of actions. Using the model it is possible to examine the complexity of TBI accurately and in great detail. This shows the value that the model adds by revealing the micro details of task-based interaction in a moment-by-moment fashion. This will, it is hoped, allow the researcher later to see how learning evolves at this micro level. In the following

section the characteristics of TBI are re-examined with a view to demonstrating how the proposed model can give a better characterisation of task-based interaction.

5.5 Characterising task-based interaction

This section addresses the characteristics of task-based interaction. It sheds light on how the model can give a better characterisation of task-based interaction. Task-based interaction is a complex phenomenon because it involves the deployment not only of verbal actions but also the use of non-verbal communication and the immediate physical environment. In the case of this study task-based interaction was rendered highly complex, since the task used required a great deal of non-verbal manoeuvres of the digital artefacts on the Tabletop. Understanding the details of the task-based interaction, as described above, would therefore definitely be a difficult task. In the following sections some features of task-based interaction are explored.

5.5.1 Nature of the task and the turn-taking system

Each variety of interaction has a specific pedagogical focus which has an impact on the turn-taking system that accompanies it (Seedhouse, 1999). Seedhouse has also shown that in task-based interaction the focus is on the accomplishment of the task. Therefore, learners normally employ a turn-taking system that is appropriate for this pedagogical focus.

The main goal for all the participants in each of the groups who took part in this study was the accomplishment of the task: i.e., to answer the main question of the task. In order to do this they had to read the pieces and try to connect them in a way that would help them make sense of the story. The participants tried to group the pieces on the surface of the Tabletop. They did this by pulling the pieces to different areas on the Tabletop based on how closely related they seemed to be. After reading a number of

pieces, the participants would normally agree on some themes, on the basis of which they then grouped the pieces. This categorisation helped them to sort things out on the surface of the Tabletop. The following extract (5.9) shows how the nature of the task affected the type of turn-taking that took place.

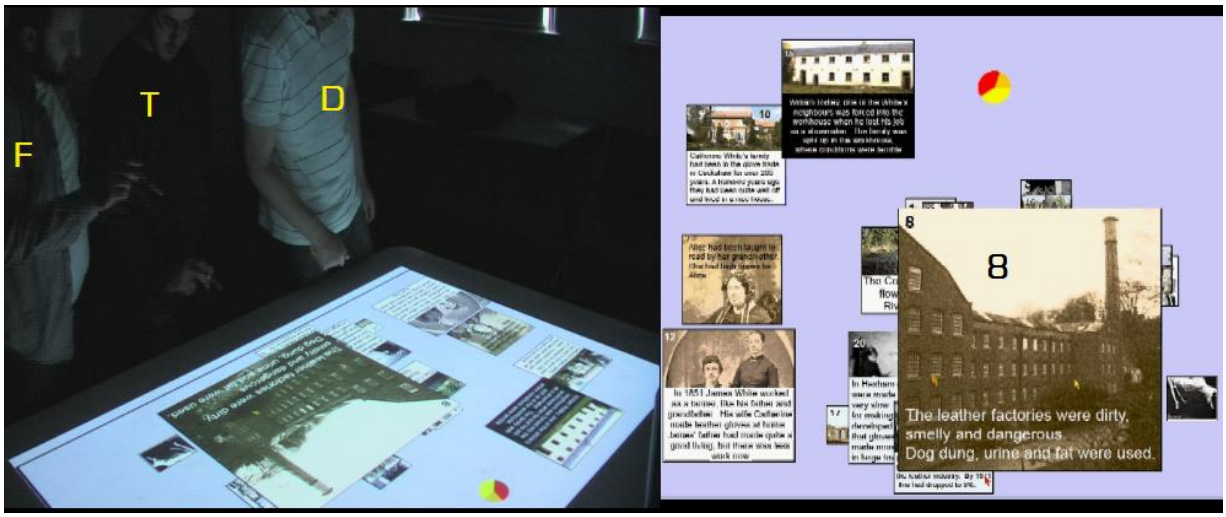


Figure 5.14 Lengthy turns

Extract 5.9

1: F: the leather factories were dirty (.) smelly and ***((D and T are gazing at the large***
2: ***piece))*** dangerous dog dung(.) urine and fat were used
3: D: were used for what ***((minimizing and moving the piece))***
4: (0.5)
5: T: of the factories ( )
6: D: so (.) .h uh maybe we c[an
7: F: [this might be related to the
8: F: [factories
9: D: [to the factorie:s yeah
10: (1.0)
11: D: it's more Cockshaw,
12: F: Cockshaw this colou:red one and the black and white
13: (1.5) ***((pulls and maximises one piece))***
14: okay in eighteen fifty eight, the ↑White 's couldn 't (.)
15: affo:rd the rent of their house, they (ta:lked towards) a
16: <Katheri":"ne's> brothers hou:se (.) their four youngest
17: children were born there ( )
18: (6.0) ***((D and F point to where should the piece go,***
19: ***T moves the piece to an area on the Tabletop while D reorganises the pieces))***

20: D: so >maybe< (.) Katheri:ne is the grandmother
21: (7.0) ***((F is maximising and pulling one piece to the centre of the Tabletop))***
22: D: [James and Kathrine
23: F: [James and Katherine White's older [children. (.) Robert
24: D: [children (.) Robert
25: F: James Katherine a:nd Jo>seph< .h (.) had die:d in s'
26: <sma:llpox (.) ou:tbree:k> in May >eighteen fifty<
27: (three) >fifty people< die:d in Cockshaw that month.
28: D: aha so [this ***((pulling one piece))***
29: F: [this one >is related to< this ***((pointing at two pieces))***
30: D: James is um <the child of>
31: (5.0) ***((reorganising the pieces))***
32: °so basically katreen,°
33: (2.0) ***((moving one piece))***
34: it's the son, so James is one of the sons,
35: T: no James is the father, James [(and Katherine) ok ***((points at one piece))***
36: D: [a:h ok
37: (3.0) ***((D is arranging pieces))***
38: F: this one is just related to this o:ne. (.) I think they ***((points at two pieces))***
39: are from each other. because they are talk' talking about
40: the (.) the family,
41: T: both er those er thi er this (.) it's not talking about
42: the family ***((points at two pieces))***
43: D: hmm mm
44: F: (4.0) ***((pulls one piece and maximise it))***
45: F: in eighteen fifty three:, (0.2) the boa::rd (.) of health
46: reported that Cockshaw >area<(.)
47: T: ***((points to where the piece should go))***
48: F: >an' Hexham< was one of the mo:st (0.2) unhealthy areas in Britain, becau::se
49: of the poll:ution and overcrowding. (.) diseases such as smallpox, (.) and tay (.)
50: phoyee:d were common
51: T: °are these related°
52: (1.5) ***((T pulls the piece next to another one))***

This extract presents evidence of how the nature of the task and the goal that the participants were aiming for had an impact on the nature of the interaction. One can see that throughout the extract there are long turns which show one participant reading from the pieces. The participants in this task were focused on solving the mystery so that they could identify 'who was responsible for the death of Alice'. This focus seems to have prompted them to maximise each piece and read it to see how it should be categorised. It was noticed that the participants collaboratively picked pieces one by one and

maximised each one to read it. As each piece was maximised, one of the participants would spend some time reading the text aloud while the other participants attended to the piece in question. As their colleague read they attended to him and looked at the text in an effort to find clues. They aligned their bodies and gaze to the piece they were focusing on.

Lengthy turns can be seen in lines 1, 14, 25 and 48. In each of these instances one participant takes the floor and reads one of the pieces while the other participants orient to what he is doing with the piece. What is happening here is that the participants are allowing one member of the group to read the piece aloud, and they are trying collaboratively to find clues so that they can categorise the piece. In line 1 Participant F starts to read one of the pieces (piece 8). As he reads he is not interrupted by his colleagues but is left to finish reading it. In lines 3-11 the group discuss where this piece should belong. We can see short turns and suggestions regarding where to group the piece (the factories, Cockshaw). The same pattern occurs again in lines 13-17, where Participant F starts a lengthy turn reading another piece. After reading the piece Participants F and D non-verbally indicate where the piece belongs on the Tabletop (line 18). In line 19 the third participant responds to his colleagues' non-verbal action by pulling the piece to the area they indicated without verbalising. Throughout the rest of the extract we can see the same pattern occurring time after time.

Lengthy stretches of silence are also noticeable in this extract. The model reveals that such pauses or silent moments are not empty but are in fact used to perform actions on the surface of the Tabletop. The nature of the task seems to have caused such silences, as the participants needed time to move things on the Tabletop and to group or connect the digital artefacts. Interaction in the task was not achieved exclusively by talk. A great deal of non-verbal and embodied action can be seen throughout the task

enactment. This is owing to the nature of the task, which was based on the movement of pieces, and which led to periods of silence in the interaction as the participants spent time moving, connecting or grouping the pieces.

In the above extract, it may be observed that lines 13, 18, 21, 31, 33, 37, 44 and 52 show lengthy periods of silence during the interaction. The model reveals that in each of those lines action was taking place. The participants were focusing on the main goal, which was to find a solution to the problem posed at the start of the task. They knew they needed to make sense of the story, and the only way to do this was to read the pieces and try to reconstruct the story by grouping and connecting them[10]. These manoeuvres and manipulations of the pieces on the surface of the Tabletop are embedded within the turn-taking system. The silence that these manipulations involve is not regarded by the participants as irrelevant. On the contrary, they orient to this silence and attend to the non-verbal action that takes place during the silent periods.

For example, in line 18 we notice that there is a very long period of silence (6 seconds). The model shows that a lot of non-verbal action is taking place. This silent period occurs immediately following the reading of one of the pieces by Participant F in line 14. As soon as he has finished reading aloud, he and D non-verbally indicate where that piece should be grouped, i.e., a particular area of the Tabletop. Participant T immediately takes up this suggestion (line 19) and moves the piece in the right direction without verbalising. All of these turns of embodied actions are taking place in the 6-second silent period.

[10] It could be argued that the interactive nature and prominence of the digital Tabletop might lead participants to be more attentive to what they see and do on the surface. That could potentially lead them to focus on the movement of the pieces rather than on continuing the discussion.

One can see from the example above that the nature of the task is shaping the turn-taking system in the task. Since the task requires movement and manipulation of the pieces the participants tend to conduct some of their turns non-verbally. The participants collaboratively co-construct the progress and direction of action, which involves a great deal of movement. The movement is interactively intertwined with talk and group dynamics.

This section has illustrated one of the characteristics of task-based interaction. It has been shown that the nature of the task has an impact on the turn-taking system of interaction. More specifically, the section has presented two examples to explicate how the nature of turn-taking is shaped by the nature of the task and the pedagogical focus of the participants. The following section will present two other features of task-based interaction, i.e., indexicality and minimalisation.

5.5.2 Indexicality and minimalisation

The following extract (5.10) shows a heavily indexical encounter. It clearly portrays how task-based interaction can be extremely minimal and indexical. The extract is characterised by short turns and long periods of silence.

Extract 5.10

1	C:	°and looking at family photographs°
2		(1.0)
3	A:	and not ***((moving one of the piece to the middle))***
4	Y:	(0.7) ***((reaching for the same piece))***
5	A:	oh that's full stop (0.6)
6	C:	yeh (0.8) ***((moving one of the piece))***
7	A:	no (0.6) ok (.) [photographs] ***((moving one of the piece))***
8	C:	[what is this]
9	C:	(2.8) ***((moving one of the pieces))***
10	A:	ok
11		(5.4) ***((Y is moving one of the pieces))***
12	A:	the story went ***((moving one of the pieces))***
13		(1.3) ***((A and Y are moving one of the pieces))***
14	Y:	the story went on yeh yeh yeh (.)***((moving one of the pieces))***

15 A: huh (.) do you [think]
16 C: [I think] so yeh why not ***((moving one of the pieces))***
17 A: ok go ahead
18 (1.8) ***((Y is moving of the pieces in the agreed position))***

The learners' utterances in the transcript do not show what was actually happening in the task. Without looking at other aspects of the interaction, it would be difficult to have a complete picture of the moment. This indexicality is explicated by showing the other elements in the model, i.e., the video and screen capture that accompany the transcript. Looking at the transcripts with these resources to hand help us make sense of this interactional encounter. The holistic model developed in this study allows the analyst to see beyond the spoken word or the written script. Being able to see the participants' embodied actions and the arrangement of pieces on the Tabletop added another layer to our understanding of the interactional phenomenon.

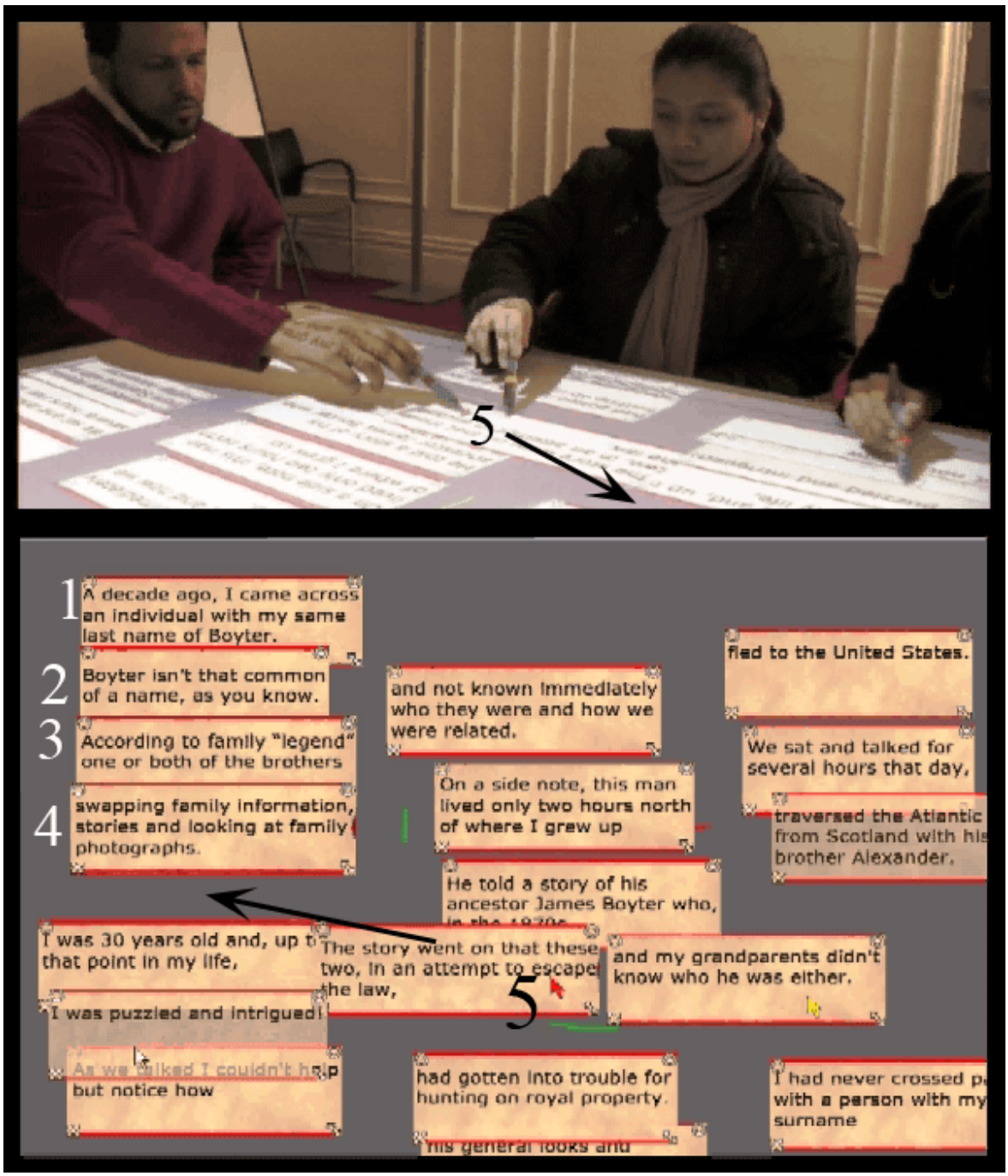


Figure 5.15 Juxtaposition of the visual elements

The arrangement of the pieces on the table shows the progress of the task. The four pieces (1-4) in the top left corner were picked as the first four pieces in the story. This frame was taken at line 12 in the extract above. Participant A (on the left) suggests that that piece 5 (that reads 'the story went…') is a potential candidate for the next move. He moves it to the left and finally Participant Y puts it in place below the four pieces (1-4) on the top left. His proposal is thus accepted by the other participants and

conjointly acted upon. If we looked only at the transcript we would be tempted to think that A is telling the other participants a story about something that happened and about some events that followed. It would be impossible to guess what is really happening. A is actually talking about whether piece 5 (that starts with 'the story went on…') can be the next in order after pieces 1-4. The combination of perspectives can clearly explicate highly indexical moments and show the impact they have on our analysis of the unfolding course of action. In the above figure the points that influence the direction of the task and its outcome can visibly be spelled out by looking at the visual factor. Such graphical artefacts have an immense effect on the way participants and analysts look at the interaction. Goodwin (2000:1505) indicates that "participants visibly attend to such graphic fields as crucial to the organization of the events and action that make up activity reflexively situated within a setting, and which contribute structure to that action."

This section has discussed two characteristic features of task-based interaction: indexicality and minimalisation. The analysis has shown that the proposed model is able to portray the features of TBI in detail and give a better understanding of the details of interaction. The next section will show how the model can facilitate a closer look at other features of TBI: self-repetitions, clarification requests and confirmation checks

5.5.3 Other interactional features

In early TBLT studies based on the Interaction Hypothesis (Doughty and Long, 2003; Pica, 1988), particular features of interactional modifications were isolated for quantitative treatment, specifically self-repetitions, clarification requests and confirmation checks. The following extract (5.11) offers a different perspective on this issue. Analysing the interaction using the proposed model reveals that repetitions can sometimes mean different things in different situations, and thus quantifying these

repetitions without obtaining a more comprehensive picture of what is actually happening can yield a different understanding of the interaction at hand.

Extract 5.11

1	A:	yeh that's right what [I mean]
2	C:	[the sto]ry on that these two in an attempt to escape the law
3		(1.3) ***((A is moving one of the pieces))***
4	C:	to escape the law:↑ (0.9)
5	A:	[the law:↑]
6	Y:	[escape] the law::: (.) ***((moving one of the pieces))***
7	A:	the law:
8		(1.3) ***((Y is moving one of the pieces))***
9	C:	and [not a sen]se here
10	A:	[ok:] ***((moving one of the pieces))***
11		[>what about< something there is hiding there] ***((points at an area on the Tabletop))***
12		[***((Y moving one of the pieces))***]
13		(1.1) ***((C and A are moving some pieces))***
14	C:	the law:

Lines 4-7 could in principle be coded as any one of the three features listed above. However, when we look at the visual data together with the transcript, a radically different picture emerges. Extract 5.11 contains minimised linguistic forms that appear be mere repetitions. In lines 4-7 the participants seem to be repeating the same thing. The words 'the law' resonate over and over again in the lines that follow. An analyst might suggest that what is going on here is that the participants are trying to sort out the reference to 'these two', thinking that 'these two' refers to 'photographs' and 'escaping the law'. Evidence for this is found in Participant C's indication in line 9 that it does not make sense. A quantitative analysis of tasks might simply count these encounters as confirmation checks, although in fact what is happening is something entirely different.

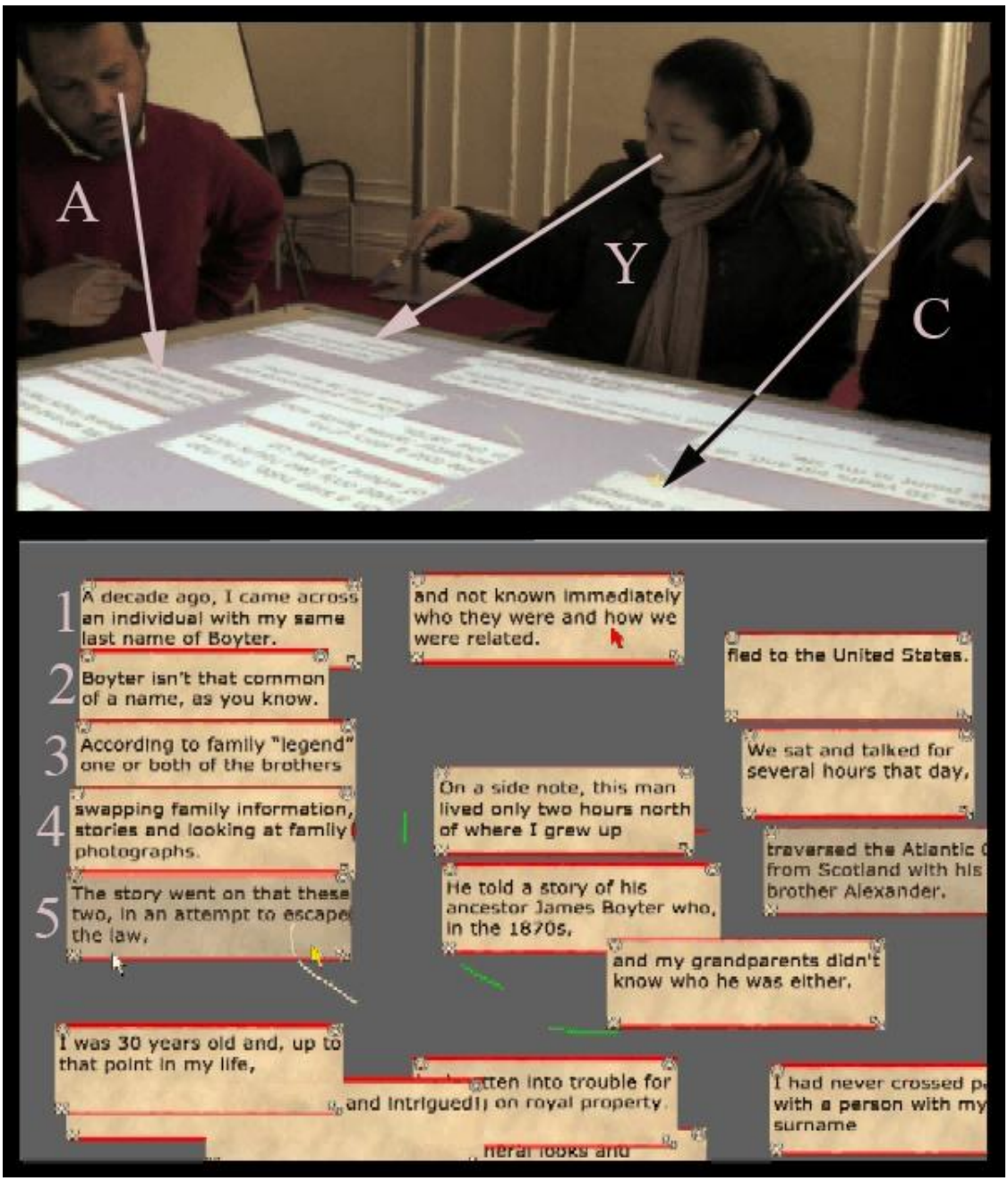


Figure 5.16 Eye gaze during repetitions

The meaning of the repetition of 'the law' in lines 4-7, then, can only be understood by referring to visual information. The three participants are scanning the board to find a piece 6 to put after piece 5 (the law). They are scanning different areas of the Tabletop, as can be seen in figure 7. By repeating 'the law', they are displaying to

each other their joint orientation to exactly the same part of the task at the same time. The repetition is therefore a kind of anchoring system.

Referring to the visual representation of the task, it can be easily seen that the participants, through gesture and movement of artefacts, are actually looking for the piece suitable to follow the current one (piece 5). A's utterance in line 5 is not a confirmation check but rather an entry point that he keeps in mind as he looks for a piece that will fit. The same can be said about Y's contribution in line 6. The participants are collaboratively looking among alternatives for a possible candidate that will fill the space after the piece that is being talked about. Later on during the task they manage to resolve the problem cooperatively as they group things and look back at the visual representation and check the relevance of one piece to the other. After a few lines Participant C draws the attention of the other participants to the fact that 'these two' must refer to people. At that point, the group agrees and makes the appropriate arrangement. The visual manoeuvring and grouping played a role in sorting out this problematic point. It also allowed the analyst to gain a clear insight into what was happening that could enhance the analysis.

The model has provided evidence that understanding task-based interaction goes beyond what a transcript tells us. It gives meaning to and provides context for the numerous realities of task processes. The tracking of the movements as the task unfolds gives the analyst a very powerful tool to look into the locally contingent repercussions of the task processes. This mode of analysis makes it relatively easy to follow the highly indexical encounters typical of task-based interaction. Generally speaking, the combination of analytical tools helps the analyst to re-enact the whole task and conduct rigorous analyses of the data over and over again.

The example in this section has shown that TBI involves instances of self-repetitions, clarification requests and confirmation checks. The model goes a step further by providing a closer look at these characteristic features of TBI. As shown above, all aspects of such features can be understood fully by using the holistic model, since it reveals the contextual elements that shape the interaction: i.e., the digital artefacts, the non-verbal actions.

This section has shown that the model can facilitate the characterisation of task-based interaction. The analysis above has shown general characteristics of task-based interaction. It was shown first that the nature of the learning task has an impact on the turn-taking system of interaction; secondly, that task-based interaction shows a tendency toward indexicality and minimalisation, and thirdly, that task-based interactants generally use numerous self-repetitions, clarification requests and confirmation checks.

An important factor in the explication and exploration of task-based processes is the non-verbal element of the model. The analysis above demonstrated that the non-verbal aspect plays an important role in revealing the micro details of task-based interaction. It has been shown that the non-verbal aspects of interaction provide a better look inside the moment-by-moment processes of TBI. The embodied actions of the participants facilitated the interpretation of the interactional phenomenon.

5.6 Summary

In this chapter it has been shown how the proposed the model can enable a holistic analysis of task-based interaction. The analysis has drawn attention to several important points. First, it has shown how the model can reveal the mutual interplay between and synchronisation of the verbal and non-verbal elements of task-based

interaction. Second, the holistic analysis using the proposed model reveals that participants develop unique speech exchange systems that involve a great deal of non-verbal communication to accomplish tasks in the Tabletop environment. It has also been shown that the analysis will reveal that during silences there is embodied action taking place. Participants orient to each other's embodied contribution and build on it.

This chapter has also shown how the proposed model is able to portray the complexity of task-based interaction. Despite the fact that participants use talk, gesture, hand movement, body orientations and the physical environment during their task interaction, the model is able to clarify the complex interrelatedness and interwoven nature of these modalities of interaction.

The chapter has also explored the characteristics of task-based interaction. It was demonstrated how the model could be used to characterise task-based interaction in this study. The analysis revealed how the nature of the task affects the turn-taking system. It has also been shown that task-based interaction can be extremely indexical and minimal. The model can successfully help analysts make sense of the highly indexical episodes of interaction. That is achieved by depicting the non-verbal work that takes place in a moment-by-moment fashion during such indexical encounters. Lastly, the analysis shed light on another feature of task-based interaction: the tendency to generate many instances of self-repetitions, clarification requests and confirmation checks. It was demonstrated that the model can show how such interactional features are actually used in the interaction.

CHAPTER 6: DISCUSSION

6.1 Introduction

In the preceding chapters I have attempted to argue and demonstrate that the holistic model developed in this study will enable us to analyse task-based interaction in great detail.

The aim of this research was to develop a model that would enable a holistic analysis of the micro details of task-based interaction, a goal that has been very difficult to achieve in language studies. In this study it has been achieved by developing a model that comprises various elements: TBLT, multimodality, CA and the Tabletop, and that makes it possible to examine the processes of task-based interaction in much greater detail than has previously been the case. The model was developed and then applied to data collected from second language learners performing a language task in a digital Tabletop environment (section 6.1). Section 6.2 discusses the relationship between the findings of the current study and those of other related studies.

6.1 Applying the model to TBI data

This section summarises the findings of chapter 5, which are used to answer the second research question. The development of the model was not only a theoretical endeavour. The model was also applied to a real TBI context where naturally occurring data were collected. Using the model to analyse the data revealed several important points.

The analysis of the data showed that the participants precisely synchronised verbal and non-verbal resources during task-based interaction. Multimodal analysis indicated that the interplay between the verbal and non-verbal elements of interaction was closely orchestrated by the participants. The discussion in section 5.2 revealed that

the model is able to demonstrate in great detail how participants organise their talk using non-verbal resources. Using the model it became possible to see how the participants constantly oriented to each other's actions and collaboratively ratified them in precise timing. In a moment-by-moment fashion it was possible to observe how they conjointly coordinated verbal and non-verbal resources at the right moments during the task-based interaction. For example, in the same section (5.2), it was shown how, when the participants encountered the problem of identifying the meaning of a word, they employed various resources to solve it: verbal and non-verbal communication and the digital environment. The orchestration and synchronisation of such resources is a complex task. The model revealed this task in detail.

In section 5.3 it was demonstrated that the participants developed unique speech exchange systems to accomplish the task in the digital Tabletop environment. During their task interaction the participants relied heavily on non-verbal resources. As the task required a lot of digital manipulation of artefacts on the surface of the Tabletop, the participants' interaction was sometimes constituted through numerous embodied mutual orientations. Some turns consisted of the movement of objects on the surface, while others involved the maximisation of a digital piece of the puzzle which lead to a next turn by a co-participant.

The same section (5.3) also demonstrated the important role that silence plays in interaction. Because the model relied on video data captured from the surface of the Tabletop and video of the participants performing the task, it was possible to reveal the action that took place during silences. The model revealed that long periods of silence were not treated as sanctionable by the participants. The model also revealed the micro details of the kinds of action taking place during periods of silence. The participants were constantly displaying the focus of their orientation during silent periods, as there

was non-verbal action taking place. The holistic nature of the model allowed us to see in detail what was going on during moments of non-verbalisation. In typical analyses of TBI such silences would be ignored as irrelevant. In a similar fashion, section 5.3.3 showed how the participants sometimes contributed non-verbally to the practicalities of the task. The multimodal analysis of the data revealed that silent contributions to interaction demonstrate the mutual interplay between language and non-verbal communication. The model showed that the non-verbal contributions to the interaction have an impact on the progress of the task. It is interesting to see how participants' non-verbal moves push the task forward towards completion. Participants' use of multimodal resources in relation to task completion is an aspect that has not received the attention it deserves in L2 studies.

The findings of this research also show that the model is able to reveal some of the complexity of task-based interaction. In section 5.4 it was demonstrated that using the model researchers can relate task-related actions to the patterns of interaction. Furthermore, the model allows us to develop a detailed representation of the micro details of task processes, including the precise synchronisation between verbal and non-verbal resources. For instance, the example discussed in section 5.4 showed that what might seem a simple process is actually very complex when examined holistically. The participants were facing the problem of repairing a trouble source in interaction. The multimodal analysis revealed that turn-by-turn they employed different modalities - talk, non-verbal resources, the Tabletop - to resolve this problem. The model is able to reveal this multidimensional dance in great detail. As discussed in the preceding chapters, there is a need to reveal the complexity of TBI in order ultimately to understand how TBLT enhances learning. The aim in this research was to take a step forward in this direction: that is, in developing ways of analysing TBI in detail.

The use of the model enabled the characterisation of task-based interaction. Section 5.5 shed light on how the model can reveal the characteristics of TBI. The focus in section 5.5.1 was on how the nature of the task can influence the patterns of interaction. For example, in this section, the multimodal analysis revealed that the turn-taking system was affected by the nature of the task and the pedagogical focus of the participants. More specifically, in extract 5.9 one can see that there are lengthy turns where one participant is reading the pieces. This is caused by the nature of the task, as they had to read every single piece of the puzzle. Their goal was to make sense of the story by putting the pieces together. This goal orientation influenced how they interacted to work out a solution.

Another aspect of the task-based interaction that took place in this study revealed in section 5.5.1 was the occurrence of lengthy periods of silence. Multimodal analysis revealed that these periods of silence were not empty of action but rather mandated by the nature of the task. That is, the task required the manipulation of the digital surface of the Tabletop. This feature of the task had consequences for the patterns of interaction. It led the participants to spend more time dealing with the digital artefacts on the Tabletop: moving, reorganising, grouping, or connecting them. The model accurately captured the kinds of non-verbal action that were taking place during silences that had an impact on the turn-taking system.

Section 5.5.2 revealed two other features of task-based interaction: indexicality and minimalisation. The analysis showed that TBI is generally indexical and minimal, especially in convergent tasks. Tasks seem to generate locally context-dependent interactions that cannot be understood except with reference to the nature of the task and what the participants are trying to make of it. Part of the reason why TBI is indexical in the Tabletop environment could be the fact that participants do things with their hands

on the table, so part of the action is performed non-verbally. The model enabled an in-depth look at the indexical and minimal nature of TBI by going beyond the text and incorporating the role of non-verbal communication and the use of the immediate environment. The model can help us make sense of minimal and highly indexical interactional encounters in TBI.

The findings of this study also show how the model can give us a better understanding of another feature of task-based interaction, i.e., self-repetitions, clarification requests and confirmation checks. The multimodal analysis of the data (section 5.5.3) showed that TBI is extremely complex and context-bound. Thus, any conclusions about the nature of self-repetitions, clarification requests or confirmation checks in TBI should be drawn with caution. In TBLT research that is based on the Interaction Hypothesis (Doughty and Long, 2003; Pica, 1988) it is usual to find that such features are isolated for quantitative analysis. The multimodal analysis applied in this study indicates that there is a need to examine such features from a multimodal, emic perspective. For example, in extract 5.11 (page 148) an analyst could simply conclude that the repetition of the phrase 'the law' is a confirmation check. However, analysing the extract using the model reveals a different picture. The repetition of the phrase 'the law' could be the result of a problem that the participants are facing: that is, trying to sort out the reference to 'these two', thinking it refers to 'photographs' and 'escaping the law'. The emic evidence for this came from a participant who indicated that it did not make sense.

This section has summarised the main findings presented in chapter 5. It has illustrated the value of applying the model to TBI data. The findings demonstrate how the model can offer deeper insights into the analysis of task-based interaction. The next section will relate the findings of the current study to the relevant literature.

6.2 Locating the findings within the relevant literature

This study has examined task-based interaction from a process-oriented perspective, unlike most studies that have studied TBI from a product-oriented perspective (Ellis, 2003). The focus was on developing a holistic model that could reveal the details of action during the enactment of the task. The model has shown that it is essential to take into account how interactive and intertwined the relationship between language, bodily movement and the configuration of the surrounding environment is (Heath, 1986; Goodwin and Goodwin, 1987). In previous research, the analysis of non-verbal communication such as gesture has taken into consideration the observable behaviour that shapes individuals' interactions: for instance, what they are looking at when they are interacting with others, whether and how they are using their bodies, and their orientation to others (Kendon, 1990). The results of this study support these notions. That is, it has been shown that it is essential for any analysis of TBI to be holistic and to involve the combining of verbal and non-verbal elements.

The findings of the current study can demonstrably inform TBLT research in many ways. The study has shown that interaction in TBLT is much more complex and interesting than people thought. Quantification of phenomena in TBLT research can only capture a thin layer of the reality of TBLT. This research offers a better understanding of the processes that take place during task implementation. Furthermore, the current study highlights an important aspect of TBLT, i.e., the multimodal aspect of interaction. Non-verbal communication in tasks, as shown in the preceding chapters, plays an important role in affecting task implementation and outcomes.

With regard to characterising TBI, the findings of the current study are consistent with those of Seedhouse (2004) who found that there is a reflexive relationship between the nature of the task and the turn-taking system. He also indicated

that task-based interaction shows a tendency toward minimalisation and indexicality. Additionally, he showed that TBI generates numerous self-repetitions, clarification requests and confirmation checks. This study has also shown that silence in TBI is action-laden. The nature of a task can sometimes generate long periods of silence that are loaded with non-verbal task-relevant actions.

In regard to non-verbal communication and interaction, the analysis has shown how talk, non-verbal communication and the physical use of the Tabletop are closely intertwined with the moment-by-moment enactment of the task processes. The Tabletop technology provided dynamic visual cues that were lodged and deployed in the course of the talk-in-interaction. The participants interactively oriented to these cues in a turn-by-turn fashion. It became clear that what happens in this type of task is more than turns of talk. Non-verbal actions and gestures are heavily deployed in this environment as key interactional resources in developing task processes. The wider interactional context, especially the physical environment and participant configuration (Goodwin and Duranti, 1992), played an important role in moving the task forward. As shown throughout the analysis presented in this thesis, the participants used talk, embodied actions and manipulation of the Tabletop surface to work out the problem they were encountering. Seeing all the details of how they went about that became easier using the model proposed in this thesis.

The participants' management of their interaction and the way they constructed their participation framework in the digital Tabletop environment revealed that they relied on gaze, gesture and other semiotic recourses (Goodwin, 1981, 2000, 2003; Goodwin and Goodwin, 2004). The exact details of such mechanisms and their deployment over time have been extremely difficult to pin down. However, the model

developed in this study has shown that it is possible to track and capture in great detail the verbal and non-verbal deployment of such resources.

The findings of this study confirm the findings of earlier studies that examined non-verbal behaviour and repair (e.g., Goodwin, 1981; Goodwin and Goodwin, 1986; Streeck, 1995). Language learners use non-verbal resources to resolve problems in communication and to help in achieving mutual understanding (e.g., Olsher, 2004; Mori and Hayashi, 2006; Caroll, 2008; Mori and Hasegawa, 2009). The proposed model offers more insights into how non-verbal behaviour is deployed to resolve repair, for example. In the case of the digital Tabletop environment it can demonstrate in micro detail how participants jointly accomplish repair resolution by utilising non-verbal resources and the affordances of the digital environment.

Generally speaking, the findings of this research revealed a heavy reliance on non-verbal resources by the participants to solve the task. This could be a result of the nature of the task; however, the analysis shows how talk and bodily gesture elaborate each other in the situated interactional process (Goodwin and Goodwin, 1986; Hayashi, 2003, 2005; Heath, 1986; Hutchins and Palen, 1997; Kendon, 1972, 1980, 1990, 1992; Murphy, 2005; Sidnell, 2005; Schegloff, 1984; Streeck, 1993, 1994, 2003). This study contributes to that body of knowledge by providing a multimodal holistic tool that can reveal the micro-details of the interaction and show how participants employ their bodies and the local environment.

The details and the direction of the task and its outcome can visibly be spelled out by looking at the visual factor. Such graphical artefacts have a significant effect on the way participants and analysts look at the interaction. Goodwin (2000:1505) indicates that ‘participants visibly attend to such graphic fields as crucial to the

organization of the events and action that make up activity reflexively situated within a setting, and which contribute structure to that action.' The holistic model is able to track and reveal the progress and outcome of the task by capturing in great detail the processes of task-in-process as the task unfolds. The inner manifestations of the task progress can be seen and tracked using the model.

From the data analysis it is easy to see that there were noticeable periods of silence during the interaction. These important shades of interaction can only be captured and correctly analysed by using an approach that looks holistically at the task. M. Goodwin (1980: 314) indicates that:

> … participants utilise not only the possibilities of the turn taking system but also the resources provided by their co-present bodies to provide and ratify interpretations of silences, with the effect that silences are neither pauses nor gaps but rather spaces that continue to be occupied with material implicated in the production of the speaker's talk.

The analysis showed that on various occasions participants were performing 'embodied action' in the ongoing task without contributing verbally. Although such contributions might possibly be perceived as silence, in fact these participants were involved physically in the interaction. Their contributions were acknowledged by the other participants in the same task and built upon while moving through the task stages.

Similarly, embodied completion of turns has been studied by other researchers. For example, turns in talk are sometimes brought to completion through embodied action (see Olsher, 2004). In this research it was shown that whole turns were performed and acknowledged non-verbally by participants. These manipulations of semiotic resources had important consequences for the outcome of the task. It was not

just an extraneous embodied action, it was an essential interactional move that lead the task in a certain direction and dictated a particular sequence of events that engendered a particular course of action.

The findings of this study confirm the findings of Kaanta (2010) and Mortensen (2009) who showed that embodiment and material resources play a major role in the emergence of talk and that they constrain it. The material classroom environment plays a role in shaping the social interaction that takes place amongst participants. In the current study it has been shown that the digital Tabletop environment was the locus for a great deal of the embodied action. Lazaraton (2004) has shown that what happens in a classroom environment involves not simply talk by the teacher or the students, but rather the classroom is seen as the 'locus of embodied practice'.

The use of digital Tabletops in the manner described in this thesis might seem time-consuming and to require hard work. However, it provides a much-needed opportunity for researchers to look holistically at tasks in action. Because task processes are fluid and emergent it is difficult to predict a priori how they will unfold, and it is equally difficult to capture the details of the interaction using simple quantification. A closer and more detailed investigation yields a better understanding of the minute details of the interactional processes in TBI. There is a need to spend some time conducting similar research efforts looking specifically at the realities of tasks as they take place, preferably using similar technology. The combination of technologies used in this research offers an excellent foundation for exploring the nuances of interaction that takes place in classrooms.

Finally, this research adds to the body of research that has called for a social shift in studying second language learning (e.g., Firth and Wagner, 1997, 2007;

Schegloff et al., 2002; Wagner, 2004). The study employed CA for the analysis of interaction; therefore the focus was on the local, emic perspective on interaction. The starting point for a close understanding of TBI is the local contingent realities of interaction.

6.3 Summary

In this chapter the findings of the research have been discussed by showing how the results can be used to answer the research questions. The first part of the discussion focused on how the model was applied to the data obtained in this research. The purpose of the second part of the chapter was to locate the results of the study within the relevant literature.

CHAPTER 7: CONCLUSIONS

6.1 Introduction

In this chapter the final conclusions from the research reported in this thesis are presented. The key issues raised by the research questions are discussed and the contributions made by the study are summarised. This is followed by some thoughts on the model and the methodological approach used in this study. The concluding points made in this chapter suggest further insights into how this line of research might be developed.

As described in the preceding chapters, the aim of this study was to develop a model for the analysis of task-based interaction. The reason for doing so was the fact that, as clearly documented in the literature, TBI is very difficult to analyse owing to the dynamic and fluid nature of human interaction. TBI also shows a tendency towards indexicality and minimalisation which makes it resistant to proper analysis. This study has attempted to achieve the goal of analysing TBI by developing a multimodal model that can holistically capture the various aspects of interactional encounters that take place in language tasks.

As shown in chapter 4, the model takes into account the verbal and non-verbal aspects of task-based interaction. This makes the model holistic in its scope and enables it to explore an aspect of L2 interaction that has rarely been touched upon by L2 researchers, i.e., the non-verbal elements of interaction. This is also one of the gaps that the present study clearly helps to fill. As shown in chapter 5, the model can obviously give a clearer view of the details of task-based interaction. It makes the process of analysing TBI possible by capturing a great deal of verbal and non-verbal data and by allowing the synchronisation of different perspectives on the interaction.

The contribution of this study is to provide a better understanding of the reality of TBLT. There is much that goes on during task-based language learning which has not yet been properly analysed. Consequently, understanding the details of TBLT processes should enable L2 researchers to understand how learning in TBLT occurs in real contexts, and thus inform the design and implementation of tasks. The proposed model is a step towards broadening our understanding of TBLT processes.

6.2 Reflections on the model

The model developed in this study is innovative and unique in language learning contexts. First, the model incorporates the digital Tabletop technology as one of its components. The Tabletop is a recent technological development that could shape the future of classroom teaching and learning in the forthcoming few years. This technology allowed us to capture the details of the shared surface where the task was being carried out. By using the Tabletop I was able to track every single move on the surface. The added value of the Tabletop is that it is a digitally interactive horizontal surface that supports face-to-face interaction. Furthermore, the Tabletop captures and tracks manipulations of the surface as the task unfolds.

Second, the model also incorporates the multimodal analysis of interaction. This is a key feature as it touches on the non-verbal elements of L2 learning and teaching, which is an area that has not received the attention it deserves in research. The model portrays how non-verbal elements are linked to the patterns of interaction in a moment-by-moment fashion.

Despite being hard work and time-consuming, the application of the model to TBI data can be fruitful. The process of applying the model to TBI data requires a great deal of time and effort. For example, CA is employed for the analysis of episodes of

interaction; thus, preparing the data for analysis entails transcribing them using CA conventions. This step takes an immense amount of time and effort. However, despite these practical difficulties the model has proven to be effective in providing numerous insights into task-based interaction. It can portray the verbal and non-verbal micro details of TBI. Additionally, it allows the characterisation of TBI processes. Overall, the model will undoubtedly inform the analysis and understanding of language learning and teaching in general.

6.3 Reflections on the CA methodology

In this study Conversation Analysis methods were incorporated into the model to uncover the micro details of participants' task-based interaction. The data collected were analysed using CA, which depends on the emic perspective of the participants (Seedhouse, 2004). Using CA as the theoretical basis gave the model a powerful tool that can portray the details of social interaction in the Tabletop environment. As demonstrated in chapter 5, the model makes possible a highly detailed analysis of TBI. CA is the tool that allows such an in-depth analysis of the data. CA pays attention to the details of interaction which makes it extremely valuable for examining the highly complex TBI. However, conducting research in this manner results in large amounts of data, which means it is time-consuming and laborious to accomplish, especially when one takes into account the multimodal nature of the analysis, which includes gesture, embodied actions and movement on the surface of the Tabletop. This is not to say it is difficult to achieve success. In fact, more research of this sort is necessary to give a clearer picture of the relationship between language learning and students' non-verbal behaviour.

The incorporation of CA in the model resulted in a deeper analysis of the task-based interaction in the Tabletop environment. The advantage of using CA is that it

gives a rich and elaborated description of the interactional phenomenon. However, one does not embark on this type of research with preconceived assumptions about task-based interaction. Researchers who adopt a different methodological paradigm might shed light on different aspects of task-based language learning in the digital Tabletop environment. However, I believe that taking a micro-analytical perspective on task-based interaction in the Tabletop environment enables us to see some aspects of task-based language learning which might not be clearly visible from any other perspective; for instance, aspects such as non-verbal work and embodied actions in the language classroom.

CA methodology does have its limitations: for example, its narrow and micro focus. CA focuses on producing an emic interpretation of data and thus is criticised for ignoring the broader issues of social phenomena. However, in the present study CA is used as one part of a larger model. Insights obtained from CA inform the overall analysis of TBI. As shown in chapter 5, CA is used along with multimodal analysis to examine TBI.

5.3 Implications

This research has attempted to develop a model that will enrich our understanding of task-based interaction and has also demonstrated how the model can be used in practice to analyse TBI. Adopting a CA-inspired approach, I tried to explore how the model could be used to portray the complexity of task-based interaction as it unfolds around a digital Tabletop. This type of technology is new and has rarely been used to research TBI, especially from a CA perspective. It is hoped that the findings of this study will be a valuable addition to the literature of TBI, and that they will contribute to the use of technology in educational settings. The model establishes a new methodological approach to the analysis of task-based interaction. This will help to give

researchers investigating TBLT to a closer look at the different aspects of the interactional phenomena that take place in TBLT.

From a methodological point of view, in the analysis this research has relied heavily on CA approaches to data. CA seems to be an effective tool for analysing task processes (task-in-process) as they unfold. This research thus represents only one way of looking at task-based interaction. It is not intended to overlook the importance of research conducted from an Input-Interaction framework. In fact, the literature on task-based interaction is dominated by studies adopting the Input-Interaction framework. This study can be regarded as a pull in the other direction to create a much-needed balance in this area. More attention is needed in this direction to enrich our understanding of task-based interaction.

The technology used in this research represents a powerful tool in the educational arena. As shown in the analysis of the data of this study, it is clear that we can now have access to the details of TBI while it is taking place. This facility can be used to inform our planning and design of teaching materials in the future. Although task-as-plans do not necessarily translate into tasks-in-process, we can make informed decisions about the holistic nature of TBI. Another consideration is the incorporation of the non-verbal aspect when planning and designing language tasks. As shown in the discussion earlier, the participants in this study relied heavily on non-verbal and embodied means of communication. This non-verbal aspect seems to play an important role in task processes and should be taken into consideration during the design and planning of tasks for the digital Tabletop. More emphasis should be placed on the role of non-verbal communication in the TBLT classroom. The analysis presented in chapter 5 revealed that participants rely on the contribution of non-verbal resources to accomplish the ongoing task.

The findings of this research also have important implications for research methodology in Applied Linguistics. As mentioned above, the analysis conducted in this research revealed the crucial role that non-verbal behaviour can play in task-based studies. Task-based interaction by nature requires interaction among groups of students, and this entails the deployment of gesture and embodied actions that can only be captured by incorporating video data, as shown in the use of the model developed in this research. The use of such embodied action sometimes produces periods of silence while dealing with the task or in cases of repair resolution. Sometimes, the use of non-verbal behaviour produces some silent periods. Such silences are not meaningless. In mainstream SLA research such silent periods might be interpreted as thinking time (Gass, 2004). This research has shown that such silent periods involve the use and deployment of non-verbal resources while engaging in task processes. For instance, in some instances participants would contribute a turn or complete a turn in the interaction non-verbally. They also sometimes repaired interactional troubles using gesture and other non-verbal resources.

The model developed in this study is not limited to language learning settings. It can be useful in all kinds of task-based research. For example, in psychology it could be used to capture and track human behaviour in great detail. The use of the model would result in enormous amounts of fine details about the actions and behaviour that participants demonstrate or are involved in. This will allow researchers to see the multi-layered nature of human interaction, and thus be able to examine it more closely.

6.4 Further research

The study broadens second language interaction research by developing a holistic model that facilitates the fine-grained analysis of task-based interaction. The model is a ‘new’ introduction to the research and analysis of TBI. The combination of

technologies used in the model gives it a unique fingerprint in approaching TBI analysis. More specifically, the use of the Tabletop environment opens the door for new perspectives on second language research. In light of the results of this research, a number of possible directions for future research will be summarised in this section. Thus, it is strongly recommended that more research be conducted using the model to gain a better understanding of the realities of task-based interaction in the second language classroom.

The data collected are immensely rich and complex. It would take a larger effort to pull all the strands and resources of data together into a single picture. It would be extremely useful and insightful if log data could be included in drawing the picture of TBI in this model. 'Log data' refers to the automatic record of every action that participants perform on the surface of the Tabletop. This represents a valuable resource for researchers who might be in a position to enhance their qualitative analysis with quantification.

The use of this technological innovation can inform our understanding of the different aspects of task-based interaction: namely, task-as-workplan and task-in-process. In this environment tasks can be designed and implemented in ways that might reveal how closely the task-as-workplan translates into a task-in-process. It is true that task takers construct the task-in-process (Seedhouse, 2004; 2005; Thorne, 2005); nevertheless, insights from the model might allow us to design language tasks in a way that guarantees the achievement of pedagogical goals.

In this study the model was not used to investigate learning, owing partly to space and time limitations. Besides, the scope of this study was limited to the development of the model and to applying it to some TBI data to sketch generally how it might enable a holistic analysis of TBI. However, an ambitious attempt would be to

try to track learning opportunities in this environment. As mentioned earlier, the Tabletop tracks and records all the details of the interaction that takes place on the surface. It would be valuable to conduct longitudinal studies that employ this facility to capture the genesis and development of learning on the surface. The combination of technologies used in this study formed a multimodal lens that paints a full picture of task-based interaction on and around the surface of the Tabletop. A next step for me is to use the model to investigate learning in TBLT settings.

Research should continue to examine the role that gesture and embodied actions play in second language development. This is an under-researched area in second language learning research. The technology allows the researcher to track and monitor gesture and embodied actions. Specific tasks can be designed to examine how gesture, for example, is intertwined with language use on a moment-by-moment basis. Another strand of research could seek to investigate the link between non-verbal communication and learning in second language classrooms.

Another interesting strand of research would be to examine how the digital Tabletop might inform our understanding of the role of repair in second language learning. Repair/error correction plays an important role in language learning contexts. It would be interesting to see how the model can shed light on the interplay between repair and gesture in second language learning contexts. The current study has only scratched the surface of the work of non-verbal communication in TBI. The holistic nature of the analysis revealed how the model can be used successfully to obtain a holistic view of what happens in task-based interaction.

The model relies on the Tabletop technology to capture the details of TBI. The technology might fit nicely in an interactive classroom and enhance the quality and depth of interaction. Interaction as used here includes embodied interaction, which plays

an immense role in human communication but is often neglected in studies of language education. This type of technology is capable of paving the way for a better understanding of the intricacies of task-based interaction and could potentially yield insights into how to approach TBI over extended periods of time to obtain a longitudinal perspective.

APPENDIX A

Transcription Convention (Atkinson and Heritage, 1984)

[[ ]]	Simultaneous utterances - (beginning [[ ) and (end]])
[ ]	Overlapping utterances - (beginning [ ) and (end])
=	Contiguous utterances
(0.5)	Represents the tenths of a second between utterances
(.)	Represents a micro-pause (1 tenth of a second or less)
:	Sound extension of a word (more colons demonstrate longer stretches)
.	Fall in tone (not necessarily the end of a sentence)
,	Continuing intonation (not necessarily between clauses)
-	An abrupt stop in articulation
?	Rising inflection (not necessarily a question)
__	Underlined words indicate emphasis
↑↓	Rising or falling intonation (after an utterance)
° °	Surrounds talk that is quieter
hhh	Audible aspirations
.hhh	Inhalations
.hh.	Laughter within a word
> <	Surrounds talk that is faster

< > Surrounds talk that is slower

(( )) Analyst's notes 206

((bold)) The bold parts describe non-verbal communication

APPENDIX B

Participant	Gender	Age	School	Mastery of English	Country
1	Female	30-35	ECLS	Advanced	Thailand
2	Female	30-35	ECLS	Advanced	Thailand
3	Male	30-35	ECLS	Advanced	Saudi Arabia
4	Female	25-30	Computer	Advanced	Germany
5	Female	25-30	Computer	Advanced	Germany
6	Male	25-30	Computer	Advanced	Germany
7	Female	30-35	ECLS	Advanced	Egypt
8	Female	30-35	ECLS	Advanced	Saudi Arabia
9	Female	30-35	ECLS	Advanced	Saudi Arabia
10	Male	30-35	SML	Advanced	Saudi Arabia
11	Male	30-35	Engineering	Advanced	Oman
12	Male	30-35	Medicine	Advanced	Saudi Arabia
13	Male	30-35	ECLS	Advanced	Saudi Arabia
14	Male	35-40	Computer	Advanced	Libya
15	Male	30-35	Computer	Advanced	Saudi Arabia
16	Male	30-35	Agriculture	Advanced	Saudi Arabia
17	Male	30-35	Business	Advanced	Saudi Arabia
18	Male	35-40	Computer	Advanced	Libya
19	Male	30-35	ECLS	Advanced	Saudi Arabia
20	Male	35-40	Computer	Advanced	Libya
21	Male	30-35	ELCS	Advanced	Saudi Arabia
22	Male	35-40	ECLS	Advanced	Libya
23	Female	30-35	ECLS	Advanced	Korea

25	Male	35-40	ECLS	Advanced	Libya
26	Male	30-35	Engineering	Advanced	Saudi Arabia
27	Female	30-35	ECLS	Advanced	Saudi Arabia
28	Male	30-35	Architecture	Advanced	Saudi Arabia
29	Male	30-35	Education	Advanced	Saudi Arabia

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