Field dependence/field independence: how do students perform in CALL-based listening activities?

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Field dependence/ field independence: How do students perform in CALL-based listening activities?

by

Mónica Stella Cárdenas-Claros

A thesis submitted to the graduate faculty
in partial fulfillment of the requirements for the degree of

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(Computer Assisted Language Learning)

Program of Study Committee:
Carol Chapelle, Major Professor
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Iowa State University
Ames, Iowa
2005

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This is to certify that the master's thesis of
Mónica Stella Cárdenas-Claros
has met the thesis requirements of Iowa State University

Signatures have been redacted for privacy
To Magangué, my nephew
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This study explored how the cognitive style (CS) of field dependence/independence (FD/I) related to performance in CALL-based listening activities. It also attempted to identify the preferred media tools, help options and on-line patterns of behavior of FD and FI learners. To serve this purpose, the Academic Listening On line website (ALO) (Cardenas-Claros, 2004), which allowed students to choose from different media tools such as video/audio and audio, and it offered help aids such as transcripts and a dictionary that students could use on demand, was created. The listening exercises included in ALO, required students to answer multiple-choice comprehension questions, do matching exercises, use scroll down menus to complete charts and classify information based on the lecture “Insect Communication.” Participants in this study were 20 graduate and undergraduate students enrolled in a listening class offered to international students at Iowa State University. Performance was assessed through a 15-item post-test presented in multiple-choice format that students were asked to complete after working on the exercises introduced in ALO. Preferred help aids, media tools and patterns of on-line behavior were tracked by uploading the website to MyIowaState portal, which allows instructors to set up events that fit the research design.

To classify students as FD or FI learners, a 30-item questionnaire was designed and piloted with 52 international students at Iowa State University. The validity of the questionnaire was investigated by comparing the results obtained after administering the Group of Embedded Figures Test (GEFT) (Witkin, Oltman, & Raskin, 1971) to the results obtained by the FD/I CALL cognitive style questionnaire. A 10-item, face-to-face interview where students were asked to reflect on the way they approached the listening exercises presented in ALO was also conducted. Results of the validation inquiry and reliability analysis suggest that the FD/I CALL cognitive style questionnaire should be revised. Although it is not recommended to use the questionnaire in CALL research without revision, it could be used as a raising awareness tool for the classroom teacher to introduce the topic of learner differences.
Findings that investigated the relationship between FD/I and performance in CALL-based listening activities suggest that there is no relationship between performance in CALL-based listening activities and FD/I as measured by the GEFT or by the CALL cognitive style questionnaire. It was also found that video/audio is the preferred media tool of both FD and FI learners, but FD learners tended to rely slightly more than FI learners on the media tool as the main source of input. FD learners used the transcripts more frequently than FI learners and that FI learners used the Dictionary more frequently. None of these differences were statistically significant. Finally, findings that investigated the patterns of on-line behavior of FD and FI learners, suggest that from the three identified patterns of behavior, no pattern was exclusively associated to FD or FI learners. Findings in this research also support the observation that the GEFT measures "how well" students perform in the test rather than the processes they follow to complete it.
CHAPTER 1. INTRODUCTION

Language teachers and researchers recognize that learners approach language learning differently. Some learners understand and interact easily with new input that is presented out of context. For some others, a lack of context represents a real challenge since most of their choices are based on external clues that help learners understand and interact with new input. This type of consistent difference is studied through cognitive style theory. More specifically, the construct of field dependence/independence (FD/I) intends to explain such differences.

My interest in this research comes from my experience as an EFL instructor in my home country, Colombia. There, I came to appreciate how students approached learning materials presented through the computer differently and how their learning styles highly influenced the choices they made. In investigating learning styles, I came across the term cognitive style and more specifically the terms field dependence and field independence. I became aware of how context could be of great help to some students to better understand the learning materials, and how the same context is useless for some other students. This perception sparked my curiosity and an opportunity to create and pilot an instrument that measured three constructs relevant to CALL: FD/I, Reflectivity/Impulsivity, and the Visual/Auditory preferences, got me into the trail of designing specific-context instruments. As each of the constructs previously explored were investigated on the surface, for the research I am introducing here, I investigated the FD/I construct in depth. FD/I is a very complex yet fascinating topic to investigate and finding the link to CALL is even more captivating. There is a lot that still needs to be investigated and the results presented in this research are a first attempt to explore this issue.

Statement of problem

Addressing and assessing students’ cognitive style in the traditional classroom has been considered a challenge mainly because language instructors work with too many students to tailor instruction to individual students. Using computers in language classrooms seem to offer a new possibility for “individualizing learning for students with different cognitive
styles" (Chapelle & Cárdenas-Claros, 2005: 1). It seems that the resources students may have at hand when working with computers, namely help facilities (subtitles, transcripts, dictionary, feedback, etc.) hold great potential in accommodating students with different cognitive styles. Although these help facilities exist, and a number of studies have investigated the use of help options in CALL from different perspectives, e.g. frequency of use (Liou, 1997 and Grgurovic, 2005), proficiency level (Pujolà, 2002 and Grgurovic, 2005), behavior and performance (Liou, 1997 and Grgurovic, 2005), and researchers in the field are aware of the gains students have if they make use of such help options (Hsu, 1994; Liou, 1997; Chapelle, 2001), it seems that no research has explored them from the perspective of cognitive styles, more specifically from the perspective of FD/I. This leaves a gap which the current study attempts to investigate. Examining help functions in CALL from the perspective of cognitive styles provides more sound understanding of how FD/I can be successfully addressed to find the match between instruction and cognition when using computers for language learning.

To determine the preferred media tools, choices of help options, and patterns of behavior of FD and FI learners, it is helpful to identify student’s cognitive styles. This identification mainly depends on how cognitive styles are defined and assessed. New approaches on assessment suggest that constructs should be measured in specific contexts (Chapelle and Cárdenas-Claros, 2005). Thus, if researchers wish to understand learner differences as they affect strategies learners use in CALL, then the FD/I construct should be measured in the context of CALL. Given the common concern expressed by SLA researchers (Brown, 1987; Chapelle, 1995) who suggest that the Group Embedded Figures Test (Witkin et. al, 1971), one of the most widely used instruments that assesses FD/I, should not be used in SLA research, and the lack of an instrument that measures FD/I in CALL, it is necessary to design such instrument. Creating such instrument is important because it will provide theoretical understanding of how specific styles might best be served by instructional approaches.
Significance of the study

Understanding the role of cognitive styles in CALL might prove as tempting for software designers, CALL researchers and practitioners as it might be for language teachers, given the increasing number of new technologies that are integrated into the language classroom day after day.

The understanding of FD/I in CALL can be used by software designers as the theoretical framework that supports the decisions they are to make, not only based on design features but also on sound pedagogical foundations. For instance, software designers may be able to determine activities that best accommodate students with different cognitive styles, the order in which these should be presented, the quantity of control that should be given to students, the types of feedback that should presented, and the types of help options to be included in their designs.

CALL researchers may not only gain deeper understanding on how people learn languages when using computers, but they can also obtain evidence on the way students with different cognitive styles approach new materials presented through computers, the way they interact with such materials and the role those instructional materials have for language learning. They can also understand how help options use can be better exploited to present learners with opportunities for modified input. Moreover, by approaching language learning from the perspective of cognitive styles, researchers may address more accurately the rapidly increasing range of issues in CALL.

Being aware of the student's cognitive styles in CALL may give educators the most powerful advantage available to analyze, motivate, and assist students in language learning environments. This knowledge can assist language instructors in selecting the type of instructional materials to be used in the classroom; how such materials can be exploited to accommodate for different learners, and the ways in which they should be introduced, presented and assessed in the language classroom.
Purpose of the study

This study introduces and investigates a new instrument designed to assess FD/I in CALL: the FD/I CALL cognitive styles questionnaire. This instrument, a 30-item questionnaire, inquires into students’ preferences when using computers for language learning.

Participants’ self-perceptions, students’ scores in the Group Embedded Figures Test (the most commonly used instrument to assess FD/I) and the FD/I CALL cognitive styles questionnaire scores are used to identify students’ cognitive styles.

The aim of the study is to explore how FD/I relates to performance in CALL-based listening activities. In addition, this study attempts to identify the preferred media tools, help options and patterns of behavior displayed by FD and FI learners. To serve this purpose, a CALL-based listening activity that evolves around an academic lecture was designed. Students have access to this lecture by making use of two types of media tools: audio and video. Moreover, students have access to modified input by making use of two help options: transcripts and dictionary. The media tools and transcripts are presented through buttons that learners can use on the order they want. Word definitions in the dictionary can be assessed through the transcripts.

Organization of the study

The next chapter in this report, chapter 2, presents an overview of the theoretical framework in which the current study is guided. Thus, FD/I is defined and a new way of measuring FD/I in the context of CALL is suggested. Chapter two also contains an overview of multimedia listening and how this should be viewed in the integrationist theory of second language acquisitions and concludes by summarizing some research on help facilities in CALL. Chapter 3 includes a detailed description of the participants, the materials used and the procedures followed along with a description of the analysis performed. In chapter 4, the results of the study are explained; the research questions are answered and the statistical analyses are explicated. Chapter 5 summarizes the results and provides conclusions to the study. Recommendations and suggestions for further research are also provided.
Conclusion

In this chapter I have identified the gap the current research attempts to address by briefly describing the existing literature on FD/I, multimedia listening, help options, and how it links to CALL. I have argued that when using computers in language learning the opportunities for individualized instruction are increased. Furthermore, the cognitive style of FD/I could be addressed more successfully. Along these lines, I have argued that in order to address FD/I in CALL, it should be first defined and then appropriate measures of assessment should be designed. The potential significance of the study has been presented from the perspective of the software designer, the CALL researcher and the language teacher. The recurrent theme is that understanding cognitive style in CALL helps to better serve, guide and address learner needs in CALL.
CHAPTER 2. LITERATURE REVIEW

Exploring how learners with different learning styles perform in CALL-based listening activities requires an understanding of cognitive styles and listening in CALL. In this chapter, I situate the cognitive style of FD/I in CALL research, describe one of the most common instruments used to assess this construct, and summarize research that suggest how FD/I should be measured in CALL. Other aspects discussed in this chapter relevant to the present study are help options in CALL and multimedia listening. Thus, the present review of relevant literature attempts to summarize and focus an immense body of research that intertwines the components mentioned above, both informing and directing the current study.

The cognitive style of field dependence/independence

The cognitive style of FD/I is a trait of an individual characterized by a particular way of thinking, solving problems, and relating to others (Witkin and Goodenough, 1981). According to this approach to cognitive styles, FD learners are portrayed as holistic, uncertain and dependent upon others, and FI learners are seen as "analytic, self-reliant and confident" (Chapelle and Green, 1992: 49). Words commonly associated with FD learners are warm, tactful, affectionate, non-evaluative and accepting of others. In the language learning classroom, this type of learners tends to prefer group activities, role plays and socially oriented activities. In contrast, FI learners are seen as "demanding [...and] (brackets added) inconsiderate, manipulating others as a means of achieving personal ends" (Witkin and Goodenough, 1981: 44). Words commonly used to describe FI learners are cold and distant. In the language learning classroom, these learners tend to prefer working individually, may prefer grammar, and likely enjoy exercises that require them to find specific details.

There are three major aspects identified in the definition of the cognitive styles of FD/I. These are: 1) reliance on internal vs. external referents, 2) cognitive restructuring skills, and 3) interpersonal competencies (Witkin and Goodenough, 1981).

The tendency individuals show toward relying on internal or external referents in the perception of the upright seems to be highly related to the behavior of people in the
interpersonal domain. Thus people with greater ability to disembled, FI people, are less likely to “have recourse to external sources of information when dealing with ambiguous social tasks” (Witkin and Goodenough, 1981: 39).

Witkin (1977) points out that the development of a person’s manner of processing information is highly influenced by the tendency of the individual to rely on external referents or to be self-reliant. As a result, it most likely that a less autonomous person (FD) may rely on context when exposed to tasks that require cognitive- restructuring abilities. It is assumed that a more autonomous person is more likely to go beyond the information given. When new information is evaluated and integrated into already existing information, restructuring takes place. Restructuring relates to the organization that is imposed when information lacks organization or when internal referents are used to arrange information in such a way that can be easily understood and processed by the learner. Skehan (1998) identifies cognitive restructuring abilities as “those which allow a given set of ideas or components to be manipulated and transformed.”

In the Jonassen and Grabowski’s view of FD/I (1993), the authors elaborated on the interpersonal competencies component. In their view, FD learners are more affiliated-oriented; they need friendship and social contexts to express and share with others what they have learned. It is through social interaction that they benefit the most. FI learners seem more internally directed, may be distant in social relationships and tend to have a more impersonal orientation.

Field dependence/independence in CALL

The cognitive style of FD/I in CALL was studied initially as an extension of SLA research that attempted to identify the characteristics of good language learners in the 1970’s (Chapelle and Cárdenas-Claros, 2005). Although little research has specifically investigated the CALL-FD/I relationship, some studies in CALL have interpreted results based on this cognitive style variable. Two major studies that were published nearly 20 years ago have served as the starting point for current research in CALL.

The first of these studies, reported by Abraham (1985), examined the effects of two types of lessons: rule-oriented and example-oriented lessons for the acquisition of participle
formation in English, that is, sentences such as "I am writing a letter," or "She is doing homework." In the rule oriented lessons, Abraham introduced the rules for completing participle formation. The example-oriented set addressed the same grammatical structure but presented it through examples. Sixty-one high-intermediate learners of English attending the Intensive English Program at Iowa State University participated in this study. The students were exposed to two and a half weeks of instruction in which they practiced grammar-based exercises through computers. The GEFT was used to classify students as FD or FI learners. Findings showed a significant interaction between FD/I and lesson type preference. That is, FI learners performed better when working with lessons that required them to use an inductive approach (rule-oriented lessons) and FD learners with lessons that required them to use a deductive approach (example-oriented lessons). Abraham noted that the findings that field dependent students perform better with example-oriented lessons suggest a useful alternative to the deductive approach to teaching grammar, used at the time of the research. The study provided "insights into how students along one continuum of individual differences internalize knowledge about one grammatical item in the second language" (Abraham, 1985: 700).

As for the second study, Chapelle & Jamieson (1986) reported the findings of a research study in which the effectiveness of CALL in the acquisition of English as a second language was examined in 48 Arabic and Spanish speaking students. These participants were enrolled in an English intensive program at a major American university. In this study, PLATO courseware, "primarily a drill and practice curriculum of lessons in three skills areas: grammar, reading, and listening" (p.30) was used. Results suggested that FI and motivational intensity were significantly related to the time spent by students using CALL and their attitude towards computers. The GEFT was used to classify students as FD or FI. The authors found that FI learners "tended not to like the use of CALL lessons on PLATO" (p. 40) given the fixed structure and the path of learning that had been previously designed for them. In contrast to FI learners, FD learners spent more time working with the courseware and showed significant preference for using it. The findings in this study highlight the need for the creation of instructional materials that can accommodate learners that exhibit different types of learning behavior and hence different cognitive styles.
Chapelle and Cárdenas-Claros (2005) suggest that while teachers in the traditional classroom may encounter limitations in offering individualized attention to learners, CALL may provide a mechanism for offering this type of attention. For instance, they argued that teachers in traditional classrooms may face difficulties integrating both the rule-oriented and the example-oriented formats due to the constraint of class size on offering individual attention to students. However, both formats may be more conveniently offered by computers, as individual students can be directed to select the type of format that best addresses their cognitive styles.

Raschio (1990) investigated students' performance of learners of Spanish, learning the direct and indirect object. He examined 62 students that were randomly assigned to the classroom group and to the computer group. Findings for this study suggested that FD learners preferred an inductive approach to learning grammar and FI learners learned better using a deductive approach.

Liu and Reid (1995) investigated the learning strategies used by FD and FI learners. They also investigated the type of media, tools and learning aids most preferred by the different learning styles groups. They used 63 college students and the GEFT was used to assess FD/I. They classified students as FD, FI and FM (field mixed). They found that different learning styles groups employed different strategies in accomplishing the same task. In addition, they found that FD learners used various features of the software significantly more often than FM and FI students. Field-Independent students tended to “jump freely from one point to another using the index tool, whereas Field-Dependent students tended to follow the sequence from the beginning to the end” (Chen & Macredie, 2002).

In a more recent study that examined FD/I in Computer hypertext environments, Lin & Davidson-Shivers (1996) reported similar results to the ones presented by Chapelle and Jamieson (1985) in the sense that there was a direct relationship between task type preference and FD/I. However this 1996 study contradicted the results presented by Abraham, in which performance did not relate to FD/I. Specifically, the study examined the effects of linking structure type and FD and FI on recall of verbal information. It also investigated participants' attitudes toward instructional materials. The results of the study indicated that students with higher scores on the Group GEFT, that is, FI learners, outperformed students with lower
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scores on the GEFT on the performance post-test. Students tended to like hierarchical linking structures and hierarchical-associative linking structures more than linear structures, and those who were more field independent had more positive attitudes toward the tasks they were asked to perform. In addition, results suggest that FI learners would have “more positive attitudes when using less structured instruction, while students who are more field dependent would prefer more structured instruction” (p. 326).

The findings of these studies together suggest as summarized in Table 2.1 the potential for further research that questions the connection between CALL and FD/I, an endeavor the current study attempts to explore.

A measure of field dependence/independence

Assessing FI/D is not an easy task, and the creation of a reliable instrument that measures this construct may be a long-term goal in CALL research. Although it is not the only method used for assessing FD/I in CALL, the GEFT is the most commonly used instrument to assess FD/I. The Group Embedded Figures Test (Witkin et al., 1971), a test created based on laboratory studies, measures FD by asking students to locate and trace a simple figure embedded into a more complex one.

Although many researchers have used the GEFT in both SLA research (Chapelle and Jamieson, 1986; Jamieson & Chapelle, 1987; Chapelle, 1988; Jamieson, 1992; Chapelle & Green, 1992; Violand-Sanchez, 1995; Skehan, 1998) and in computer assisted instruction, (Liu & Reed, 1994; Liu & Reed, 1995; Meng & Patty, 1991; Lin & Davidson-Shivers, 1996), concerns are regularly expressed about the validity of the use of the GEFT in second language research. These concerns originate from two sources. One of them has to do with the nature of the tasks learners are asked to do in the GEFT (find and trace a figure that it is embedded into a more complex one). Given the complex definition of FD/I definition in which three aspects intertwine (reliance on internal vs. external referents, cognitive restructuring skills and interpersonal competencies), researchers have pointed out that the GEFT assesses only one aspect of the three-part definition. Chapelle and Green (1992: 51) noted that "It is apparent that the EFT measures only the restructuring ability component." Moreover, “the aspect of the construct measured resembles more an ability than a style.”
Brown (1987) also points to this aspect and notes that the GEFT fails in assessing how individuals work, because people are scored on the number of correct responses they supply. Thus, if they get many correct responses, they are classified as having an independent style; however "a low score does not necessarily imply relatively high dependence" (p. 87). In later work, Chapelle (1995) emphasizes that an instrument that measures learning styles should consist of items or tasks that assesses "how individuals work, not how well they work" (p. 167).

The second concern, as expressed by Chapelle and Cárdenas-Claros (2005), stems from recent perspectives in measurement, in which researchers are more interested in assessing constructs in the specific context of interest. This emphasis on context further establishes a real need for a new measure of FD/I that is directly relevant to CALL contexts.

**New measures of field dependence/independence in CALL**

As Chapelle (1995) points out, given the complex definition of FD/I in which three components intertwine, a measure of cognitive styles should ideally reflect the procedure learners follow when getting a task accomplished (how) rather than how well they perform (what they learn). Questionnaires and on-line assessments obtained through tracking systems are two of the suggested measures to assess this construct.

When designing questionnaires, Chapelle (1995) suggests three characteristics a measure of FD/I should comprise:

1. A test for which there are no correct or incorrect responses, but only different responses.
2. It should also contain items or tasks that are interpretable with reference to the language classroom.
3. A measure of FD/I style for L2 acquisition should be a positive, consciousness raising experience for learners to take and interpret (Chapelle, 1995: 167).

Providing items that are not labeled as correct or incorrect could help make learners aware that there are not good or bad styles, just different ways to approach and interact with a task or with the tools provided by the computer. Including items that are interpretable with reference to the language classroom offers the questionnaire-takers a context in which they can reflect on their experience. Students may experience confusion and disappointment when asked to complete a test that requires them to do certain tasks that they cannot associate with
tasks they normally do in the language classroom. Moreover, the questionnaire can be used as a positive, consciousness-raising tool that learners can easily take and interpret. Because the tasks are interpretable with reference to the tasks developed in the classroom, teachers can use the results and ask students to reflect on the way they learn and the strategies that may work better for them.

On-line assessment of behavior, on the other hand, should ideally provide a second approach to assess FD/I. Jamieson and Chapelle (1987) noted that through “working style data” inferences can be drawn from the interpretation of the consistent behavior displayed by L2 learners as they work with L2 tasks when using computers. Collentine (2004: 47) suggests that process-oriented research “analyzes how learners acquire knowledge while he reacts to the learning conditions.” This type of research may offer an alternative to measure FD/I in CALL since what matters is “how” students learn, not “how well” or “what” they learn (Witkin and Goodenough, 1981; Brown, 1987; Chapelle, 1995). In this respect, Hegelheimer and Chapelle (2000) suggest that the use of recorded data on number of clicks, number of help aids used, and preferred media tools, for example, may provide insights on the patterns students follow. Interpretations of these data can be used as the “basis to the design of instructional materials that can accommodate learners with different cognitive styles” (Chapelle and Cárdenas-Claros, 2005: 12).

The new problem posited for CALL is two fold. As Chapelle (2003) reminds us, researchers need to interpret data accurately “when inferences are being attempted in research on learners’ use of CALL and to theorize such extensions beyond the description of the data in such a way that they can be understood and justified” (p. 112). Moreover, in the particular case of research in FD/I in CALL, interpretation of results depends on the definition of FD/I and the assessment tool used. As has been discussed, the definition of FD/I in CALL, and, most importantly, the creation of a questionnaire that measures this construct in the specific context of CALL, is the main goal of this research.
Listening in second language instruction

One of the goals of current study is to explore how FD/I relates to performance on a CALL-based listening activity. Thus, the second area of concern is listening, more specifically multimedia listening. An understanding of several characteristics of multimedia listening along with the role of academic lectures is necessary to establish the framework for research in this area. In addition, studies in computer assisted language listening comprehension, a concept rather new in the ample framework of listening, inform and guide the present study.

Brett (1997) states that “listening is a key language skill, it has a vital role in the language acquisition process” (p. 39). Compared to other language skills, research on listening suggests that on average people can expect to listen “twice as much as we speak, four times more than what we read and five times more than we usually write” (Morley, 2001). These findings are in line with the increasing number of studies in SLA reporting the significant role of listening in communication and in language learning (Dunkel, 1991; Anderson and Lynch, 1988).

As the focus of language teaching and learning has moved from teacher-centered approaches to more learner-centered approaches, the focus of listening has also changed. In the late 70s this skill was labeled as a “passive skill” in which no major recognition to the internal and cognitive processes was given. Nowadays, listening is recognized as an active receptive skill (Anderson and Lynch, 1988) in which the hearer activates previous knowledge to integrate new knowledge.

Academic listening

Academic listening has been recognized as an important area of second language listening instruction and research (Rost, 2002). This type of listening is built upon the basis of transactional listening, in which language is message-oriented and major emphasis is given to the content and “conveying factual or prepositional information” (Morley, 2002: 73).

The main genre used in academic listening is the lecture, and most second language
learners have been exposed to this genre in academic settings in their L1. Berlo (1960, cited in Rost, 2002) suggests that the prime purpose of communication is generally “to influence someone with intent” (p. 163), through lectures this intention may be interpreted as raising awareness on a topic informing about it and to some extent influencing the audience attitudes towards the ideas discussed.

Flowerdew (1994) recognizes this type of listening has unique characteristics such as its non-interactional nature, long stretches of speech, and use of specialized vocabulary. These factors constitute a major challenge for L2 learners. Smidt and Hegelheimer (2004), suggest that since academic listening seems more demanding than other types of listening, using lectures in video format may contribute to understanding of the content. Moreover, it has been suggested that the audio-visual nature of the academic lecture may be beneficial in building pragmatic knowledge, developing bottom-up processing ability, developing higher levels of comprehension skills and helping to activate schemata (Flowerdew, 1994).

Multimedia listening

The computer has been perceived as a useful tool in the teaching of listening (Brett 1995 and Hoven, 1999) for the last 20 years. Much research has been done in this field, but at the same time, more research is needed to cover all the perspectives from which multimedia listening can be examined. In 1995, Brett provided a list of advantages of using multimedia listening over traditional listening. Among the advantages, he pointed to the combination of media, quantity of content, computer power, degree of learner control, and motivation.

Brett (1995) defined combination of media as the integration of various media tools (audio/video) that can be achieved in a multimedia academic listening task in a single interface. In tools traditionally used for language learning, “audio and video materials supported by text, do not contain so much data” (p. 83). Brett (1995) also suggested that the quantity of data available promotes the design of a wider range of activities that can be tailored to accommodate students’ preferences, needs, level of proficiency and learning styles.
Brett (1995) justified computer power through recognition of the investments most countries have been adopting in their government policies on technology. These investments are shown in the rapidly growing number of users with internet connections and public internet facilities all over the world. Moreover he pointed to the benefits of immediate feedback, learner control and decision-making, which in his view, cannot be matched to those of the traditional tools in language teaching. Brett also suggested that the extended use of the computer not only to deliver sound but also to include video transformed the computer role’s from provider of mechanical patterns into a provider of real information that users can manipulate. Since recent CALL applications are no longer based on text and graphics, students are presented with new learning environments that expose them to new learning experiences.

As for motivation, research has suggested that the introduction of computers for language learning has been a powerful-motivational driver (Brett, 1995). The exposure to a variety of sensory experiences allows learners to get involved in the learning situation more easily when compared to the traditional tools used for listening.

Along with the advantages that arise, some limitations may be also found in multimedia listening. Most of the disadvantages at a technical level reported by Brett (1995) have been overcome due to the rapidly and changing technological era in which we are immersed. To mention some, the quality of images and sound in digital video resemble the quality of TV or radio broadcast presentations. A reformulation of the interaction concepts has led to a better understanding of how the computer and the user interact and how these exchanges may benefit language learning (Chapelle, 1998). The remaining problem lays in the danger of “providing too many options and too wide a choice without preparing learners to make such choices” (Brett, 1995:84). Although more research has been devoted to investigate autonomy in SLA this is a matter that deserves to be further investigated.

Studies on multimedia listening

It seems that one of the main research agendas in listening in CALL has been to understanding of CALL for listening can help learners, and the interactionist theory has been helpful in gaining such understanding. This theory considers interaction to be a central factor
since it promotes negotiation of meaning (Long, 1996; Pica 1994). Input is viewed as an important factor for interaction and as central for language acquisition, but only if it is noticed or apperceived. In other words, not all of what learners listen to positively contributes to language learning (Ellis, 1994).

In listening, the input is of particular importance since it may serve as the basis for acquisition in other language skills (Brett, 1997; Dunkel, 1991; Hoven, 1994; Smidt and Hegelheimer, 2004). An instance of this is a study reported by Hsu (1994) which investigated modified input and how it affected listening comprehension. She found that on the one hand, participants made input comprehensible by using the tools for interactional modification, and on the other hand, that the text reinforcement type modification was effective for beginning ESL learners in listening. Consequently, she concluded that interaction indeed promoted comprehension and perhaps to some extent contributed to language acquisition.

Other studies have investigated learners’ attitudes toward multimedia and offered comparisons between listening materials presented through multimedia or through traditional media. Further instances of this are reported by Brett (1996, 2000). In investigating learners’ attitudes towards multimedia, Brett (1996) surveyed 107 undergraduate EFL learners enrolled at a British university. The students worked with the software English for Business for 45 minutes. This multimedia program was intended to help learners improve their listening skills. Brett (1996) reported that 80% of the students believed that through the multimedia program they improved their listening ability. Consequently, the multimedia program was seen as a beneficial tool for language learning. When identifying students’ preferences toward books, audio, video and multimedia, Brett found that learners greatly appreciated multimedia materials.

A follow-up study investigating the integration of multimedia into a self-study curriculum (Brett 2000) reported similar results. In this study, the data of 64 undergraduate learners who worked with the software English for Business during an 8-week period revealed that more than half of the participants reported having improved their listening skills. A major finding for this study also indicated that students’ attitudes towards the software were less positive towards the end of the semester. This finding resulted from a
comparison of students initial responses to a questionnaire on attitudes towards multimedia given at the beginning of the semester and at the end of it.

Additionally, Brett (1997) investigated learner performance with forty-three advanced EFL undergraduate students of business. These learners were exposed to a variety of input delivered through different media: audio tape, video tape, and CDROM. While Input delivered through tapes and video was assessed by paper-based tests, input presented in multimedia format was assessed using a test presented by the computer. Finally, students were surveyed on their preferred media of input delivery. Results of this study show that students scored better on 4, of a total of 6 comprehension and recall tests that were delivered in multimedia format. Results of the questionnaire suggest that students found the combination of multimedia features (video, audio and test) beneficial for language learning.

Help options

Since the third major area of this study deals with help facilities in CALL, several relevant studies that investigated help facilities inform the current study.

The conceptualization of help facilities in the current study follows suggestions by Pujolà (2002). In his view, dictionaries, cultural notes, transcripts, subtitles, replaying and rewinding buttons and feedback are considered assistance facilities. These are defined as tools that help learners understand learning materials more easily when learners use them.

Studies on help options in multimedia listening

A number of studies have investigated preferred help facilities in multimedia contexts. (Liou 1997; Pujolà, 2002; Grgurovic, 2005). Liou (1997), for instance, examined how 20 college students enrolled at a Taiwanese University interacted with eight on-line help facilities: English and Chinese script, video control functions (pause and rewind), and replay of oral input. Based on their listening ability, participants were classified into two groups: the effective group and the ineffective group. Findings suggest that the ineffective group requested twice as much help than the effective group. This group also used the replay oral input more frequently than the English and Chinese script. As for the effective group, it was found that participants in this group mostly used the English script, followed by the reply
function and then by the Chinese script. In this study, the transcript (English and Chinese) was the help function most frequently used, but the frequency of help use did not correlate with performance on listening post-tests.

Pujolà (2002) examined the frequency of use of help facilities and the patterns of use exhibited by the participants. This study used 7 help functions (dictionary, cultural notes, transcripts, subtitles, video controls, an exert module and feedback) in the web-based multimedia program (imPRESSiones). The 22 beginner-level EFL participants in this study were divided into four groups (higher, average, lower and poorer decoders). Pujolà suggested that since participants in each group behaved in “varied idiosyncratic ways” (p. 253), it was difficult to draw conclusions that would apply to all the participants in each group. One of the reasons was that participants in groups that exhibited lower levels of comprehension never used the help facilities. Pujolà thus found no correlation between the use of help and the participant’s linguistic level.

A more recent study that examined the use of textual help in multimedia was that of Grgurovic (2005). She investigated the behavior and performance in a CALL multimedia listening activity that offered a video and two textual options (transcripts and subtitles). The participants were 18 ESL learners enrolled in an academic listening class at Iowa State University. These students were divided into two proficiency groups (lower and higher). The results of this study showed that “participants varied in their use of help options, in terms of help, number of page openings and number of instances of useful interaction” (p. 6). In addition, differences between the two proficiency groups were found in performance during and after the activity. Students in the higher proficiency group exhibited significant comprehension of the learning materials. Moreover, they spent more time interacting with the subtitles than students in the lower proficiency group.

The studies on help use summarized above and presented in Table 2.2. have examined help use from the perspective of frequency of use (Liou, 1997 and Grgurovic, 2005), proficiency level (Pujolà, 2002 and Grgurovic, 2005) and behavior and performance (Liou, 1997 and Grgurovic, 2005), but none of them have examined help use from the perspective of learners characteristics, more specifically, from the perspective of the cognitive style of FD/I in CALL. This leaves a gap which the current research attempts to explore.
<table>
<thead>
<tr>
<th>Researchers</th>
<th>No. of participants</th>
<th>Type of help options and groups</th>
<th>Findings</th>
</tr>
</thead>
</table>
| Liou, 1997         | 20 college students | English and Chinese script, video control functions, replay of oral input. Students were classified as the effective group and the ineffective group. | Ineffective group requested help options twice as much as the effective group.  
Ineffective group used more frequently the replay oral input.  
Effective group reply function.  
Use of help did not correlate to performance on listening post-tests. |
| Pujola, 2002       | 22 beginner level EFL participants. | *Frequency of use of help  
*Facilities and patterns of use exhibited by participants  
Four groups: Higher, average, lower and poor decoders. | No relationship between the proficiency level and the use of help options. |
| Grgurovic, 2005    | 18 ESL learners     | *Behaviour and performance of students in a listening activity that offered a video and two textual options (transcripts and Subtitles).  
*Two proficiency groups (lower and higher) | *Students varied in the use of help options.  
*Students in the higher proficiency group exhibited significant comprehension of the learning materials  
*Students in the higher proficiency group spent more time interacting with the subtitles than students in the lower proficiency groups. |
As exposed throughout this chapter, a wealth of literature on FD/I, multimedia listening and help facilities in CALL exist. However there has been a lack of research that explores how the aforementioned elements interact simultaneously, a gap the present study hopes to address. Selected articles on FD/I (Witkin, 1977; Witkin and Goodenough, 1981; Brown, 1987; Chapelle, 1995; Chapelle & Green, 1992; Jamieson, 1992 Atkinson, 2001), help facilities (Pujolà, 2002; Liou, 1997; Grgurovic, 2005), multimedia listening (Brett, 1995, 1997, and 2000; Hoven, 2001) have been instrumental for guiding the current study.

Research questions

This study attempts to shed light on these issues by introducing an instrument that measures FD/I in CALL. Specifically, the study wishes to add understanding on how FD/I relates to performance in CALL-based listening activities by examining a specific CALL-based listening activity that was created for the study. In addition, this study attempts to identify the preferred media tools, help options, and patterns of behavior of FD and FI learners. In order to investigate the new instrument designed to assess FD/I in CALL, performance in CALL based listening activities, preferred media tools, help options and patterns of behavior of FD and FI learners, the following research questions are posited for the current study:

1. What evidence indicates the reliability and construct validity of the FD/I-CALL based learning style questionnaire?
2. How does FD/I relate to performance in CALL-based listening activities?
3. What help aids and media tools that "ALO" web site has, are the most preferred by students in each cognitive style?
4. Are the steps that students follow to achieve a listening task different? If so, what are the patterns each group follows?
CHAPTER 3. METHODOLOGY

The methods in this study consisted of two phases. During the first phase, the FD/I CALL cognitive style questionnaire was piloted and revised. During the second phase, students' performance in a CALL-based listening activity was determined. In this phase students preferred media tools and help options along with some patterns of behavior followed by students were identified. In this chapter the materials, participants and procedures used to carry out this study are outlined. The chapter will begin by describing the participants and providing a detailed account of the materials. The next section will enumerate and explain the procedure used to collect data. Finally, the chapter will conclude by explaining the data analysis approach adopted to answer each of the research questions posited for the current study.

Participants

Two groups of participants were used in this study. The participants in group A contributed to the validation of the FD/I-CALL-based learning styles questionnaire. This group was made up of 52 adult ESL learners, mostly of Asian origin from a variety of language backgrounds representing 12 countries (Indonesia, South Korea, Taiwan, China, Malaysia, Japan, Hong Kong, and Korea). A smaller number of participants came from Spanish or Turkish backgrounds (Ecuador, Mexico, Belgium, Jordan, and Turkey). Sixteen of the participants were female and thirty-six were male as shown in Table 3.1. The amount of time spent in the United States ranged from 3 months to three years.

All the participants were enrolled in one of the sections of either English 101B or English 101C offered at Iowa State University. English 101B and 101C are English courses given to undergraduate and graduate international students who need to strengthen their ability to write for academic contexts. Placement in these classes is determined by the results obtained after taking the English Placement Test. This test is administered by ISU at the beginning of each academic year.
Table 3.1. Participants profile in group A.

<table>
<thead>
<tr>
<th>Subject #</th>
<th>Nationality</th>
<th>Sex</th>
<th>Subject #</th>
<th>Nationality</th>
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</tr>
</tbody>
</table>

Participants in group B were 24 ESL learners enrolled in one of the sections of English 099L at ISU. English 099L is a listening class offered to both undergraduate and graduate students whose score in the listening section of the English placement test was low. This test is administered to all international students upon arrival to the university. Seventeen of the participants were male and 9 female. The amount of time spent in the United States ranged from three months to sixteen months. Students represented six nationalities (China, Japan, Korea, Argentina, Mexico, and Uruguay). Students in this group were mostly graduate students pursuing different programs as illustrated in Table 3.2.
Table 3.2. Participant's profile in group B.

<table>
<thead>
<tr>
<th>Subject #</th>
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<td>S. Korean</td>
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<td>Plant pathology</td>
</tr>
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</table>

Materials

The materials used in this study can be divided into three categories: 1) FD/I assessment 2) Learning tasks, and 3) Assessment of behavior instruments. The FD/I assessment materials consisted of the Group Embedded Figures Test (GEFT) and the FD/I CALL cognitive style questionnaire. The learning tasks included the Academic Listening Online website with two components, On stage and Get ready and a 15-item post-test. The assessment of behavior's instruments included MyIowaState portal and a 10-item face-to-face interview.
FD/I assessment materials

FD/I CALL cognitive style questionnaire

The FD/I CALL cognitive style questionnaire (Appendix A) is a 30-item multiple-choice questionnaire designed and validated for the current study. It initially consisted of 42 questions divided into six sections: General, Listening, Reading, Writing, Vocabulary, and Grammar (See Appendix B). To design this questionnaire, the guidelines Chapelle (1995) suggested for a measure of FD/I were taken into account. Therefore, in this questionnaire there are no right or wrong responses, just different responses; each question can be interpreted with reference to the language classroom; and the results in the questionnaire can be used as a positive and consciousness-raising tool that learners can take and interpret (see page 10 for a detailed discussion).

The questionnaire is described using the framework for task characteristics proposed by Bachman and Palmer (1996) as follows:

**Questionnaire constructs.** This questionnaire measures FD/I in CALL. FD learners are holistic, dependent upon others and a highly influenced by social undercurrents. Words that are commonly associated with this type of learner are warm, affectionate, and tactful. In contrast, FI learners are seen as more analytic, individualistic and distant in relationships. These learners are more frequently associated with adjectives such as individualistic, philosophical, and impersonal.

To design this questionnaire, the three aspects of the FD/I definition were taken into account as shown in Table 3.3. Aspect No.1 refers to the reliance on internal versus external referents. In CALL, these external referents are the help options provided in different types of software. Aspect No. 2 refers to cognitive restructuring skills: In CALL as in any other learning environment, restructuring takes place when new information is evaluated and integrated into already existing information. Aspect No. 3, interpersonal competence is measured by students’ preference to work individually making use of the computer as the primary source of information, or by their preference for peer interaction even when using computers for language learning.
Table 3.3 shows the questionnaire items displayed by section, and by aspect. It is important to note that the sections in the questionnaire include a different number of items that measure each of the aspects. For instance, in sections such as Writing, Reading, and Grammar, there is a higher number of items that measure the cognitive restructuring skills, but sections such as General, Vocabulary, and Listening include a higher number of items that measure the reliance on external versus internal referents. This difference in the number of items is mainly determined by the language skill (reading, writing, etc.) involved when working with computers.

**Table 3.3. Questionnaire items classified by the aspects of the FD/I definition.**

<table>
<thead>
<tr>
<th>Question</th>
<th>Aspect 1</th>
<th>Aspect 2</th>
<th>Aspect 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
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<td>3</td>
<td>X</td>
<td></td>
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<td>X</td>
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<tr>
<td>5</td>
<td>X</td>
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<td>6</td>
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<tr>
<td>7</td>
<td>X</td>
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<td></td>
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<thead>
<tr>
<th>Question</th>
<th>Aspect 1</th>
<th>Aspect 2</th>
<th>Aspect 3</th>
</tr>
</thead>
<tbody>
<tr>
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<td>3</td>
<td>X</td>
<td></td>
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<td>X</td>
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<tr>
<td>6</td>
<td>X</td>
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<th>Aspect 2</th>
<th>Aspect 3</th>
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<tbody>
<tr>
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<td>X</td>
<td></td>
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<tr>
<td>2</td>
<td>X</td>
<td></td>
<td></td>
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<tr>
<td>3</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>X</td>
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<td></td>
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<td>6</td>
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<tr>
<td>7</td>
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<table>
<thead>
<tr>
<th>Question</th>
<th>Aspect 1</th>
<th>Aspect 2</th>
<th>Aspect 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
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<td>3</td>
<td>X</td>
<td></td>
<td></td>
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<tr>
<td>4</td>
<td>X</td>
<td></td>
<td></td>
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<td>X</td>
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<tr>
<td>7</td>
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</tbody>
</table>

* Aspects measured by FD/I

1. Reliance on external versus internal factors
2. Cognitive restructuring skills
3. Interpersonal competencies
**Questionnaire structure.** The questionnaire is made up of 30 questions grouped into six sections: Listening & Speaking, Reading, Writing, Vocabulary, and Grammar. Each section is titled so that respondents have initial orientation and that helps them to activate various content schemata (Dörnyei, 2003). For each section respondents are asked to complete the statements by choosing one of the two options provided for each one.

**Questionnaire scoring method.** There are no right or wrong answers in this inventory. Instead, the options in each statement are designed to indicate the preference and behavior of a person with a specific learning style. Thus, for the example illustrated in question No. 1, if the respondent chooses “a”, his/her response is classified in the FI learner category, whereas if he/she chooses “b” his response should fit into the FD category.

**Question No.1**

1. Using computers to learn a language seems more attractive if
   a. you decide on the type of exercises you want to work on.
   b. the computer guides you and suggests what exercises to do.

Respondents that choose “b” are identified as FD learners and are assigned a score of one (1). Respondents that mark “a” would be considered FI learners and are assigned a score of zero (0). Then, individual items are added up. The score reports are presented on a continuum that ranges from zero (0) to thirty (30) in which zero represents the FI end of the continuum and thirty represents the FD end as illustrated in Figure 3.1. Thus, if a learner’s total score is 9, it should be interpreted that his/her learning style is somewhat inclined toward the FI end of the continuum.

**Figure 3.1. Field Dependence/Independence continuum.**

```
    |   |   |
FI |   | FD|
0  | 9 | 30|
```

Characteristics of the input. The questionnaire uses a visual channel to present input. The length of each question is limited to a sentence, and the type of input uses items to elicit a selected response.

Characteristics of the expected response. The responses given by the questionnaire takers use the visual channel. The questionnaire takers are asked to choose between the two choices given for each question. The response they choose is selected, and there is no time limit for completing the questionnaire; however, it is expected that questionnaire-takers complete the questionnaire in a period of time ranging from 20-45 minutes.

Relationship between input and response. The questionnaire takers will process a limited amount of information, usually two sentences per question.

Group Embedded Figures Test (GEFT)

The GEFT (Witkin, Oltman, Raskin, and Karp, 1971) is a perceptual test in which the subject's task on each trial is to locate and trace a previously seen simple figure that is embedded within a larger complex figure. The test consists of 25 figures, distributed into three sections: The first section contains seven “very simple items and is primarily for practice” (Witkin, Oltman, Raskin, Karp, 1971: 26). Results obtained in this section do not count towards the final score. The second and third sections, each contain nine increasingly difficult and challenging items. The test is administered only in a paper-and-pencil version and it requires 20 minutes for test-takers to complete.

Each participant's score in the GEFT is obtained by adding the total number of correctly traced simple forms in the second and third sections. In the current study, participants whose score range from 0-14.5 are classified as FD learners and participants whose scores range from 14.5-18 are classified as FI learners (14.5 is the median GEFT score of the subjects).

Tasks component materials

Academic Listening Online (ALO) website

One of the main objectives in English 099L is to help learners develop strategies for
listening to academic lectures. This objective is clearly addressed in ALO, serving in this way, as a complement to the class.

The web site consists of eight sections: In the **Homepage**, a general description of the site along with course objectives are provided as shown in Figure 3.2.

*Figure 3.2. Screenshot of ALO -Homepage-*

The course introduction is made up of the following sub sections: About this site, navigations, technical requirements and authors. In about this site, students are informed about what they will find in the site, the approach used, how they will learn and what will be required of them to benefit from the website. In the navigations sections there are two pages. The first page provides specific directions on how to use the website and the type of links used in ALO. The second page provides directions on the different media tools and help options used in the website. In the technical requirements page, students are directed to different links where they can download some plug-ins needed to display more clearly some of the videos and audio files. Lastly, the Authors page tells about the website designers and gives their contact information (see Figure 3.3 for a sample screenshot of ALO).
What will I learn in this unit?

This course aims to develop your skills in listening, speaking, reading, and writing. By the end of the course, you will be able to:

- Understand and interpret spoken language in different contexts.
- Engage in effective oral communication.
- Read and comprehend a range of written materials.
- Write clearly and effectively in English.

The course is designed to help you develop these skills through a combination of interactive activities and practical exercises.

What will I accomplish?

- You will become more aware of the strategies you use when attending an academic lecture.
- You will develop skills in listening comprehension.
- You will learn strategies to enhance your performance and achieve better results.

How will I learn?

The course materials include a variety of resources such as audio recordings, video clips, and interactive activities. You will also have access to feedback and support from your instructor.

What will be required of me?

The course requires you to complete a number of activities and assignments. These include:

- Preparing for class by reviewing the material.
- Participating in group discussions.
- Completing written assignments.
- Taking quizzes and exams.

You will be expected to engage actively in class and apply the strategies you learn to your own learning process.

Figure 3.3. Screenshot of ALO - Course introduction page-

Figure 3.4. Screenshot of ALO - Strategies page-
A brief description of 8 listening strategies is included in the Strategies component of the website. These strategies are: Listening for details, listening for main ideas, inferring information, using what you already know, scanning for background information, using contextual clues, inferencing, using structure and intonation clues, and revising assumptions. Each of these strategies is defined and some specific examples to help the student remember the strategy are provided as shown in Figure 3.4.

In the Lecture section there is a lesson centered on a lecture entitled Insect communication. The lesson is divided into three components: Get ready, On stage and My performance. The Get ready component is made up of 7 pages. In this pages students are exposed to a series of activities that help them activate their schemata. Students’ knowledge about the topic is tested through predicting exercises, vocabulary exercises and quizzes on general knowledge about the topic. These tests are presented in drag and drop exercises, matching exercises and multiple-choice forms as shown in Figure 3.5.

Figure 3.5. Screenshot of ALO -Get ready component page 3-
The second component in the lectures section, *On stage*, is presented in four different pages. Substantial changes were made to this component of the website to address the objectives of the current research. In this newer version, students have the choice to watch the video segments or to play the audio files. They can also read the transcripts or the questions in the exercises. The order the students follow to do the activity is mainly determined by the students’ personal choices. The listening exercises included in the *On stage* component in ALO require students to answer multiple-choice comprehension questions, do matching exercises, use scroll down menus to complete charts and classify information based on the lecture “Insect Communication” (Figure 3.6).

*Figure 3.6. Screenshot of ALO - On stage section page1-

In the last component of the lecture, *My performance*, students are prompted to reflect on their performance and to consider to what extent they have attained the learning goals posited through the website. In this component students are required to print out and complete some of the forms that guide them in the process of self-evaluation as shown.

The *Resources* page provides external links that direct students to a selected websites
that can be used by them to improve their listening ability; it also lists the references used to build the web site and the people who made the project possible as illustrated in Figure 3.7.

Figure 3.7. Screenshot of ALO -Resources-

From the last section of the web site, the Site map, users can visit different sections within the web site. Since it is the goal of the website to have students benefit from the different types of exercises, no direct links to the Get ready and On stage and My performance components are provided. Figure 3.8 shows the access students have to the site.

Media tools and help options in ALO. The media tools in ALO consist of audio files and video segments based on the lecture “Insect communication” (Appendix C). Students can access the media tools by clicking the green and blue buttons displayed on the top part of the page. Video segments and audio files can be selected at any time. They can be paused, rewound, forwarded and stopped as students choose.

The help options include transcripts and a dictionary. Student can access the transcripts by clicking on the tan buttons that appear on the top part of the page. The dictionary is presented through the transcripts and consists of internal links that open up a
new layer when students click on them. The transcripts correspond to the segments presented in each of the four pages presented in the On stage component of ALO.

*Figure 3.8. Screenshot of ALO -Site map-

To determine the level of difficulty of the words used in the lecture “Insect communication”, the transcripts corresponding to each exercise in the Get ready and On stage sections were entered into a vocabulary profiler. The Vocabulary Profiler (2001) used in this study was created by the English Center at the University of Hong-Kong and can be found in the Internet. Words that were classified by the Academic Word List (AWL), (Coxhead, 1997), and the list of the 1001-2000 most frequent words were glossed and included in the dictionary. An instance of the type of words glossed in the dictionary can be seen in Figure 3.9. The text entered in the vocabulary profiler consisted of 72 words, from which words that are typed in regular font were not included in the dictionary. This means that these words were classified into the 1-1000 words most common in English. Italicized words such as “releasing” are considered in this profiler as academic words and it is most
likely that a typical student may not know its meaning or how to use it appropriately. Words in italics would normally be glossed and entered into the dictionary, but the ones in the example relate to the filler “hmm” and to a false start “anot” when the lecturer attempts to say another.

Each entry in the dictionary describes the grammatical category to which the word belongs, gives a short definition of the word taken from www.dictionary.com, and provides example of the word used in context. Moreover, two synonyms are also provided for each entry. Pictures are also included in the dictionary when concrete nouns are illustrated.

Figure 3.9. Screenshot of the vocabulary profiler results of text 1 in On stage page 1

<table>
<thead>
<tr>
<th>Frequency</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 - 1000 words</td>
<td>29</td>
</tr>
<tr>
<td>1001 - 2000 words</td>
<td>5</td>
</tr>
<tr>
<td>AWL words</td>
<td>1</td>
</tr>
<tr>
<td>UWL words</td>
<td>0</td>
</tr>
<tr>
<td>Off-list words</td>
<td>2</td>
</tr>
</tbody>
</table>

Profile: Number one is a message has to be sent that is somebody or in this case some insect is producing that message and releasing it across the space that separates hmm anot that insect from another insect.

1 - 1000: a across and another be case from has in is it number one or producing sent separates some somebody space that the this to

1001 - 2000: insect message

AWL: releasing

UWL:

Off-list: anot hmm
Hardware and software configurations. ALO version two was uploaded to the MyIowaState Portal, and students were given access to the website. The CALL activity was conducted in a computer lab equipped with one Macintosh computer, one server, and 15 PCs Dell Optiplex GX1110, 20GB HD, 256MB RAM Windows XP, screen resolution 1024x768 with internet access, sound cards, headsets, speakers, microphones, Quicktime plug ins (version 6), RealPlayer (version 8).

Post-test

The post-test used for this study is made up of 15 questions presented in a multiple-choice format. Each item in the questionnaire consists of a question or statement and three different choices from which to select. Therefore, students have a one-in-three chance to choose the correct answer. Finally, the post-test included questions that inquired about general comprehension of the test and specific questions that tested students' comprehension of specific details of the lecture were included in the post-test (see Appendix D).

Assessment of behavior instruments

MyIowaState portal

MyIowaState portal is the result of a joint effort of Academic Information Technologies (AIT), the administrative Technology Services (ATS), the Library, the Student Affairs Office, and the Alumni Association at Iowa State University. MyIowaState portal is a platform that allows people affiliated with ISU to share files and interact and collaborate with their peers in a professional and scholarly manner. This portal allows users to aggregate information from a variety of campus sources into a simple, web-based tool (Boysen, 2004). Of the many choices MyIowaState portal offers to its users, the built-in tracking system facilitated the gathering of the data for the current study. A short description of the tracking system and the reports is included as follows:

Tracking system. The portal tracked the events and pages visited by the students. The tracking system allows researchers to select and set up events according to the research model and the questions stated for the research. Figure 3.10 provides a screenshot of the
tracking events that can be set up for different purposes. For the current research, mouse clicks and double clicks were tracked.

**Figure 3.10 Tracking events in MyIowaState portal**

**Reports.** The tracking system reported raw data in a chart. Information such as events (click /double click), time, tags used by the designer to build-up the application and object position are included in Table 3.4.

The first column lists the events tracked. Notice that the current study mostly focused on clicks and double-clicks since the site was built based on these two events; with one click students could listen to the audio or video files, view the transcripts, get the vocabulary etc. With double-clicks all these events were closed. The second column reports the time between clicks, and the third column reports the kind of tag the learner clicked on. Since the website was built with buttons that use interactive images, most of the reports provided in this column correspond to the tag IMG which stands for images. Column 5 report the value of the tags. Thus, Target 3 should be interpreted as the third option in the drag-and-drop exercise. The numbers that appear under the columns bearing the X and Y titles deal with the exact location of the picture. Thus X is the x axis and Y the y axis. This location provides the exact location where students clicked. The last column called "Patterns" was added by the
researcher and it provides the result of interpreting the steps the student followed when working with the website.

Detailed analyses were conducted to identify the objects and places the learner clicked. From the sample provided, it can be seen that the student visited the first page in the On stage section. He clicked first on the first video and then clicked on the exercise to read the directions. It seems that while listening he attempted to do the exercise, which consisted of a drag-and-drop exercise that identified the different methods of communication. He repetitively attempted to drag the third choice and then clicked on the next page without listening to the second or third video.

Table 3.4. Reports in MyIowaState portal

<table>
<thead>
<tr>
<th>Event</th>
<th>Time(msec)</th>
<th>Tag</th>
<th>Value</th>
<th>X</th>
<th>Y</th>
<th>Char</th>
<th>Patterns</th>
</tr>
</thead>
<tbody>
<tr>
<td>click</td>
<td>28972</td>
<td>IMG</td>
<td>429</td>
<td>418</td>
<td>0</td>
<td>V1</td>
<td></td>
</tr>
<tr>
<td>click</td>
<td>53467</td>
<td>IMG</td>
<td>exercise</td>
<td>365</td>
<td>409</td>
<td>0</td>
<td>Exercise</td>
</tr>
<tr>
<td>click</td>
<td>120904</td>
<td>IMG</td>
<td>Target 3</td>
<td>437</td>
<td>959</td>
<td>0</td>
<td>Target 3</td>
</tr>
<tr>
<td>click</td>
<td>137217</td>
<td>IMG</td>
<td>Target 3</td>
<td>591</td>
<td>952</td>
<td>0</td>
<td>Target 3</td>
</tr>
<tr>
<td>click</td>
<td>140152</td>
<td>IMG</td>
<td>Target 3</td>
<td>733</td>
<td>954</td>
<td>0</td>
<td>Target 3</td>
</tr>
<tr>
<td>click</td>
<td>144428</td>
<td>A</td>
<td>Next page</td>
<td>598</td>
<td>1363</td>
<td>0</td>
<td>Next page</td>
</tr>
<tr>
<td>exit</td>
<td>144628</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Parameters: view=home, action=view, link=lecture_on_stage_3_final.htm, browse=,

click 1542   IMG  Enter 543 592 0
exit 1572

Parameters: view=home, action=view, link=home.htm, browse=,

click 1542   IMG  Lecture 677 158 0
exit 1562

Page (title): 12/01/2004:14:24:42.151
Parameters: view=home, action=view, link=lecture_lesson.htm, browse=,

click 1382   IMG  On stage 632 192 0
exit 1412

Page (title): 12/01/2004:14:24:44.194
Parameters: view=home, action=view, link=lecture_on_stage_2_final.htm, browse=,

click 4747   IMG  430 419 0
exit 14008
It seems he did not complete the exercise successfully because no reports show that he listened to segments 2 or 3 in this page, instead he continued onto the next page. He went back to the lesson page and returned to the first page on the *On stage* section. He played video number 1 again, dragged the third choice again and checked his answer. Then he proceeded to the next page.

**Oral interview questionnaire**

A 10-question oral interview form was also designed for the current study. Although the statements in the form could be simply answered with a “YES” or “NO” the researcher elicited more expansive responses by asking some of the reasons for using or not using the help options. The questionnaire inquired about the level of ease students felt working with the website, the approximate number of times students used the media tools provided, their preference for working independently, and so on (see Appendix E).

**Procedure**

The first component of the project in which the FD/I CALL cognitive style questionnaire was validated, was piloted in a 50-minute session. Students enrolled in English 101B and 101C meet twice a week through the 16-week semester. The topic was introduced as part of a “self-awareness” mini-project carried out by the class instructors; it took place at approximately the last third of the semester. Though no grade was assigned based on the project, participants were expected to be present and participate during the class.

Students completed the questionnaire individually in class and questions were solved as they arose. Two days later, a results score sheet along with a brief explanation on how to interpret the results was given to students (see appendix F).

Statistical analyses were performed to the questionnaire and changes were made accordingly. The statistical program used to run the analysis was “R”, which is “a freely available language and environment for statistical computing and graphics which provides a wide variety of statistical and graphical techniques: linear and nonlinear modeling, statistical tests, time series analysis, classification, clustering” (CRAN R project, 2005). Items that did not contribute to the reliability of the questionnaire were omitted and some others
The second component of this study was incorporated into the curriculum of English 099L listening sections 1 and 2. The class met twice a week for a 50-minute period, over 16 weeks. The listening strategies introduced in this project summarized most of the strategies students had previously discussed and learned in class. The project was carried out in two 50-minute sessions at the end of the semester. Class instructors distributed a set of instructions on how to log into MyIowaState portal a week before the study was carried out (see Appendix G). Students were expected to access ALO and familiarize themselves with the website until they felt comfortable finding their way around.

During the first session, students completed the revised version of the FD/I CALL cognitive style questionnaire that consisted of 30 items. As students finished the questionnaire, they were asked to log into MyIowaState portal individually, review the navigation directions and complete the exercises provided in the Get ready component. Twenty-five minutes before the class ended, students were asked to complete the GEFT test individually.

As for the second session, students who did not finish the exercises in the Get ready component in ALO, completed it and started working with the On stage component. They completed the post-test, and individual interviews were arranged. The interviews took place right after they had completed the post-test. In addition, students received results from both the GEFT and the Report from the FD/I CALL cognitive style questionnaire (Appendix H).

Data analysis

In order to address the research questions, the analysis of the data consisted of four distinct components. First, statistical analyses of the FD/I CALL cognitive style questionnaire were performed to assess reliability. Kuder-Richarson calculations were carried out to obtain the KR20, and an item analysis determined how many questions should be included in the final questionnaire. The results of the GEFT were used to calculate the Spearman rank order correlation to calculate the consistency between the results obtained after administering the GEFT and the results obtained from the FD/I CALL cognitive style
Table 3.5. Summary of data analyses

<table>
<thead>
<tr>
<th>Research Questions</th>
<th>Analyses</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Question No. 1</strong></td>
<td></td>
</tr>
<tr>
<td>What evidence indicates the reliability and construct validity of the FD/I CALL cognitive style questionnaire?</td>
<td>Pearson Product moment correlation</td>
</tr>
<tr>
<td></td>
<td>FD/I CALL cognitive style questionnaire and the GEFT</td>
</tr>
<tr>
<td></td>
<td>Kuder-Richarson Formula (KR20)</td>
</tr>
<tr>
<td></td>
<td>Analysis of reliability given omitted items.</td>
</tr>
<tr>
<td><strong>Question No. 2</strong></td>
<td></td>
</tr>
<tr>
<td>How does FD/I relate to performance in CALL-based listening activities?</td>
<td>Pearson product moment correlation and linear regression</td>
</tr>
<tr>
<td></td>
<td>Post-test vs. FD/I as measured by the GEFT</td>
</tr>
<tr>
<td></td>
<td>Post-test vs. FD/I as measured by the FD/I CALL cognitive style questionnaire.</td>
</tr>
<tr>
<td><strong>Question No. 3</strong></td>
<td></td>
</tr>
<tr>
<td>What help aids and media tools that ALO website has are the most preferred by students in each cognitive style?</td>
<td>Two sample T-test</td>
</tr>
<tr>
<td></td>
<td>Means of the two groups (FD/I) and use of help options.</td>
</tr>
<tr>
<td></td>
<td>Means of the two groups (FD/I) and use of media tools.</td>
</tr>
<tr>
<td><strong>Question No. 4</strong></td>
<td></td>
</tr>
<tr>
<td>Are the steps that students follow to achieve a listening task different? If so what are the patterns that each group follows?</td>
<td>Logistic regressions</td>
</tr>
<tr>
<td></td>
<td>Rate of use of pattern No. 1 and FD/I as measured by the GEFT and the FD/I CALL cognitive style questionnaire.</td>
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<tr>
<td></td>
<td>Rate of use of pattern No. 2 and FD/I as measured by the GEFT and the FD/I CALL cognitive style questionnaire.</td>
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<tr>
<td></td>
<td>Rate of use of pattern No. 3 and FD/I as measured by the GEFT and the FD/I CALL cognitive style questionnaire.</td>
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</tbody>
</table>
questionnaire. The analysis of the face-to-face interview determined toward what end of the FD/I continuum students were classified according to their own perceptions.

Second, correlation analysis between performance on the post-test and the cognitive style was calculated to determine how performance relates to FD/I. Third, the number of clicks for each kind of help option used by each student were counted, and then correlation analyses were performed to determine the help aids and media tools that are most preferred by students representing each cognitive style trait. Finally, the time logs were used to trace the sequences students followed. These sequences were converted into patterns. The patterns followed by students identified with the same learning style were grouped and compared to suggest consistent patterns.

Conclusions

In this chapter, I have described the participants, methods and the data analysis used for the current study. These descriptions help the readers understand the type of analysis used to come to the results encountered in the upcoming chapters and how conclusions were reached.
CHAPTER 4. RESULTS AND DISCUSSION

This chapter presents the results of the study and supplies findings for four research questions. First, evidence of construct validity of the FI/D measure is reported through comparison of students' scores on the GEFT and answers in the interview. Reliability of the FD/I CALL cognitive style questionnaire is also reported and discussed. Then, explanations are given about how FD/I (as measured by the GEFT and the FD/I CALL cognitive style questionnaire) relates to student’s performance in the CALL-based listening activities included in the On stage section of ALO. Next, the preferred media tools and help options of FI and FD students are identified and discussed. Finally, three patterns of behavior identified for FD and FI learners are compared to the classification of FD/I as measured by the GEFT and by the FD/I CALL cognitive style questionnaire.

FD/I CALL cognitive style questionnaire

The first research question investigated the validity and reliability of the FD/I CALL cognitive style questionnaire. The results for this question are reported in two sections. The first section presents the statistical analysis performed to the original questionnaire. Analysis reveals how each question contributes to the overall reliability of the questionnaire (KR20). The second section provides evidence of construct validity of the 30-item FD/I CALL based questionnaire, along with discussion of the results. A Pearson correlation coefficient between the GEFT and the FD/I-CALL based cognitive style questionnaire is also reported.

Original questionnaire

The original FD/I CALL cognitive style questionnaire was made up of 42-items and was piloted with 52 international students (Group A). Descriptive statistics were calculated and are reported in Table 4.1. The number of test-takers corresponds to the number of questionnaires used for the analysis. The highest possible score was 42 and the lowest score 0. Low values correspond to FI learners and high values represent FD learners (see discussion in page 24). The score range for this sample was between 15 and 27.
Table 4.1. Descriptive statistics for the 42-item FD/I CALL cognitive style questionnaire.

<table>
<thead>
<tr>
<th>Descriptive Statistics</th>
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<tbody>
<tr>
<td>Number of students (N)</td>
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<td>Total items (k)</td>
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<td>Mean (x)</td>
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<td>Median</td>
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<td>Standard deviation</td>
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<td>Max value</td>
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<td>Min Value</td>
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The mean score and the standard deviation calculated for this sample indicates that this group of subjects is in the middle of the possible range of scores. Therefore, the group does not seem to be located towards either end of the FD/I end of the continuum.

Table 4.2. KR20 if individual item are eliminated.

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<tr>
<th>General</th>
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<td>Q.2</td>
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<td>Q.3</td>
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<td>Q.4</td>
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<td>Q.5</td>
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<td>Q.6</td>
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<td>Q.7</td>
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<tr>
<th>Listening</th>
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<tbody>
<tr>
<td>Q.1</td>
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<td>Q.2</td>
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<td>Q.3</td>
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<td>Q.4</td>
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<td>Q.5</td>
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<td>Q.6</td>
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<tr>
<th>Reading</th>
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<td>Q.1</td>
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<th>Writing</th>
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<td>Q.1</td>
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<td>Q.7</td>
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<tr>
<th>Vocabulary</th>
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<tbody>
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<td>Q.1</td>
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<td>Q.2</td>
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<td>Q.3</td>
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<td>Q.4</td>
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<td>Q.7</td>
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<table>
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<tr>
<th>Grammar</th>
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<tbody>
<tr>
<td>Q.1</td>
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<td>Q.7</td>
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</table>

Questions eliminated
Questions changed
A standard deviation score of 3.43 indicates that there is not much variance in scores; for this reason it may be expected a not so high estimate of reliability given the homogeneity of responses from the sample.

The KR20 calculated for this questionnaire was KR20 = 0.4199. More detailed statistical analyses (item analyses) were performed to identify how reliability is affected by each item. Table 4.2 illustrates the expected KR20 if individual items are omitted. The results in this table are reported by section and by the number of the questions. Values that are higher than 0.4199 suggest that these questions should be reviewed, reformulated, or even changed. Values that are lower than 0.4199 suggest that these questions influence positively the estimate of reliability by increasing it. Based on this initial analysis used to highlight possible problems, and after comparing the items with the three component definition of cognitive styles in CALL, some questions were omitted and others were simply paraphrased. This analysis suggests that by omitting questions No. 4 and 6 in the general section, 1 and 3 in the listening section, 3 and 7 in the reading section, 1, 3 and 4 in the writing section, and 6 in the vocabulary section, a estimate of reliability of KR20 = 0.5723 can be reached.

For the reasons described above, results also suggest that questions 7 in the listening section, 1 and 6 in the reading section, 2 and 5 in the writing section, 1 in the vocabulary section, and 2 in the grammar section should be reviewed or omitted. If these questions were omitted a KR20 = 0.656 could be obtained, but there is no theoretical justification for eliminating them. However, these questions were paraphrased or reformulated to make them more clear and categorical as reported in Table 4.2. Appendixes I and J offer detailed reasons for omitting and/or changing questions for the final questionnaire.

It is important to note that in sections such as reading and listening a higher number of questions were omitted or changed. The purpose of providing sections in the test was to help questionnaire-takers to activate schemata, and to easily relate the questions to the topic of the section. Therefore, the number of questions in each section is not considered an important variable for the current study.
Revised questionnaire

After questions were reviewed and changes were made based on the results and on the FD/I constructs definition, a revised 30-item questionnaire, was given to students in both sections of the 099L class (Group B) to complete. The statistical analysis along with the estimate of reliability and the coefficient of correlation between the GEFT and the FD/I CALL cognitive style questionnaire are presented in this section.

Participants in group B were required to do five different things: 1. take the GEFT, 2. complete the FD/I CALL cognitive style questionnaire, 3. work in the Get ready and On stage sections of ALO, 4. complete the post-test and 5. answer the questions in the interview. Although there were a total of 24 participants in group B, only the data of 20 (see Appendix K) was complete and was analyzed for the current study. After information of participants who did not complete any of the five tasks they were required to was deleted, participants were renumbered (Appendix L) so the number of the participant that will be reported in the remaining research questions is different from the reported in the participants profile (Table 3.2 page 21).

In order to provide evidence for the construct validity of the FD/I CALL cognitive style questionnaire, correlation analysis between the FD/I CALL cognitive style questionnaire and the GEFT were performed by calculating the Pearson product moment of correlation. The KR20 was also calculated to obtain the estimate of reliability.

The descriptive statistics for this group of participants is reported in Table 4.3. A total of 30 items in the questionnaire were included, so the highest score possible was thirty (30) and the lowest score zero (0). In contrast to the first questionnaire, low values correspond to FD learners and high values represent FI learners. This change was necessary to resemble the way GEFT scores are interpreted and to facilitate further analysis. The score range for this sample was between 10 and 17. The mean score calculated for this sample indicates that this group of subjects is in the middle of the possible range of score. Therefore, the group does not seem to be located towards a specific end of the FD/I end of the continuum. A standard deviation score of 2.49 indicates that there is not much variance in scores, for this reason it may be expected a not so high estimate of reliability given the homogeneity of the sample.
Table 4.3. Descriptive statistics for the 30-item FD/I CALL cognitive style questionnaire

<table>
<thead>
<tr>
<th>Descriptive Statistics</th>
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<tbody>
<tr>
<td>Number of students (N)</td>
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<tr>
<td>Total items (k)</td>
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<tr>
<td>Mean (x)</td>
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<td>Mode</td>
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<td>Median</td>
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<td>Standard deviation</td>
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<td>Min Value</td>
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</tbody>
</table>

Reliability

The reliability for this new questionnaire is KR20 = 0.1866, a much lower estimate if compared to the estimate of the original questionnaire. Multiple explanations may support this finding.

The first reason may be the number of test takers used to pilot the questionnaire. While the first questionnaire was piloted with 52 students, only 20 subjects were included in the subsequent sample. The new questionnaire was validated with 20 participants, that is, less than half of the initial sample. Bachman and Palmer (2004) suggest that 37 subjects is the minimal number of subjects recommended to calculate estimates of reliability.

Another factor is that the first questionnaire had 42 questions, but the second one had 30. The decision of having a questionnaire with 30 questions was made based on the analysis of reliability based on item variance. Avoidance of repetition of some items (Reid, 1990) was also considered as a factor to determine what items were to be included in the final questionnaire. Moreover, having 30 questions instead of 42 may assure that test takers will answer questions more consciously without getting tired or finding some of the items quite repetitive.

The questionnaire test-takers background in both groups also differed. While in the first questionnaire 70% of the sample were from Asian background with participants mostly coming from Indonesia and Malaysia, and with some participants of Latin American and European background, for the second questionnaire 90% of the participants were of Asian background mostly from China (50%) with no representation of learners with an European
background and with only a representation of 10% of students with Latin American background. Research studies on cognitive styles reported by Reid (1995) suggest that some cultures exhibit certain tendencies in cognitive styles. For instance, learners from Latin America as a group tend to be more field dependent.

Students’ motivation and interest to take the test may have also affected the results. During the data collection of the initial questionnaire, students were prepared by the instructor and by the researcher to take the questionnaire. That is, the questionnaire was contextualized and students had a better chance to understand the purpose and the benefits of being aware of their own cognitive style. As one of the instructors commented, “it even served as a starting point to reflection and discussion in class”.

By contrast, learners who took the second questionnaire seemed a bit reluctant and uncomfortable when completing the questionnaire. The class instructors explained the consent form and no contact with the researcher took place prior to data collection. At this respect Kinsella (1995), suggests that before any attempt of administering any type of instruments that requires students to reflect on the way they learn, substantial preparation should be done, and self-awareness activities need to be carried out in order to achieve more reliable results.

The time of the semester in which the questionnaire was administered in both cases may have also influenced the outcomes. The first questionnaire was administered during the 9th week of classes, right after mid-terms had been returned to students. Consequently, the questionnaire served as a transitional activity between mid-terms results and the start of a new topic. Students took the second questionnaire one week before final examinations, a week that for some students, depending on the instructor, becomes the final week or the week in which substantial work for classes is submitted.

Another determinant factor is that it is difficult to measure three aspects of the FD/I construct by one test, especially when these three aspects overlap. For instance, reliance on internal vs. external factors, was measured through statements that inquired about the use of help facilities, but in some other items in the questionnaire, even if the question inquired about use of help facilities, results were interpreted in the framework of interpersonal competences. For instance, in example No. 1 where the use of the dictionary in question V1
is interpreted as use of help facility, but the use of the same dictionary in question V2 is interpreted as preference of using human assistance rather than assistance provided by the program.

*Example 1.*

V1. If you want to know the meaning of a new word, you most likely would
   a. look it up in the dictionary
   b. not look it up in the dictionary.

V2. If you do not know the meaning of a word, you most likely would
   a. ask a classmate or the instructor for the meaning.
   b. look it up in the dictionary.

Given these considerations, it seems that creating an instrument that successfully measures FD/I in CALL is a difficult endeavor that deserves to be further explored.

**Evidence of construct validity**

The construct validity of the FD/I CALL cognitive style questionnaire is reported by comparing two sets of data. The first set compares students' results on the FD/I CALL cognitive style questionnaire to the GEFT scores. The second set compares the results of the questionnaire to the analysis of the interviews that inquired about students' self-perception on their own cognitive style.

To provide evidence for the construct validity of the FD/I cognitive style questionnaire, the data of participants' No. 2, 3, 7, and 8 were not included in this analysis as shown in Table 4.4. This table shows students classification of FD/I as assessed by three different measures. The results of the first measure, the FD/I CALL cognitive style questionnaire, is shown in the second column. For this measure, scores higher than 15 are considered as FI learners, and scores lower than 15 as FD learners (15 was the median score). The third column shows participants scores in the GEFT. For this measure, scores higher than 14.5 are considered FI learner and scores below 14.5 are FD learners. As for the fourth and final column, ones (1) should be interpreted as FI learners and zeros (0) should be interpreted as FD learners. The main criterion to classify students as FD or FI learners was based on individual responses to the first question of the interview. This question inquired
about students' preference for working in groups or individually. With this in mind, students who suggested a preference for group work were classified as FD learners and students who suggested a preference for working individually were classified as FI learners.

Table 4.4. Three measures of students' classification of FD/I.

<table>
<thead>
<tr>
<th>Subject #</th>
<th>FD/I</th>
<th>GEFT</th>
<th>Interview</th>
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<tbody>
<tr>
<td>1</td>
<td>15</td>
<td>6</td>
<td>0</td>
</tr>
<tr>
<td>2</td>
<td>16</td>
<td>16</td>
<td>N.A</td>
</tr>
<tr>
<td>3</td>
<td>16</td>
<td>15</td>
<td>N.A</td>
</tr>
<tr>
<td>4</td>
<td>11</td>
<td>16</td>
<td>1</td>
</tr>
<tr>
<td>5</td>
<td>16</td>
<td>14</td>
<td>0</td>
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<tr>
<td>6</td>
<td>13</td>
<td>17</td>
<td>0</td>
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<tr>
<td>7</td>
<td>16</td>
<td>12</td>
<td>N.A</td>
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<td>14</td>
<td>N.A</td>
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<td>20</td>
<td>18</td>
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<td>0</td>
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*Note.* The higher the scores in the GEFT and in the FD/I CALL questionnaire, the more the FI students are. 0 = FD Students N.A. = No information available. 1 = FI Students

A comparison of the results of the three measures, it can be seen that only participants No. 11 and 17 are perceived as FD learners, but no participant was identified as a FI learner as reported by the three measures used in this study. Notice also that four participants (1, 12, 14, and 16) scored 15 in the FD/I CALL cognitive style questionnaire. Results also suggests that student self-perception as FD or FI learners is similar, in some instances, if compared to the scores of the GEFT and to the scores of the FD/I CALL cognitive style questionnaire but statistical analyses are needed to determine how theses measures correlate.
FD/I CALL cognitive style questionnaire vs. GEFT. A Pearson product moment correlation between GEFT scores and the FD/I-CALL cognitive style questionnaire was calculated. The correlation coefficient calculated for this pair of measures was -0.12. This result indicates that the FD/I-CALL cognitive style questionnaire is measuring a different construct or perhaps it is measuring the remaining constructs the GEFT has been regarded not to measure (see Chapelle and Green, 1992 for further discussion).

These results also suggest that either the FD/I CALL cognitive style questionnaire should be reviewed or the GEFT may not be an appropriate instrument to measure FD/I in CALL environments. One of the reasons for this assumption is based on previous research in SLA, which suggested that the GEFT does not offer an appropriate measure of field dependence. SLA researchers suggest that a measure of FD/I should consist of items or tasks that “assesses how individuals work not well they work” (Chapelle, 1995:167). The GEFT fails in doing so, given that people are scored on the number of correct responses they answer right, which classify them into field independent style, but a “a low scores does not necessarily imply high dependence” Brown (1987: 87). Moreover, SLA researchers (Chapelle and Green 1992; Brown, 1987) suggest that the GEFT only measures the cognitive restructuring skills aspect included in the three-part definition of FD/I proposed by Witkin and Goodenough (1981). This may partially explain why the correlation coefficient between the GEFT and the FD/I CALL cognitive style questionnaire indicates a negative relationship, since the FD/I CALL cognitive style questionnaire attempted to measure the three aspects of the construct.

FD/I CALL cognitive style questionnaire vs. interview. A comparison of students’ self-perception based on the answers to the interview, to students’ scores on the FD/I CALL cognitive style questionnaire, revealed interesting outcomes. For instance for participant No. 6, both his self-perception and the results in the FD/I CALL cognitive style questionnaire, suggest that he is a FD student, but his score in the GEFT (17) suggests that he is a highly FI learner. Further examination of this participant’s answers to the interview provides clear descriptions of some of the behaviors associated to FD learners. In his view, he is able to recall “the whole picture of the lecture” and “no many details”. He also prefers working in groups, a behavior frequently exhibited by FD learners: “I learn more when I work in groups,
I like sharing with my friends because I learn from them” or who prefers having a context to “better understand what I am listening to”. Another interesting fact that may explain this disparity in results is the educational background of the participant. As a mechanical engineer, the participant might be exposed to figures or diagrams that he needs to be able to understand, interpret, reproduce and in some instances create, tasks that in some way resemble what test takers are required to do when completing the GEFT. A similar pattern is displayed by participants No. 9, 10 and 18 but no explanation can justify the fact that they scored high in the GEFT and hence are classified as FI learners. Once again, findings suggest that cognitive styles in CALL should be redefined and based on that redefinition assessment instruments should be created. The findings presented here serve as a exploratory study on which further research can be based.

Reid (1995) suggests that cognitive style traits are not innate but acquired traits highly influenced by the culture, teaching situation and norms of behavior expected of an individual by other members of the society he belongs to. As in the case of Chinese people, who as a group have been perceived as field sensitive or field dependent in previous research studies. Interestingly, 3 out of the 5 learners who were identified as highly FI learners, that is, whose score was 18, were from China. In revising these students’ self-perception, it was found that two of them (participants 6 and 10) consider themselves FD learners. Further analysis evidence that any of the Chinese participants in the study, scored lower than 14.5 in the GEFT. That is, all of them are identified as FI, some of them with lower levels of field independence but most of them with high levels of it. It seems that these results first partially contradict the existing literature on cognitive styles that view Chinese learners as “field sensitive or field dependent” (Nelson, 1995: 15) and second, contradict the self-perception these Chinese students have.

Nelson (1995) suggests that the characteristics of the educational and cultural system in China, where instructors model a task or where long periods of observation are included before students are required to do a task, and the nature of the task involved when completing the GEFT find and trace a simple figure that is embedded into a more complex one-, Chinese students may have, to some extent be trained for developing this type of tasks and this may explain the disparity between the high scores in the GEFT and their self perception as FD
learners and the scores in the FD/I CALL questionnaire that reports most of them as FD learners. This assumption of course, needs to be further explored with a higher number of participants and may not apply to all the Chinese population but to the specific sample.

In summary, although the FD/I CALL cognitive style questionnaire needs to be revised, it seems to be a better predictor of FD/I in CALL than the GEFT.

**FD/I and performance in CALL-based listening activities**

Although the KR20 calculated for the FD/I CALL cognitive style questionnaire (KR20 = 0.1866) is low when compared to the KR20 calculated for the GEFT, (KR20 = 0.776) and the correlation coefficient between the GEFT and the FD/I CALL questionnaire is negative, there is great doubt remains that the GEFT is an appropriate tool to measure FD/I in the context of CALL. However, at this point in the research there is no conclusive evidence to support this. For this reason, performance in CALL-based listening activities, participants’ preferred media tools, help options and patterns of on-line behavior will be examined from the perspective of FD/I as measured by both the GEFT and the FD/I CALL cognitive style questionnaire.

In order to examine how FD/I relates to performance in the CALL-based listening activities presented in the second version of ALO, correlation analyses between both the GEFT scores and the post-test scores (Appendix M) and the FD/I CALL cognitive style questionnaire and the post-test were performed. In addition, linear regression of the GEFT vs. the post-test and the FD/I CALL cognitive style questionnaire vs. the post-test were performed.

Residuals vs. Fitted plot, Normal Q-Q plot, Scale location plot and Cook’s distance plot measures were used to flag possible outliers. These are standard diagnostic tools used for identifying influential observations and outliers or possible misspecifications of the model.

The Residual vs. Fitted plot and the Normal Q-Q plot should be interpreted as follows: Values that are far from the dotted and the straight diagonal line respectively as shown in Figure 4.1 and 4.2 may indicate some type of deviation. As for the Scale location plot and the Cook’s distance plot, values further from zero (0) indicate some type of deviation. After these analyses were performed, subjects No, 5, 6, and 18 were flagged only
by one of the four measures used to detect outliers; for this reason no changes were made. Although students 9 and 19, were flagged in three of the four different measures, there is no justification for eliminating them from the sample. Student No. 4, however, was omitted from the sample. This decision was based on the fact that this student only finished 2 of the 4 tasks he was required to complete as evidenced by the results obtained from the tracking system. Students No. 9 and 19 completed all the tasks thoroughly, and for this reason, their data was not omitted for the current analysis.

*Figure 4.1. Outlier and influential observation analysis for the GEFT vs. Post-test.*

The Pearson product moment correlation calculated for the GEFT vs. the post-test is 0.078, while for the FD/I-CALL based cognitive style questionnaire vs. the post-test the correlation is −0.1059. These results suggest that there is not a clear tendency between FD/I and performance on CALL-based listening activities, when FD/I is measured either with the GEFT or the FD/I CALL cognitive style questionnaire as illustrated by Figures 4.3 and 4.4. Both results indicate that the relationship between performance and FD/I is not statistically significant at the p=0.05 level.
Figure 4.2. Outlier and influential observation analysis for the FD/I CALL cognitive style questionnaire vs. Post-test.

Figure 4.3. Scatterplot post-test vs. FD/I CALL cognitive style questionnaire.
Figures 4.3 and 4.4 show that there is no significant relationship between performance and FD/I as measured by the GEFT or by the FD/I CALL cognitive style questionnaire. The main factor is that the data show no variation in the post-test scores. That is, more than half of the participants' scores ranged from 11-13. Although a number of factors may have influenced performance results in the post-test, three have been fully identified and are discussed below.

The first factor, language background, is a complicated issue that no research in SLA can fully account for. Participants from certain language backgrounds, especially those who speak a language that shares some characteristics in vocabulary (Spanish) or in phonology (German), are at an advantage if compared to students whose language system is totally different, as is the case of most Asian languages. The impact of this advantage is evidenced by participant No. 3 and 13 who considered lecture quite easy to understand, a finding largely attributed to language similarities as shown in segments 1 and 2.

Segment 1
R: How difficult was it for you to understand the lecture?
S3: no difficult at all... because the words... I mean some words are equal...similar in Spanish and English.... are cognados... you know cognados?
R: cognados? No...
S3: yes cognados words for example (he grabbed a pen and jotted down) in Spanish comunicacion- in English communication... very similar words.. you see..
R: Umm, I see you mean cognates...
S3 yes, in Spanish cognados in English what?
R:Cognates

Segment 2
R: Was it difficult to understand the lecture?
S13: No, no really... it is difficult remember the questions...but the lecture is easy
because lots of clear words.... transparent words...ummm reproduction, communication.... Bioluminiscencia...insects...

Opposite to this view, some participants from Asian background found it quite
difficult as pointed by participant No.15.

Segment 3
R: How difficult was it for you to understand the lecture:
S15: the lecture?
R: yes the lecture on insect communication you just listened to...
S15: not difficult, not easy....no...no... very difficult...many new words and
vocabulary...

Further examination of students' answers in the interview also reveals that
background knowledge also influenced the results. Such is the case of participant No. 20
whose major, although not directly related to insects (Plant pathology), has exposed him to
readings on insects and how they affect plants as evidenced in segment 4:

Segment 4
R: Were you familiar with the topic insect communication?
S20: familiar?
R: ehh...Did you know something about how insects communicate?
S20: umm...yes...some, some...because in one of my classes I read something about
plagues ....um and how are transmitted by insects... there is relation...you know

The last factor that influenced the results seems to be the format in which the post-test
was presented. Perhaps the questions and the choices were quite easy for students to answer,
simply requiring them to remember general information provided in the lecture. Moreover,
the fact that for each question there were only three choices may have increased students' chances to "guess" the right answer. This assumption is based on participant No.17 who
considered the lecture "somehow...very difficult to understand" but who scored relatively
high on the post-test. Moreover, the results displayed by the tracking system for this
participant also reveal that he neither listened to nor worked on the exercises on the last page, and five of the questions were based on this segment of the lecture.

Individual cases were further examined to search for further evidence that supported or rejected the initial finding that reported the relationship between performance and FD/I as a group. For this, the post-test scores were compared of the participants whose scores in the three measures of FD/I in the current study classify them as FD learners. This analysis revealed that performance in the specific CALL-listening activity participants worked with does not relate to FD/I as measured by any of the three instruments used in this study.

In conclusion, FD/I does not relate to performance in CALL-based listening activities. It seems that students in this study drew on different strategies to understand the learning materials, and those strategies proved to be successful. Although this study did not examine the strategies that students used, it seems that these findings support the conclusions reached by Abraham (1985) and Raschio (1990) which suggested that FD students draw on different strategies to get a task accomplished.

**Preferred media tools and help aids of FD and FI learners**

To answer question number three which investigated the preferred help options and media tools of FI and FD students, the number of times students clicked on any of the help options or the media tools was counted as reported in Table 4.5.

Participants No. 3 and 4 were omitted from this analysis since they did not complete the tasks on pages 3 and 4 in ALO. There were a total of 96 instances in which the 18 participants clicked on the video. The audio files were clicked a total of 37 times, the transcript 29 times and the dictionary only 3 times. The number of clicks for the help option was far less than what was expected, thus limiting analysis of the preferred media tools and help options of FD and FI learners. On average students clicked 5.3 times on the video, 2.1 times on the audio, 1.6 times on the transcripts and 0.2 times on the dictionary. The standard deviation calculated for this set of results reveals little variation in the individual number of times students used each of the help options and media tools.
Table 4.5. Number of times students used the media tools and help aids in ALO.

<table>
<thead>
<tr>
<th>Subject #</th>
<th>FD/I CALL</th>
<th>GEFT</th>
<th>Media tools</th>
<th>Help aids</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Video/Audio</td>
<td>Audio</td>
<td>Transcript</td>
<td>Dictionary</td>
</tr>
<tr>
<td>1</td>
<td>6</td>
<td>2</td>
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<td>20</td>
<td>18</td>
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<td>0</td>
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<tr>
<td>Total</td>
<td>96</td>
<td>37</td>
<td>29</td>
<td>3</td>
</tr>
</tbody>
</table>

# subjects (N) 18 18 18 18
Mean 5.3 2.1 1.6 0.2
Standard Deviation 1.2 1.4 1.8 0.4

The listening activities used in ALO were presented in four pages as shown in Table 4.6. Page number 1 consisted of three video segments, three audio segments, three transcripts excerpts and a total of seven glossed words. Page numbers 2, 3, and 4 have similar characteristics in that each page consisted of one video segment, one audio segment, and one transcript. The number of glossed words differed for each page, so for page 2, 24 words were glossed, for page 3, 25 and for page 4, 26 words were glossed. In summary, students had 6 videos to watch, 6 audio segments to listen to, 6 transcripts to read and a total of 82 glossed words to check.
Table 4.6. Number of media tools and help aids included in the On stage section in ALO.

<table>
<thead>
<tr>
<th>Page # in ALO</th>
<th>Media tools</th>
<th>Help aids</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Video/Audio</td>
<td>Audio</td>
</tr>
<tr>
<td>1</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>2</td>
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<td>1</td>
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<td>4</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Total</td>
<td>6</td>
<td>6</td>
</tr>
</tbody>
</table>

Preferred media tools and help options of FD and FI learners as measured by the GEFT

Results identifying preferred media tools and help options of FD and FI learners, as measured by the GEFT, show that on average FD students clicked 5.6 times and FI 4.8 times. That is, FD students clicked 0.6 times more often in the video than FI students. A similar pattern occurred with the audio, while FD students clicked 2.6 times in the audio, FI clicked 1.4 times. Therefore, FD students clicked the audio option 0.8 more times than FI students (see Table 4.7).

Table 4.7. Mean number of times FD and FI students, as measured by the GEFT, clicked on the help aids and media tools.

<table>
<thead>
<tr>
<th>CS</th>
<th>Media tools</th>
<th>Help aids</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Video/Audio</td>
<td>Audio</td>
</tr>
<tr>
<td>FD</td>
<td>N=9</td>
<td>5.6</td>
</tr>
<tr>
<td>FI</td>
<td>N=9</td>
<td>5.0</td>
</tr>
</tbody>
</table>

These results suggest that on the one hand, video is the preferred media tool by both FD and FI learners, and on the other hand, FD learners use it more frequently as the main source of input. This finding supports other studies in which researchers have acknowledged that the visual aspect of video supports or complements listening comprehension, and this leads learners to prefer it. (Thompson, 1995; Rubin, 1990; Brett, 1995).
As for the preferred help aids (transcripts and dictionary), both FD and FI students on average clicked the transcript the same number of times (1.6). Since glossed words could be seen only if students used the transcripts, it is difficult to suggest whether students prefer using transcripts or the dictionary, and this represents one of the main limitations for this part of the research. The data obtained, though, show that from the sample of students who used the transcripts, FD students clicked the glossed words 0.3 times more than FI students, who never used this type of help.

Although these findings partially supported the hypothesis that FD learners, given their tendency to rely on external clues, in this case help aids in CALL, may use them more frequently if compared to FI learners, the results are non-statistically significant at the p=0.05 level.

The main factor that influenced the results was the fact that students, in general, did not make use of the help facilities as much as has been previously expected. These findings are in line with other research studies that have investigated the use of help facilities (Pujola, 2002; Liou, 2000; Grgurovic, 2005).

Further examination of the interview responses reveals some of the reasons why students decided to use or not to use the help aids. For one FD learner who decided to use transcripts, this choice was a matter of previous experience with this type of help, as pointed out by participant No. 12, who claimed that it was one of her hobbies to learn English (segment 5).

Segment 5
S: Did you use the transcripts?
R12: Yes...I like to read the transcripts because I do it with songs. I listen to the songs and I sing along with the transcripts, in that way I know exactly what I am saying. I mean singing.

On the one hand, transcripts were used in two situations, to verify information after questions in the exercise were answered, as was the case of participant No.14 who is a FD learner (segment 6), or to understand the lecture more clearly before answering questions, as in the case of participant No. 15, a field independent learner (segment 7).
Segment 6
R: Did you use the transcripts?
S14: Yes, I like to answer questions first and then see the transcripts because I want to be sure my answers... is right

Segment 7
R: Did you use the transcripts?
S15: A little bit, I didn’t read the whole transcript...only one part because I did not know the answer for a question...

On the other hand, both FD and FI learners according to the GEFT reported that they did not use transcripts largely because they found it difficult to keep up with two types of information at the same time, that is, watching a video while reading the transcript, as exemplified in segments 8 and 9.

Segment 8
R: Did you use the transcripts?
S18: I tried.... but...umm.. It is difficult to see the video and read... it is too much for me...

Segment 9
R: Did you watch the video?
S20: No, because I don’t like to read the transcripts.... If there is a video want to watch it and listen...no, I don’t like to read.

Findings also suggest that in listening tasks, the dictionary is a less frequently used help facility. One of the explanations for this may be purely technical in nature, i.e. students could view the glossed words only when they opened the transcripts. It may also be speculated that the delivery pace of the lecture and language skill were important factors, as pointed out by participants.20 who is a FI learner (segment 10) and by participant 5 who is a FD learner (segments 11).

Segment 10
R: Did you use the dictionary in ALO?
20: No, only when I am reading I like to check the words in dictionary... when I listen is very difficult.
Segment 11
R: Did you use the dictionary in ALO?
S5: No... when you listen the lecture is very fast and you have no time to check the dictionary.

Preferred media tools and help options of FD and FI learners as measured by the FD/I CALL cognitive style questionnaire

Results on the questions that investigated the preferred media tools and help options of FD and FI learners as measured by the FD/I cognitive style questionnaire show that both FD and FI learners identified the video as the preferred media tool. This is evidenced by the number of times students used the video as the main source of input.

Table 4.8. Mean number of times FD and FI students, as measured by the FD/I CALL cognitive style questionnaire, clicked on the help aids and media tools.

<table>
<thead>
<tr>
<th>CS</th>
<th>Media tools</th>
<th>Help aids</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Video/Audio</td>
<td>Audio</td>
</tr>
<tr>
<td>FD</td>
<td>N=9</td>
<td>5.0</td>
</tr>
<tr>
<td>FI</td>
<td>N=9</td>
<td>5.3</td>
</tr>
</tbody>
</table>

Results also show that FD learners clicked the audio files more times than FI learners. A comparison of the average number of times students FD learners used the video and the audio files to the average number of times FI learners used these media tools suggests that on average, FD learners tend to rely more on the input provided by the media tools than on their own knowledge of the topic. This assumption partially supports the definition of FD/I in CALL which claims that FD learners tend to rely on external clues and FI learners tend to rely on internal clues.

FD learners more frequently clicked transcripts 0.5 more times than FI learners, who used it 1.3 times. Interestingly, the dictionary was more frequently used by FI learners (0.3) times than by FD learners (0.1) times. Although none of these results are statistically significant at the p=0.05 level, results seem to suggest that transcripts are more frequently
used by FD learners but the dictionary is more frequently used by FI learners. However, the analysis of these results is constrained by the limited number of students that used the help options, as well as the fact that only students who view the transcript could access the dictionary.

Some of the reasons for students to use or not to use the help options emerged upon examination of interview responses. For instance, transcripts helped participant No. 6, who is a FD student according to the FD/ICALL cognitive style questionnaire, to verify whether his answers were right or wrong after he completed the exercise and before he viewed the right responses as shown in segment 12.

**Segment 12**
R: Did you use the transcripts?
S6: the transcripts?
R: ....the transcripts... in the lecture... in ALO
S6: Yes, I saw the transcripts before I click the button check your answer... but I saw the transcript after I answered the questions....with the pictures of the insects.
R: you mean in the first page?
S6: Yes in the page

Findings also suggest that in the CALL-listening task examined for this study, the dictionary was a less frequently used facility. Familiarity with the topic was identified as the one factor for students not using the dictionary, as participant No. 10, who is a FD learner, pointed out (segment 13).

**Segment 13**
R: You said you used the transcript but did not use the dictionary right?
S10: yeap,
R: Why not using the dictionary then?
S10: I don’t know.... This is difficult questions.... I guess because after I read the transcripts I knew the meaning of the words, because the topic is easy, I mean understand is easy when reading
R: If it was easy then why did you use the transcript?
S10: I don’t know... umm, because I understand when I read, but listening is difficult for me...
R: I see...

An additional factor, pointed by participant No.13, suggests that the dictionary could be used to aid in the recollection of definitions of certain words.
Segment 14
R: Did you use the dictionary?
S13: Yes.. only once I think.
R Why did you use it?
S13: why I use it ?...because I was... because I don’t know, I mean I do not remember, well... it is more difficult to remember the words if I don’t use the dictionary.

At this point, video was pointed as the preferred media tool of both FD and FI learners no matter what instrument was used to assess FD/I in CALL. However, preferred help options of FD and FI learners seem to be contradictory depending on the instrument used to assess FD/I in CALL. Further comparison of students results to the identified patterns of on-line behavior, which will be explained more fully in the next section, seems to indicate that FD learners prefer using the transcripts, while FI learners prefer using the dictionary. FI learners seem to use the dictionary as a way to make sure they know the meaning of the words. Perhaps learning vocabulary from context, which in this particular case is provided through the transcripts, does not directly address these students' cognitive styles. It is important to recognize that this assumption needs to be further explored with a larger number of participants and may only apply to students in this sample.

One of the limitations in answering this question is that although time logs were available, the information provided by the tracking system used for the current study does not provide information as to whether students actually listened to the whole video segment or if it was stopped at any time. Some type of screen capturing device such as Camtasia studio would be necessary to gather this type of data.

In conclusion, the limited use of help options as exhibited by students may be attributed to the lack of knowledge of how they work, but most importantly, in the limited awareness of how its use can assist them in interacting with the learning materials more fully.

Patterns of behavior of FD/I learners in CALL-based listening activities

To answer question No. 4 about the patterns of behavior that FD and FI students followed, three patterns were identified by observing the behavior students exhibited when working with the activity, as summarized in Table 4.9.
Table 4.9. *Identified patterns of behavior of FD and FI learners*

<table>
<thead>
<tr>
<th>Pattern 1</th>
<th>Pattern 2</th>
<th>Pattern 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Learner interacts with the input, does the exercise without using help aids.</td>
<td>Learner interacts with the input but does not complete the comprehension exercises.</td>
<td>Learner interacts with the input and completes comprehension exercises using help aids.</td>
</tr>
</tbody>
</table>

In the first pattern, the learner interacts with the input, that is, he/she watches the video and/or listen to the audio file, then completes the exercise without using the help aids included in the activity. This type of pattern suggests that the learner relies primarily on the input before doing the exercise. Working with the exercise, at the same time, helps the learner verify and confirm understanding of the learning materials. This type of behavior may be associated to FI learners, given their tendency to rely on internal clues.

In pattern No. 2, the learner interacts with the input, that is, he listens to the audio and/or watches the video, but no response is expected. In other words, no attempt is made to check comprehension of the input. This pattern suggests that the learner does not use exercises to confirm understanding of the input, but solely relies on his own judgment of how much he/she has understood, a behavior consistent with FI learners.

As for pattern No. 3, the learner interacts with the input, uses the help aids, (transcript and/or dictionary) and completes the exercises. This pattern suggests that in using the transcripts, and/or the dictionary, the learner is making use of modified input either to confirm his answers after he has completed the exercises or to check for understanding before completing the exercise. This type of behavior, based on the definition of FD/I posited for the current study, may be hypothesized for FD learners.

Participants’ patterns of behavior were identified for each activity they were asked to complete and are summarized in Table 8. This table also includes students’ results on the GEFT and on the FD/I CALL cognitive style questionnaire. Pages or activities are identified by number, thus, OS1 means page 1 in the On stage section, OS2 should be interpreted as page 2 in the On stage component of ALO. The numbers 1, 2, and 3 correspond to the
identified patterns that are presented in Table 4.10. For instance, participant No.19 exhibits patterns No. 3, 1, 1, and 1. According to the hypothesis, his pattern of behavior suggests that this participant tends somewhat towards the FI end of the continuum.

*Table 4.10. Patterns of behavior identified by participant and by page.*

<table>
<thead>
<tr>
<th>Subject #</th>
<th>FD/1 CALL</th>
<th>GEFT</th>
<th>ages in AL</th>
<th>OS2</th>
<th>OS3</th>
<th>OS4</th>
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</thead>
<tbody>
<tr>
<td>1</td>
<td>15</td>
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</tbody>
</table>

*Note.* OS = On stage. OS1 = On stage page 1. N.A. = No information available for this participant 1, 2, & 3 = Patterns students followed.

After individual patterns were identified, logistic regression analysis between FD/I and the overall identified pattern was performed. This type of analysis is used when the independent variables are on a continuum and the dependent variable is a proportion ranging from 0 to 1. For the current analysis, FD/I as measured by the GEFT scores and the FD/I CALL cognitive style questionnaire provide the independent variables, and the use of identified patterns serve as the dependent variables. Since not all students used the same
number of pages this type of calculations was needed. The proportion of use of the pattern can be better explained by the following formula:

\[
\frac{\text{# of times the pattern was observed}}{\text{# of pages students went through}}
\]

In addition, logistic regression was performed between FD/I, as measured by the GEFT and the proportion of FI/FD patterns exhibited by each individual in the four pages, which the tracking system identified.

Figures 4.5-4.7 show the logistic regression between the GEFT and the rate of each pattern as well as between the FD/I CALL questionnaire and the rate of patterns.

**Pattern No. 1**

Results for this pattern show no relationship between pattern 1 (*learner interacts with the input but does not use help aids*) and the GEFT. This result may be better explained based on Chapelle and Green’s (1992) suggestion that the GEFT only measures the restructuring ability component. Moreover, this aspect of the construct measured resembles “more an ability than a style” (p. 52). Since the patterns identified show the processes students actually followed when working in the CALL activity, that is “how” they worked and not “how well” they worked, this relationship was to some extent expected.

In contrast to the findings regarding the relationship between pattern 1 and the GEFT, the relationship between pattern 1 and the FD/I CALL cognitive style questionnaire is positive. That is, people who scored high in the FD/I CALL cognitive style questionnaire showed a stronger tendency to use pattern 1. Although this relationship in principle exists, it is not statistically significant (p=0.1) at the p=0.05 level. The FD/I CALL cognitive style questionnaire used items that inquired about students preferences when using computers for language learning, that is, it inquired “how” they worked with computers, the positive relationship between students patterns and the scores of the questionnaire. This suggests that this instrument, although not highly reliable, seems to be measuring the processes students
follow when they work rather than how well they work, a good indication that the questionnaire design is heading in the right direction.

Figures 4.5. Logistic regression analyses between rate of use pattern 1 vs. GEFT and pattern 1 vs. FD/I CALL cognitive style questionnaire.

Pattern No. 2

For pattern No. 2, defined as: *Learner interacts with the input but there is no response*, which may be associated to FI learners, logistic regression analysis (Figure 4.6) suggests that on the one hand, there is a negative relationship between pattern 2 and FD/I as measured by the GEFT. That is, people who scored high on the GEFT showed a lower tendency to follow pattern 2. On the other hand, a slightly positive relationship between pattern 2 and FD/I as measured by the FD/I-CALL based questionnaire is observed, but this relationship is not statistically significant (p=0.636) at the level of p=0.05 level. These
findings once again seem to confirm the assumption that the GEFT is measuring something different than how students work. However, this assumption needs to be further explored and validated. The slightly positive relationship between the FD/I CALL questionnaire and pattern 2 may be explained in two ways. The limited number of times students followed this pattern may have influenced the results; on the other hand, perhaps pattern No. 2 should not be exclusively associated to FI learners.

Figure 4.6. Logistic regression analyses between rate of use of pattern 2 vs. GEFT and pattern 2 vs. FD/I CALL cognitive style questionnaire.

Pattern No. 3

For pattern No. 3 defined as: Learner interacts with the input and completes comprehension exercises using help aids, which has been hypothesized for FD learners, logistic regression analysis between pattern No.3 vs. the GEFT results and the FD/I CALL
cognitive style questionnaire were performed as illustrated in Figure 4.7. Results for this analysis suggest a negative relationship between FD/I as measured by the GEFT and a positive relationship between FD/I as measured by the FD/I CALL cognitive style questionnaire. That is, people who exhibited a tendency towards FD based on the results of the FD/I questionnaire showed tendency to follow pattern 3. This positive relationship may be meaningful (p=0.06), even if not significant at the p=0.05 level.

The findings for these sets of analysis, once again corroborate the inefficacy of the GEFT to measure the process students follow. In addition, this finding partially meets the hypothesis that FD learners may use more frequently help aids.

*Figures 4.7. Logistic regression between rate of use of pattern 3 and GEFT and pattern 3 and FD/I CALL cognitive style questionnaire.*
A pattern emerged from the three pairs of logistic regressions calculated for the three identified patterns of on-line behavior and the two measures of FD/I (the GEFT and the FD/I CALL cognitive style questionnaire). That is, when the three patterns were compared to the GEFT scores, the relationship was either neutral or negative, and when they were compared to the FD/I CALL cognitive style questionnaire, the relationship was positive. This seems to indicate further that the GEFT measures something other than “how” students work, and that the FD/I CALL cognitive style questionnaire relates more to “how” students work. This finding may suggest that the creation of an instrument that assesses FD/I in CALL may be heading towards the right direction. The lack of statistical significance also suggests that none of the patterns should be exclusively associated to FD or FI learner, but FD learners show a stronger tendency to use them. This statistical significance may have been affected by the small number of participants.

Conclusion

In this chapter I have presented and discussed the results for the four questions posited for this study. The findings for the first question, regarding the reliability and construct validity of the FD/I CALL cognitive style questionnaire, suggest that the questionnaire should be reviewed, and most importantly, that it should be used with a larger number of participants from a more heterogeneous group, that is, a group of participants who are likely to vary on the degree of FD/I and language backgrounds. Findings for the second question suggest that FD/I, as measured by the GEFT or by the FD/I CALL cognitive style questionnaire, does not relate to performance in CALL-based listening activities. Question number 3 suggests that video is the preferred media tool by both FD/I learners, but FD learners rely on video as the main source of input. FD learners use transcripts more frequently than FI learners, and FI learners use more frequently the dictionary. Finally, the findings for question 4 suggest that of the 3 identified patterns of behavior, no pattern should be exclusively associated to FD or FI learners.
CHAPTER 5. CONCLUSIONS

With the increasing number of listening materials that appear day after day in the Internet and with the rapidly growing access that second language learners have to these materials, the new paradigm posed for CALL researchers, practitioners, and instructional website designers include the understanding of how such materials can better address students with different cognitive styles. This study examined performance of FD and FI learners in CALL-based listening activities along with the preferred media tools, help options and patterns of behavior. To identify students as FD or FI a 30 item–questionnaire was designed and validated. The findings presented here shed light on a topic.

Findings

The first research question examined the design and validation of a 30-item questionnaire that assessed FD/I in the context of CALL. Findings suggest that although the FD/I CALL cognitive style questionnaire is a better predictor of FD/I in CALL than the GEFT, it should be used cautiously in CALL research until its validity and internal consistency are improved. Before researchers attempt to use the FD/I cognitive style questionnaire for studies in CALL, several steps must be taken: the questionnaire needs to be further analyzed, items should be reviewed, the three aspects of FD/I should be more clearly identified through the questions, a more heterogeneous sample should be used to validate the questionnaire, and most importantly, students should be guided to reflect on the choices they make when using computers for language learning before completing the questionnaire. If these suggestions are followed, I see the results presented here as a stepping-stone from which future CALL researchers and practitioners can base further research on the topic of cognitive styles and CALL.

The questionnaire, as presented in this study, serves as a concrete tool to familiarize students with the topic of learner’s differences, and more specifically with the topic of FD/I in CALL. This instrument can be used to lead students toward a “more heightened understanding and appreciation of their individual learner’s characteristics” (Kinsella, 1995: 187). As the results obtained after its administration are interpretable with respect to the task.
developed in the language classroom in which computers are used as a learning tool, the present questionnaire may prove "useful in the classroom" (Reid, 1990: 387).

The second question investigated the relationship between FD/I and performance in CALL-based listening activities. Findings suggest that there is no relationship between performance and FD/I as measured either by the GEFT or by the FD/I CALL cognitive style questionnaire. These findings partially support other studies that have examined performance of FD and FI learners in other skills. For instance in a study reported by Raschio (1990) that investigated performance of FD and FI learners in grammar activities when students were asked to learn the direct and indirect objects in Spanish, it was found that there is no correlation between FD/I and performance in grammar. It also contradicts a more recent study that examined the effects of linking structure type and FD and FI on recall of oral information (Lin & Davidson Shivers, 1996). It seems that results on performance of FD and FI independent students does not only depend on the cognitive style but also on other variables such as level of proficiency, language skill (reading, writing) under examination, type of task that is assessed, and time observed. All of these are factors that the current study did not take into account.

The third question examined the preferred media tools and help options of FD and FI learners. Findings suggest that students preferred using media tools but did not use the help options much; video/audio was identified as the preferred media tool of both FD and FI learners, but FD learners tended to rely slightly more on the visual input presented through videos. As for preferred help options, FD learners used transcripts more frequently than FI learner but FI learners used the dictionary more frequently. One of the main reasons for not using the dictionary may be the website design. Perhaps the results would have been different if Dictionary use had not been limited to students who made use of the transcripts.

The fourth and last question, examined the patterns of behavior of FD and FI learners. Comparison of students' patterns of on-line behavior with the two measures of FD/I used in this study, the GEFT and the FD/I CALL cognitive styles questionnaire showed that on the one hand, patterns 2 (learner interacts with the input but there is no response) and pattern 3 learners interacts with the input and completes comprehension exercises using help aids) correlate negatively with the GEFT, and between pattern 1 (learner interacts with the input
but does not use help aids) and the GEFT there is no correlation. On the other hand, the three patterns observed correlated positively with the FD/I CALL cognitive style questionnaire.

Although none of the estimates of correlation is statistically significant at the 0.05 level, this finding seems to support previous observations made by SLA researchers, (Chapelle and Green, 1992; Brown, 1987) that pointed out that the GEFT measures only one aspect of the cognitive style definition: the cognitive restructuring skills. It also supports the observation that what the GEFT measures “resembles more an ability than a style” (Chapelle and Green, 1992) because students are scored on the number of correct answers; that is “how well” they completed the questions rather than the processes they followed to complete it, that is “how”. The positive relationship found between the FD/I cognitive styles questionnaire and the identified patterns of on-line behavior might be interpreted as initial evidence that efforts to create an instrument that assesses FD/I in CALL may be heading in the right direction.

The findings presented for this study may guide future researchers on the type of design and the type of data they need to obtain to improve the questionnaire and offers CALL practitioners and researchers a topic for research that needs to be further explored.

**Implications**

Cognitive style of FD/I is an elusive topic. A topic which most teachers and researchers recognize as they perceive the different ways in which people approach learning, yet it remains intangible. It is evidenced by certain attitudes or tendencies learners display when interacting with learning materials. Unfortunately, it seems that these tendencies in the perception of students are not always clear. Perhaps students themselves are not aware of the types of choices they make when using computers for language learning, which tends to complicate the assessment of cognitive styles in CALL. To overcome some of these problems a number of suggestions can be followed before the questionnaire is actually administered:

- Students should be familiarized with the topic of learner differences. Students should be aware that there is no a better style, just different styles and that people draw on the strategies that best address their own style.
- Instructors should make sure that students can relate the questions presented in the FD/I CALL questionnaire to existing software and/or instructional websites devoted for language learning. It may be the case that the software used by the instructor at the time to administer the questionnaire only covers some of the language skills the questionnaire inquires about. If that is the case, expose students to a variety of software to help them better understand and become aware what type of software they can benefit the most from.

- Students should be given enough time to complete the questionnaire. There is no need to hurry and sufficient time should be given to student to reflect on the questions presented in the FD/I CALL questionnaire.

- The instructor should remind students that in some questions, the two options presented may seem to apply, but that they need to choose the option that applies more frequently.

- The questionnaire should be given to students in a class context. The instructor should be available to help students, in case someone does not understand some of the questions.

Implications of this study also suggest that, the GEFT should not be used as a tool to assess FD/I in the context of CALL. Evidence reported in this study suggests that this test is not measuring “how” students work with the learning materials, but instead “how well” students work with them. Although the FD/I CALL cognitive style questionnaire is presented as an attempt to measure FD/I in CALL, it appears that its design is heading in the right direction.

The tendency exhibited by participants in this study to not to use help, may indicate that students lack familiarity with the potential benefits of help functions. Subsequently, teachers clearly need to provide guidance on help use and how it potentially may assist learners in the understanding of the learning materials. Grgurovic (2005) suggests two forms in which help use could be prompted by teachers. Following her view, in-class help use should be promoted by guiding students on using the transcripts, and subtitled digital video.
Out-of-class help use should be prompted by suggesting that students watch subtitled TV programs, movies on DVD, etc., as a way to help students improve their listening skills.

That both FD and FI learners prefer video presentation of materials rather than audio presentation of materials provides software designers with evidence that second language learners find video more appealing. It seems reasonable to suggest that video should be included in CALL materials as a way to motivate students, to address their learning preferences and to address both FD and FI learners.

That dictionary is preferred by FI learners in this study posit a new issue for designers to address: The creation of a dictionary that addresses both FD and FI learners. FI learners may feel more comfortable by clicking on words previously glossed and displayed through links but FI students may feel constrained to what the computer tells them they need to learn, rather than what they feel they need to learn, with this type of design. Linking existing online dictionaries where students can search the words they feel they need to understand and linking words directly to those dictionaries might be one of the solutions.

Limitations of the study

If this study were to be replicated, several technical and non-technical issues should be addressed to improve the study. Among the technical issues to be addressed, both the website and the tracking system should be revised.

First, access to glossed words should not be limited to students who only view the transcripts. Instead, the dictionary should be provided as a separate help option available through a separate button that gives access to the list of words glossed from each transcript.

Another change that would facilitate both the data collection and the navigation patterns of the website is the use of frames instead of layers. In general, it is quite difficult to predict where layers may appear, even if the screen sizes of the monitors are identical. Students' tendency to adjust the screen size to suit their needs made the interpretation of results difficult since the tracking system provided the location where students clicked, yet this location varied depending on the established screen size.

In addition to these changes, I would also recommend that data from the tracking system should be complemented with data obtained by using a screen-capturing device. This
would be beneficial in the case that the tracking system does not offer enough information, as occurred in the current study, in which no information on the number of times students listened to the lecture was provided.

Some of the non-technical limitations encountered in this study include the number of participants, number of tasks tracked, lack of variation in cognitive styles, time allotted to collect data, and format in which the post-test was presented.

The number of participants for the second component of this study was quite limited (20). Moreover, the fact that most of the students came from similar language and cultural backgrounds, that is, the sample was quite homogeneous, likely affected the analysis of the questionnaire and both the identification of preferred media tools and help options. The number of activities used to track students' on-line behavior was quite limited. Further research could observe a higher number of tasks over longer but repetitive periods of times. It seems quite “risky” to draw conclusions on on-line patterns of behavior based on the observation of what students do in one sitting, especially when investigating a complex topic such as FD/I in CALL.

More time should be allotted to collect data. During the data collection I felt that students had to run through a number of tasks without really understanding what was expected of them. It seemed that they did not have time to process an activity when they were asked to do something else immediately. For instance, on the first day of the data collection, I felt students had not recovered from taking the GEFT when they were asked to start working with the Get ready section in ALO; later, they were not even familiar with the exercises in ALO when they were asked to complete the FD/I CALL cognitive style questionnaire. On the second day of the data collection, they had to finish the exercises, take the test and then be interviewed. All of these activities proved difficult to accomplish in 50 minutes for both the researcher and for the students.

Additionally, the fact that the data collection was embedded in the course but students were not given additional credit for it may have influenced their motivation. Moreover, the fact that the data was collected at the end of the semester, when students were getting ready to take final exams, may have also influenced the results.
Finally, one of the main factors that influenced the results of the investigation of how FD/I relates to performance is the format in which the post-test was presented. Perhaps results would have been different if comprehension of the academic lecture had been assessed using some other type of format.

Personally, in retrospect, I regret that my limited interviewing skills may have affected the outcomes of this study. When I began reviewing audiotapes of the interviews, it seemed to me that during the interview sessions, I was not listening to what students had to say, but instead, I was much more concerned about eliciting answers to all of the questions. I felt that if I had asked more follow-up questions when students were answering some of the interview questions, or perhaps worded the interview questions differently, I could have explored more deeply the reasons students reported for using or not using the help options.

**Suggestions for further research**

Once the construct validity and reliability of the FD/I CALL cognitive style questionnaire is improved, the questionnaire could be used to investigate a number of aspects in CALL. One of them would be feedback in CALL. It would be interesting to investigate the preferred types of feedback of FD and FI learners, how learners in each trait interact with feedback, and how feedback helps them gain knowledge in the L2. It would be also interesting to explore preferred help options of FD and FI learners by giving students more options (subtitles, feedback) and by observing student work in a different language ability (reading or grammar).

Another aspect that in my view needs to be researched is finding some of the reasons for students not using help options. Such inquiry may provide clear parameters to design strategic training and raise second language learners awareness on how help use can contribute to language learning.

This study has reported findings that seem to support previous literature in cognitive styles and raised some other issues. However, it must be noted that research on cognitive styles in CALL is a new avenue not widely investigated; much still awaits exploration.
APPENDIX A. 30-ITEM FD/I CALL-BASED COGNITIVE STYLES QUESTIONNAIRE

I. Personal Information
Answer the following questions using your personal information.

Nationality
Sex: Female ___ Male ___
How long have you been in the US? ______ months ______ years.
How long have you studied English?
   Elementary school ______ years
   Junior high school ______ years
   Senior high school ______ years
   College in your home country ______ months ______ years
   College in the USA ______ months ______ years
   Other ______ which one? ______

II. FD/I Questionnaire

Objective
This questionnaire will help you identify your cognitive styles when learning language through computers.

Directions
For each of the questions below circle either "a" or "b" to indicate your answer. Please choose only one answer for each question. If both "a" and "b" seem to apply to you, choose the one that applies more frequently.

General

1. Using computers to learn a language seems more attractive if
   a. you decide on the type of exercises you want to work on.
   b. the computer guides you and suggests what exercises to do.

2. You prefer working with software intended for language learning that
   a. requires you to complete all the exercises.
   b. allows you to skip some exercises.

3. You prefer working with software intended for language learning that
   a. includes help aids (e.g. transcripts, dictionary, etc.)
   b. has no help aids.

4. You would prefer working with software intended for language learning that includes
   a. topics you are familiar with.
   b. topics that are new to you.

5. When working with software intended for language learning you prefer
   a. working alone.
   b. working with a human tutor.

Listening

1. If you do not understand a part of an on-line lecture, you most likely would
   a. read the transcripts while you listen to the lecture.
   b. listen to the lecture again, before using the transcripts.
2. In class, if you don't understand a listening comprehension exercise you most likely would
   a. ask your classmate/teacher to explain it.
   b. check the transcripts.

3. When listening to lectures, you prefer
   a. lectures on topics you are familiar with.
   b. lectures on topics that are new to you.

4. After listening to an on-line lecture, it is most likely that you will remember
   a. concepts explained through examples
   b. concepts explained by definitions.

Reading

1. When reading on-line texts, you prefer
   a. readings on topics you are familiar with.
   b. readings on topics that are new to you.

2. In a reading assignment for a class, it is most likely that you would read
   a. what you have been asked to read even if you know about the topic.
   b. what you consider you need to read.

3. When reading a text on a topic you are not familiar with, it is most likely that you would
   a. use the dictionary to better understand the text.
   b. not use the dictionary.

4. After reading an on-line text for a class assignment, it is most likely that you would
   a. talk about it with a classmate to clarify some ideas.
   b. trust your own understanding of the text.

5. When reading an on-line text for pleasure, it is most likely that you will
   a. focus on the specific details.
   b. try to get the general idea of the text.

Writing

1. When taking notes based on a lecture you most likely would
   a. write down your own ideas about the content of the lecture.
   b. write down excerpts of the content of the lecture.

2. When writing a report based on a lecture, it is most likely that you would
   a. highlight your opinion about the content of the lecture
   b. provide a description of the content of the lecture.

3. When you are writing a report based on a lecture and the computer indicates that you have
   made a grammar or spelling mistake, it is most likely that you would
   a. use some of the help options provided by the computer
   b. try to correct the mistake on your own.

4. If you don't know how to spell a word when writing a report based on a lecture, you most
   likely would
   a. ask the person besides you to spell it for you.
   b. look it up in the dictionary.

Vocabulary

1. If you want to know the meaning of a new word, you most likely would
   a. look it up in the dictionary.
   b. not look it up in the dictionary.
2. If you don't know the meaning of a word, you most likely would
   a. ask a classmate or the instructor for the meaning.
   b. look it up in the dictionary.

3. If you encounter a word that you are not familiar with, you most likely would
   a. stop reading and look it up in the dictionary or in any other help provided by the computer.
   b. keep on reading and get the meaning from the context.

4. After learning a new word, you most likely would
   a. try to use the word as much as possible.
   b. not use the word unless you are completely sure when to use it.

5. You are more likely to remember the meaning of a word if
   a. you read the definition of the word.
   b. you read a phrase where the word is used.

6. You are more likely to remember
   a. words presented in context.
   b. words presented in vocabulary lists.

**Grammar**

1. If you suspect that a grammar based answer is wrong, you most likely would
   a. use the help option to figure out what the mistake might be before checking it.
   b. try again without using any help from the computer.

2. During a writing class where you are working with computers, if you are not sure a sentence is grammatically correct, it is most likely that you would:
   a. ask a classmate to check it for you
   b. use the grammar checking tool provided by the computer program.

3. When working with grammar exercises, it is most likely that you would
   a. start working with easy grammatical exercises.
   b. start working with more challenging grammatical exercises.

4. If after receiving computer-generated feedback you discover that a grammar answer you entered is incorrect you most likely would
   a. try as many times as necessary until you get it right.
   b. try one or two more times and then use the check answer option.

5. If the computer shows that a sentence you wrote is grammatically incorrect, it is most likely that you would
   a. use the grammar check tool.
   b. not use the grammar check tool.

6. It is easier for you to remember how to use a grammatical structure if
   a. it doesn't relate to grammar structures previously studied.
   b. it relates to structures previously studied.

7. When learning a new grammatical structure, you are most likely to
   a. try to use this structure even if you are not sure if it is right.
   b. avoid using this structure until you feel comfortable using it.
APPENDIX B. 42-ITEM FD/I- CALL BASED COGNITIVE STYLES QUESTIONNAIRE

I. Personal Information
Answer the following questions using your personal information.

1. Nationality__________________________
2. Sex: Female _____ Male_____ 
3. How long have you been in the US? _____ months _______ years.
4. How long have you studied English?
   a. Elementary school _______ years
   b. Junior high school _______ years
   c. Senior high school _______ years
   d. College in your home country _______ months _______ years
   e. College in the USA _______ months _______ years
   f. Other_______ which one?____________________

II. FD/FI Questionnaire

Objective
This questionnaire will help you identify your cognitive styles when learning language through computers.

Directions
For each of the questions below circle either "a" or "b" to indicate your answer. Please choose only one answer for each question. If both "a" and "b" seem to apply to you, choose the one that applies more frequently.

General

1. Using computers to learn a language seems more attractive if
   a. you decide on the type of exercises you want to work on.
   b. the computer guides you and suggests what exercises to do.

2. You prefer working with software intended for language learning that
   a. requires you to complete all the exercises.
   b. allows you to skip some exercises.

3. You prefer working with software intended for language learning that
   a. includes help aids such as transcripts and a dictionary.
   b. has no help aids.

4. Software intended for language learning seems better if
   a. you are given the exercises in a fixed order.
   b. you can choose the order of the exercises.

5. You would prefer working with software intended for language learning that includes
   a. topics you are familiar with.
   b. topics that are new to you.

6. When working with software intended for language learning you prefer software that
   a. gives you many different types of exercises.
   b. gives you few types of exercises.

7. When working with software intended for language learning you prefer
   ____________________________
Listening

1. In a listening comprehension exercise based on an on-line lecture, you most likely would
   a. listen to the complete lecture before answering the questions.
   b. answer questions as you listen to the lecture.

2. If you do not understand a part of an on-line lecture, you most likely would
   a. read the transcripts while you listen to the lecture.
   b. listen to the lecture again, before using the transcripts.

3. When working on a listening comprehension exercise based on an on-line lecture, it is most likely that you would
   a. read the questions before listening to the lecture.
   b. read the questions after you have listened to the lecture.

4. If you don’t understand a listening comprehension exercise when working during class time, you most likely would
   a. ask your partner/teacher to explain.
   b. look at the transcript.

5. When doing a listening comprehension exercise on a topic you are not familiar with, you most likely would
   a. read the transcripts first and then listen to the lecture.
   b. listen to the lecture first and then read the transcripts.

6. When listening to lectures, you prefer
   a. lectures on topics you are familiar with.
   b. lectures on topics that are new to you.

7. After listening to an on-line lecture, you are most likely to remember
   a. specific examples provided by the lecturer.
   b. general concepts explained by the lecturer.

Reading

1. When surfing the net, you are most likely to select readings on
   a. topics you are familiar with.
   b. totally new topics.

2. In a reading assignment for a class, it is most likely that you would read
   a. what you have been asked to read even if you know about the topic.
   b. what you consider you need to read.

3. When reading an on-line text, it is most likely that you would
   a. evaluate the authors’ point of view.
   b. trust the statements made by the author.

4. When reading a text on a topic you are not familiar with, it is most likely that you would
   a. use the dictionary to better understand the text.
   b. not use the dictionary.

5. After reading an on-line text for a class assignment, it is most likely that you would
   a. talk about it with a classmate to clarify some ideas.
   b. trust your own understanding of the text.
6. When reading about a topic you are familiar with, it is most likely that you would
a. focus on details.
b. focus on the general idea of the text.

7. When reading a text on-line it is most likely that you would
a. read the text from the beginning to the end.
b. skip parts of the text as you read along.

Writing

1. When answering questions in written form based on a lecture, it is most likely that you would
a. answer the questions using your own words.
b. use the words from the lecture to answer the questions.

2. When taking notes based on a lecture you most likely would
a. write down your impressions on the content of the lecture.
b. write down definitions about the content of the lecture.

3. When answering questions based on a lecture in writing, you most likely would
a. answer the question based on the information you got in the lecture and the previous
   knowledge you had on the topic.
b. answer the question based only on the information you got from the lecture.

4. When writing a report based on a lecture, it is most likely that you would
a. make an outline of what you want to write.
b. start writing ideas as they come to your mind.

5. When writing a report based on a lecture, it is most likely that you would
a. include your opinion on the content of the lecture.
b. provide a description of the content of the lecture.

6. When you are writing a report based on a lecture and the computer indicates that you have
made a grammar or spelling mistake, it is most likely that you would
a. use some of the help options provided by the computer.
b. try to correct the mistake on your own.

7. If you don’t know how to spell a word when writing a report based on a lecture, you most
likely would
a. ask the person besides you to spell it for you.
b. look it up in the dictionary.

Vocabulary

1. If you want to know the meaning of a new word, you most likely would
a. look it up in the dictionary.
b. guess the meaning from context.

2. If you don’t know the meaning of a word, you most likely would
a. ask a classmate or the instructor for the meaning.
b. look it up in the dictionary.

3. If you encounter a word that you are not familiar with, you most likely would
a. stop reading and look it up in the dictionary.
b. keep on reading and get the meaning from the context.

4. After learning a new word, you most likely would
a. try to use the word as much as possible.
b. not use the word unless you are completely sure when to use it.
5. You are more likely to remember the meaning of a word if
   a. you read the definition of the word.
   b. you read a phrase where the word is used.

6. You are more likely to answer vocabulary questions
   a. in the order they are presented
   b. going from the easier questions to the more difficult ones.

7. You are more likely to remember
   a. words presented in context.
   b. words presented in vocabulary lists.

Grammar

1. If you suspect that a grammar based answer is wrong, you most likely would
   a. use the help option to figure out what the mistake might be before checking it.
   b. try again without using any help from the computer.

2. If you are not sure if a sentence is grammatically correct you would
   a. ask a native speaker to proofread it for you.
   b. use the grammar checking tool provided in your computer programs.

3. When working with grammar exercises, it is most likely that you would
   a. start working with easy grammatical exercises.
   b. start working with more challenging grammatical exercises.

4. If after receiving computer-generated feedback you discover that a grammar answer you entered is incorrect you most likely would
   a. try as many times as necessary until you get it right.
   b. try one or two more times and then use the check answer option.

5. If the computer shows that a sentence you wrote is grammatically incorrect, it is most likely that you would
   a. use the grammar check tool.
   b. not use the grammar check tool.

6. It is easier for you to remember how to use a grammatical structure if
   a. it doesn’t relate to grammar structures previously studied.
   b. it relates to structures previously studied.

7. When learning a new grammatical structure, you are most likely to
   a. try to use this structure even if you are not sure if it is right.
   b. avoid using this structure until you feel comfortable using it.
APPENDIX C. TRANSCRIPTS OF THE ACADEMIC LECTURE

“Insect Communication” by Donald Lewis

The transcript is presented in numbered paragraphs that specify the paragraph length. This allows designers and evaluators to easily identify where the information comes from.

1. (0.11) Hello and welcome. We have a lot of information to cover so we are going to get right into the topic. We are going to talk about insect communication which is one of those things not everybody would immediately think of as something that would have to be studied, something that would have to be taught, and something that would have to be learned. In fact, the insects don’t have to learn any of these at all because they come with an innate ability to produce messages or to receive other messages and then act upon those messages. So that’s what we’re going to be looking at briefly is, how insects use communication in their success, the same way we use communications to transfer things here.

2. (0.52) We’ll talk about communication as the transferring or exchange of information. Now of course, information can mean lots of different things and we’ll talk about some of the types of messages that insects might send to one another, but communication really involves three processes:

3. (1.10) Number one is a message has to be sent that is somebody or in this case some insect is producing that message and releasing it across the space that separates him, another insect.

4. (1.27) Process number two that that message has to be received and so we are talking about equipment that not only to produce that message but also that the equipment to receive that message and especially in animal ecology and insect behavior what we are most interested in is a reaction by the individual that received that message that we sent a message for a purpose and we expect something to happen at the other end of that as a result.

5. (1.53) Well, do insects communicate? Is there communication among insects? It’s certainly a likely question that would come up and when, until you actually think about what it actually takes to be an animal, what it takes to be a successful animal this may not have occurred to you. But of course insects have been very successful. They have been here on earth for approximately three hundred and fifty million years and we now know that there’s over a million seventeen thousand different species of insects. So they have been incredibly successful for a very long period of time and their commun...communication has been a part of that.

6. (2.26) What would one insect say to the another that could be so all fired also important and of course one of to the mind among insect communicating would be sex. Insects are mostly sexual, that is the that they exist as males and females and that’s a part of a message that has to be sent back and forward in order for mating to occur. Mating a and reproduction and is not a simple message to accomplish,
matting and reproduction what it is in that message that is sent by one and received by another is the sub message that “I am in the same species”, and of course with so many different kinds of insects that is an important part of it. There is also the message that “I am the opposite gender” and then somewhere in the exchange of messages there’d also be varied the sub message of that I “I am available” and we may refer to that in human terms as “I am in the mood” but insects are a little simpler than that and so the message would go back and forward in that regard.

7. (3.32) Another important message would be food and specially among the most advanced insects like the social insects there is a lot of communication to make sure that other members of the colony find enough to eat or find food to share with the colony, So we would see this in lots of different insects, everything from honey bees to the ants that are walking in a straight line across the your counter top are sending messages and receiving messages that are saying this way to the food.

8. (4.03) Also some insects will communicate to other members that this is good a place to hide. For example the cockroaches are frequently found hiding in fairly short or highly distinct places or fairly distinct separate places and part of that is because they are sending a message to other cockroaches that says “this is a good place to hide”, and the result of that hiding message then is that they end up frequently all in the same location.

9. (4.35) Another piece of insect communication may be danger, that some insects are communicating with other insects saying “there is a problem here”, “you have to get out of the way”, they may be saying... another part of danger is “get over here and help me” and we may see that in honey bees, when one honey bee stays other honey bees would come and visit the same location to see if there is a problem there at all. And honey bees have lost of messages that they would send to each other and not only this has to do with gathering food or maintaining the cohesiveness of that large colony or hive of insects but it also has a lot to do with the protection of the colony as they go about their business.

10. (5.20) Some insects use communication as a way of dispersion particularly “this is my territory”, “stay out of this area” because this one individuals already here and this serves to disperse the insects through the environment as well as.

11. (5.38) Those are the type of messages that would be sent, how the message is sent is equally important to us, and one of those, those four basic methods of communication is listed here. Visual where they can actually see each other, acoustic where they hear each other, tactile, where they touch each other and then chemical where they are in the process of sending chemical signals one from the other.

12. (6.05) Now, one of the methods of communication in visual communication is of course going to involve light and we know that many insects are brightly colored. And some of coloration has to do with the communication that they are sending back and forward. For example the butterflies that we see perched on flowers and
on leaves are frequently tripping their wings gradually in the sunlight, reflecting ultraviolet light up into the sky as part of their communication. We also know that some insects use bioluminescence that is the biological ability to produce light and the best known example of that would be fireflies. But other insects as well produce their own light for methods, for means of communication.

13. (6.53) Under the acoustic sometimes Insects use vibration such a tapping and shaking but of course the most common insect communication you are most familiar with would be the sounds that insects produce. Insects have lots of ways of producing sounds. It is not all done the same way. Some Insects use stridulation which is a stripping noise. Some insects actually vibrate and others use membranes and others then use the buzz of their wings or change the air pressure around them to produce various sounds.

14. (7.26) Now if we think about insects that stridulate those are making noise by stripping the best known would be the cricket and we will talk about those just for a second. But what they are strapping is actually a specialized structure of the wings and on a cricket lies one wing lies on top of the other, and on one wing there is a small... like a piece of a file and in the other wing there is a little pig that drags on across the file as the wing moves over each other, so they are rubbing a wing together and the technique will be the same things as rubbing your thumb down a comb, then you get a series of clicks. Now if we can do that as fasts as an insect moves its wings then we wouldn't hear click, click, click... we wouldn't be able to hear individual clicks but what we would hear instead is chirp which is actually hundreds of clicks per second.

15. (8.22) Now, the membranes that insect use in this would be in ...this like the cicada is essentially a drum that pops in and out such as the lid in a candy jar that makes sound when it pops in and makes another sound when it pops out. And if you just did that up to a hundred times per second, you wouldn't hear pop, pop, pop, you would hear [zzzzzz] and that is the noise we hear form cicads that are seen in the tree. So the methods of producing sound vary with the insect and those are probably the two that are most, the best known.

16. (8.58) Well, we also talked about some wing activity and some buzzes and so forth. But those are the basic methods of how that s done. Now, crickets, of course do that kind of activity, katydids sing in the trees especially in the late summer. We hear them here in Iowa usually late afternoon producing a buzzing sound and...and have lots of examples of those out there, of course and many of these are familiar to you. This would be the plain black field cricket that we would hear tripping in the last half of the summer. This is one, the katydid that we would hear cricking; making a grasping noise on the top of the trees, and the other one is the cicada that makes the buzzing sound. Now to go to an actual audiotape of one of those. The cricket, the field cricket is again one of those that make sound by tripping and would sound about like this <<<<<<< cricket sound>>>>>Again this is the sound made by rubbing wings over each other.

17. (10.12) Well, the last method of insect communication is chemical communication, and these are pheromones highly volatiles chemical that are
released outside of the body of one the insect that flow throw air and then are received and perceived by another insect. And the best known of this chemical communications are in the moth where the one moth the male... will usually the, usually the female mood releases a pheromone into the air that flies through the air and males then perceiving that pheromone will start flying and they'll pick up into the wind as a result of receiving that particular message.

18. (11.00) Insect communication is not one of these things that are simple of a course with a million of different kinds of insect varieties. There are lots of variations and varieties, and we have touched the surface on some of the major forms of communication, some of the major ways that insects do that.
APPENDIX D. POST-TEST

English 099L
Lecture: Insect communication
Name__________________________________________ Date__________________

Multiple-Choice
Directions: Circle the choice that best answers the question.

1. Why does the lecturer ask the questions “Well, do insects communicate? Is there communication among insects?
   a. He assumes the audience knows the answer so he is asking them.
   b. He wants to attract the attention of the audience before the main part of the lecture.
   c. He wants to repeat some ideas mentioned in the introduction to restate the main point.

2. What is the lecturer doing when saying "which is a stripping noise" in the sentence “Some insects use stridulation which is a stripping noise”
   a. Defining a term
   b. Giving an example
   c. Signaling the change of a topic

3. Inferring from the lecture, what is not an innate ability in all insects?
   a. To produce messages
   b. To react upon the messages they receive.
   c. To maintain the cohesiveness of the community.

4. According to the lecture, “mating” can be achieved when insects react upon messages that refer to
   a. Food and shelter
   b. Sex and reproduction
   c. Dispersion and danger

5. The lecturer states that one of the reasons for cockroaches to end up in the same location is that
   a. The message sent indicates that "a particular place is a good place for hiding"
   b. They are social insects
   c. They want to maintain the cohesiveness of their community.

6. Which of these topics was not deeply explained in the lecture?
   a. Communication process among insects
   b. Methods of insect communication

7. The dispersion of insects through the environment is a natural way of:
   a. Maintaining the cohesiveness of a community.
   b. Helping in the reproduction process of some types of plants.
   c. Protecting the colony or some members of a particular colony.
8. “Butterflies tripping their wings in the sunlight” would be a clear example of
   a. Visual communication
   b. Acoustic communication
   c. Chemical communication

9. Cicadas and crickets communicate by:
   a. Tripping their wings
   b. Strapping their wings
   c. Popping their wings

10. Shaking and tapping are examples of
    a. Visual communication
    b. Acoustic communication
    c. Chemical communication

11. One of the examples used by the lecture to illustrate the acoustic method of
    communication in insects is:
    a. Fireflies
    b. Crickets
    c. Moths

12. Changing the air pressure and using their membranes are methods of
    a. Visual communication
    b. Chemical communication
    c. Acoustic communication

13. Vibration and stridulation are two types of
    a. Visual communication
    b. Chemical communication
    c. Acoustic communication

14. Bioluminescence is a method of:
    a. Visual communication
    b. Chemical communication
    c. Acoustic communication

15. According to the lecture, katydids communicate by:
    a. Singing in the trees
    b. Releasing pheromones
    c. Reflecting their wings in the sunlight.
APPENDIX E. ORAL INTERVIEW

Name ________________________________

1. In your 099L class, how do you feel more comfortable, working alone or working in groups? Why?

2. Did you work on ALO before coming to class? When was it the last time you worked with it?

3. How difficult was it for you to understand the lecture?

4. Were you familiar with the topic “Insect communication”?

5. After you listened to the lecture insect communication, what can you remember easily, some of the concepts explained by lecturer or some of the examples he used to explain?

6. Did you use the transcripts? How often?

7. Did you check the words on the dictionary? How often?

8. Did you take notes while listening to the lecture?

9. After reading the transcripts and there was a word you were not familiar with, did you click on the word to know the meaning or just keep on reading to get the meaning from context?

10. Do you think the post test was difficult?
APPENDIX F. 42-ITEM FD/FI-CALL COGNITIVE STYLES
QUESTIONNAIRE REPORT

Name_________________________________________ Class__________________

You scored ____ in the Field dependent/Field independent questionnaire.

I. Learner types

Field dependent students are portrayed as holistic learners. They are more attentive to social information, and they value friendship highly. These types of learners enjoy activities that involve group and team work. They get along well with people and are socially oriented. They are highly influenced by structure and format.

Field independent learners are more analytic. They are independent and quite individualistic. They prefer working alone and are usually risk takers. These learners establish distant relationships and are generally reserved.

Remember: There is not a “good” or a “bad” cognitive style, every individual has a singular way to approach problem solving and that is what makes us unique. The ideal language learner is the one that uses strategies of both learning styles.

II. Results interpretation

The closer your score gets to zero (0) the tendency will fall towards the field independent end of the continuum. The closer your score gets to 42 the higher the tendency to fall towards the field dependent end of the continuum. Being field dependent or field independent is not a matter of being a better or a worse student; it is just a matter of being different.

If your score is lower than 21 you tend to be field independent...

Congratulations! Being a field independent student has lots of advantages when learning a foreign language, especially when achievement is measured through grammar and vocabulary tests. But learning a foreign language requires more than learning grammar rules and vocabulary, it also requires using those rules in real situations with a certain level of confidence. Here are some strategies that may help you improve your performance:

Get involved in activities that require group or team work.
Look for opportunities to talk to native speakers outside of the classroom.
Details are important, but sometimes it is better to have a general picture of the topic.
If your score is higher than 21 you tend to be field dependent...

Congratulations! Being a field dependent student has lots of advantages when learning a foreign language, especially when achievement is measured through role plays and activities that require group work, but learning the grammar rules and vocabulary accurately also helps to make sure the person we are talking to is understanding what we mean. Here are some strategies that may help you improve your performance:

Spend more time analyzing tasks.
Challenge yourself to use words and structures you are not familiar with.
When reading or listening to academic lectures, pay more attention to details.
APPENDIX G. LOGGING DIRECTIONS TO MYIOWASTATE PORTAL

Dear student,

Before we actually start working with Academic Listening On line “ALO” website, it is important that you get familiar with the “Portal” that we will be using. My Iowa State Portal is a platform that allows ISU students (undergraduate and graduate) to share files and interact and collaborate with their peers in a professional and scholarly manner. If you want to read more about this, you can visit the link: http://www.public.iastate.edu/~rema/eDoc/homepage.html

Remember: It is important that you enter the portal before coming to class and get familiar with the layout, this will help you feel more comfortable in class and that will help me save time that can be used for some activities that I have also planned.

Directions to enter the portal:

1. Go to https://portal.iastate.edu:9081/uportal
2. Look for the log in button that appears on the top bar (the bar that has the ISU logo) on the right.
3. Enter your net ID and password. The net ID and password are the same you use to check your mail using “webmail”.
4. Once you enter the portal, you will see four blue tabs namely: Home, Community, Academics, and Personal.
5. Find Personal and click on it.
6. A channel called “Portfolios” will appear. There will be no files in this portfolio because this is the first time you enter the portal.
7. Find “others” and click on it.
8. A file called “Testing ALO” will be shown. Click on it to enter.

If you have any problems do not hesitate to contact me.
Monica Stella Cárdenas Claros
monena@iastate.edu
I. Learner types

Field dependent students are portrayed as holistic learners. They are more attentive to social information, and they value friendship highly. These types of learners enjoy activities that involve group and team work. They get along well with people and are socially oriented. They are highly influenced by structure and format.

Field independent learners are more analytic. They are independent and quite individualistic. They prefer working alone and are usually risk takers. These learners establish distant relationships and are generally reserved.

Remember: There is not a "good" or a "bad" cognitive style, every individual has a singular way to approach problem solving and that is what makes us unique. The ideal language learner is the one that uses strategies of both learning styles.

II. Results interpretation

The closer your score gets to zero (0) the tendency will fall towards the field independent end of the continuum. The closer your score gets to 30 the higher the tendency to fall towards the field dependent end of the continuum. Being field dependent or field independent is not a matter of being a better or a worse student; it is just a matter of being different.

If your score is lower than 15 you tend to be field independent...

Congratulations! Being a field independent student has lots of advantages when learning a foreign language, especially when achievement is measured through grammar and vocabulary tests. But learning a foreign language requires more than learning grammar rules and vocabulary, it also requires using those rules in real situations with a certain level of confidence. Here are some strategies that may help you improve your performance:

- Get involved in activities that require group or team work.
- Look for opportunities to talk to native speakers outside of the classroom.
- Details are important, but sometimes it is better to have a general picture of the topic.
If your score is higher than 15 you tend to be field dependent...

Congratulations! Being a field dependent student has lots of advantages when learning a foreign language, especially when achievement is measured through role plays and activities that require group work, but learning the grammar rules and vocabulary accurately also helps to make sure the person we are talking to is understanding what we mean. Here are some strategies that may help you improve your performance:

Spend more time analyzing tasks.
Challenge yourself to use words and structures you are not familiar with.
When reading or listening to academic lectures, pay more attention to details.
APPENDIX I. QUESTIONS CHANGED

The questions in this section were paraphrased, that is, a word or an expression was changed and the question or any of the choices were reformulated. Each question is presented with a letter and a number. The letter stands for the section of the questionnaire, and the number corresponds to the number of question within that section. Thus L7 should be interpreted as question number 7 in the listening section.

L7 After listening to an on-line lecture you are most likely to remember
   a. specific examples provided by the lecturer
   b. general concepts explained by the lecturer

In this question options a. and b. were paraphrased. They essentially mean the same, but the new question uses a structure that it is simpler to understand by the reader as can illustrated as follows:

   concepts explained through examples
   concept explained through definitions

R1. When surfing the net, you are most likely to select readings on topics:
   a. you are familiar with
   b. totally new topics.

"When surfing the net” was replaced by “when reading on-line texts”. The first phrase gives a general idea of what a user will do, but it talks about selecting but no reading. The second phrase provides the reader with a specific context.

R6. When reading a topic you are familiar with, it is most likely that you would
   focus on details
   focus on general ideas of the text

The word focus is quite strong, and it is mostly used when you look into details more carefully as when you search for specific information. For this reason, the word focus in choice b. was replaced by the expression, “try to get” which would be a more appropriate expression when referring to extracting general ideas of the text.

W2. When taking notes based on a lecture you most likely would
   write down your impressions on the content of the lecture.
   write down definitions about the content of the lecture.

The choices in this question were paraphrased. They mean basically the same, but it is easier for the test taker to understand and interpret the new choices as seen below:

   write down your own ideas about the content of the lecture
   write down excerpts of the content of the lecture.

Moreover, writing down definitions may be a difficult task to accomplish given the fast-pace characteristic of most lectures. The following statements replaced

W5. When writing a report based on a lecture, it is most likely that you would:
   include you opinion on the content of the lecture.
   provide a description of the content of the lecture.
Not including one’s opinion on a report is something inevitable that is why choice a. was paraphrased. Instead of using include the statement uses “highlight”.

VI. If you want to know the meaning of a new word, you most likely would:
   look it up in the dictionary
   guess the meaning from context

Statistical analysis from the questionnaire suggested that more discrete questions were needed to obtain a higher estimate of reliability. For this reason, choice b. was replaced by “not look it up in the dictionary”. To some extent it is implied that if the student does not look it up in the dictionary, he/she is making an effort to guess the meaning from context, but the opposite cannot be argued since vocabulary items can be also presented in isolated lists.

Gr 2 If you are not sure if a sentence is grammatically correct, you would
   ask a native speaker to proof read it for you
   Use the grammar checking tool provided in the computer programs.

The question is too broad and needs to be contextualized, for this reason the initial statement was replaced by “During a writing class where you are working with computers, if you are not sure a sentence is grammatically correct, it is most likely that you would”. Moreover, choice a. seemed a little bit unrealistic, since most grammar-based writing classes are offered to non-native speakers. For this reason “native speaker” replaced by “classmate”.
APPENDIX J. QUESTIONS ELIMINATED

In the following section, a brief account of the reasons for eliminating some questions of the original questionnaire is provided. Each question is presented with a letter and a number. The letter stands for the section of the questionnaire, and the number corresponds to the number of question within that section. Thus, G4 should be interpreted as question 4 in the general section and so forth. Notice that most of the questions eliminated describe the order in which some activities are carried out, a construct that is not considered in the three-component definition of FD/FI.

G4. Software intended for language learning seems better for you if:
   a. you are given the exercises in a fixed order.
   b. you can choose the order of the exercise.

Whether students display preference for working on exercises given in a fixed order or at random, does not provide clues of students' cognitive styles, it provides instead clues on the preference for guided or not guided learning.

G6. When working with software intended for language learning you prefer software that
   a. gives you different types of exercises
   b. gives you few types of exercises

The variety of exercises provided in software does not provide clues on students' cognitive styles. It may be risky to associate an individual trait to their preference for a variety of exercises. It seems that most students no matter their cognitive styles, prefer software in which activities are presented in a different format. In this way students' motivation is maintained throughout its use. Moreover, the question cannot be related to any of the three constructs, the cognitive styles of FI/D measures.

L1. In a listening comprehension exercise, based on an line lecture, you most likely would:
   a. listen to the complete lecture before answering the questions
   b. answer questions as you listen to the questions.

Although this question describes some of the choices students make when approaching listening materials, the order in which the different steps are followed, is irrelevant for the questionnaire because it does not match any of the three components of the FD/I definition. The pattern of students' behavior is a topic that is further explored in the current research for that reason this question has been omitted.

L3. When working on a listening comprehension exercise based on an on-line lecture, it is most likely that you would:
   read the questions before listening to the lecture
   read the questions after you have listening to the lecture.

Once again, the order in which some activities are performed seem irrelevant for the current questionnaire and it is not included as a component of the FD/I definition. Moreover, given the educational background of the participants and the exposure of
formal listening instruction, it is most likely that they have been trained to read the questions first and then listen to the lecture.

**R3.** When reading on an on-line text, it is most likely that you would:
   a. evaluate the authors’ point of view
   b. trust the statement made by the author

Given the sample used for this study, and the educational context they belong to, it is more likely that students evaluate the author’s point of view. It seems that most of the time, as graduate students were are required to evaluate what has been said by the interlocutor no matter the level of expertise of the author of the text.

**R7** When reading on-line texts, it is most likely that you would:
   read the text from the beginning to the end
   skip parts as you read along

This question inquires much more about strategies people use when reading, and such strategies can be called upon depending on the purpose, on the length of the test, on the readers’ familiarity with the topic and on the text difficulty.

**W1.** When answering questions in written form based on a lecture, it is most likely that you would
   a. answer the questions only using your own words
   b. use the words from the lecture to answer the questions.

It may be somewhat improbable that a learner does not use some of the words used in the lecture, or some of the expressions introduced by the lecturer. It is also improbable that the learner limits himself to reproduce what the lecturer has said without including his/her personal style to answer a question.

**W3.** When answering questions based on a lecture in writing, you most likely would:
   a. answer the question based on the information you got in the lecture and the previous knowledge you had on the topic.
   b. answer questions based only on the information you got from the lecture.

It seems a bit unrealistic, to be able to separate what you already know about the topic and the new knowledge gained through a lecture. That is the main reason for eliminating this question for the questionnaire.

**W4.** When writing a report based on a lecture, it is most likely that you would
   Make an outline of what you want to write
   Start writing ideas as they come to your mind.

Whether people prefer writing based on an outline, of if they decide just to jot down ideas, does not provide clues for FD/FI in CALL. These types of decisions mainly depend on the way students have been trained to write. Most L2 learners are familiar with the first one, since most writing classes use it to help students become aware of how certain language features (e.g. discourse markers) are included.

**V6** You are more likely to answer vocabulary questions
   a. in the order they are presented.
   b. Going from easier questions to more difficult ones.
Similar to previous questions that described the order in which some activities are carried out, this question does not provide clues that help determine whether a person displays a tendency towards either FD or FI.
APPENDIX K. REASONS FOR OMITTING SUBJECTS

- Participant No. 17 did not attend classes on the second day of data collection.
- Participant No. 21 decided that he did not want to complete the CALL-based learning styles questionnaire, arguing that it was difficult for him to recall his behavior in specific contexts.
- Participant No. 23 attended the second day, but missed the first day in which both the GEFT and the CALL-based learning styles had been administered.
- Participant No. 24 left before the post-test and the interview was administered.

These reasons are based on the summary of data collected for the participants and is illustrated as follows:

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<th>Subject No.</th>
<th>GEFT score</th>
<th>FD/FI-CALL</th>
<th>Interview</th>
<th>Post-test</th>
<th>Tracking</th>
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APPENDIX L. RENUMBERED LIST OF PARTICIPANTS

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APPENDIX M. POST-TEST SCORES

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REFERENCES


Grgurovic and Cardenas-Claros (2004). Academic Listening On line (ALO)


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