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THE ROLE OF SYNTAX PRESENTATION MODE, ABSTRACT REASONING, AND LEARNER INSTRUCTIONAL PREFERENCE ON SECOND LANGUAGE ACHIEVEMENT

DISSERTATION

Presented in Partial Fulfillment of the Requirements for the Degree of Doctor of Philosophy in the Graduate School of The Ohio State University

By

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***

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1999

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ABSTRACT

This study examines the interplay among second language (L2) modes of syntax presentation, learners' abstract reasoning abilities (induction and deduction), IQ, and instructional preferences. An experiment was conducted among 66 beginner students of Italian at a US state university. Three types of syntax presentation mode were employed: example-based/inductive, rule-based/deductive, and combination-based (both examples and rules in equal proportion) to determine effects of teaching (1) on learning outcomes for a feature of Italian ("molto") and (2) for transfer of the underlying rule to new instances (the feature "tanto"). The experimental setting utilized three multimedia programs, which were projected during regular classroom hours on a large screen. Differences in instructional modes did not result in differences of achievement or transfer of the rule. Trends, however, were found for the role of abstract reasoning ability, overall all instructional conditions. In
the example-based group inductive reasoning significantly related to achievement and transfer. In the rule-based group, IQ related to transfer and, in the combination-based group deductive reasoning related to transfer. Other evidence from the study indicates that there was no discrepancy between students’ understanding of the rule and its actual implementation. Findings from self-reports also indicate that students rely on both examples and rules when instantiating rules, even when only examples or rules are provided during instruction. Implications for pedagogy and future research are presented.
I wish to thank my dissertation co-advisors, Vladimir Sloutsky, for providing remarkable intellectual stimulation, friendship and moral support, and Keiko Samimy, for serving as my general examination advisor and for her academic help and insights, kindness, and understanding throughout my studies at OSU. I am deeply indebted to Gerald Winer, for his substantial contributions to this and to previous projects, and for continuing to be a source of inspiration. I also gratefully acknowledge the mentoring role of Albert Mancini and Christiane Laeufer in the Foreign Language Department.

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# TABLE OF CONTENTS

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>ABSTRACT</td>
<td>ii</td>
</tr>
<tr>
<td>ACKNOWLEDGMENTS</td>
<td>iv</td>
</tr>
<tr>
<td>VITA</td>
<td>vi</td>
</tr>
<tr>
<td>LIST OF TABLES</td>
<td>ix</td>
</tr>
<tr>
<td>LIST OF FIGURES</td>
<td>x</td>
</tr>
<tr>
<td>CHAPTER 1: THE PROBLEM</td>
<td>1</td>
</tr>
<tr>
<td>Introduction</td>
<td>1</td>
</tr>
<tr>
<td>Statement of the problem</td>
<td>5</td>
</tr>
<tr>
<td>Purpose of the Study</td>
<td>11</td>
</tr>
<tr>
<td>Research Questions</td>
<td>14</td>
</tr>
<tr>
<td>Basic Assumptions</td>
<td>15</td>
</tr>
<tr>
<td>Definition of Terms</td>
<td>17</td>
</tr>
<tr>
<td>Delimitations and Limitations</td>
<td>22</td>
</tr>
<tr>
<td>CHAPTER 2: REVIEW OF THE LITERATURE</td>
<td>23</td>
</tr>
<tr>
<td>Inductive vs. Deductive teaching</td>
<td>24</td>
</tr>
<tr>
<td>Cognitive Variables: abstract reasoning and IQ</td>
<td>39</td>
</tr>
<tr>
<td>Socio-cultural Variable: learning preference</td>
<td>48</td>
</tr>
<tr>
<td>CHAPTER 3: RESEARCH DESIGN AND METHODOLOGY</td>
<td>52</td>
</tr>
<tr>
<td>The features “molto” and “tanto”</td>
<td>53</td>
</tr>
<tr>
<td>Design</td>
<td>55</td>
</tr>
<tr>
<td>Participants</td>
<td>56</td>
</tr>
<tr>
<td>Variables</td>
<td>57</td>
</tr>
<tr>
<td>Instrumentation</td>
<td>69</td>
</tr>
<tr>
<td>Data Collection Procedures</td>
<td>79</td>
</tr>
<tr>
<td>Data Analysis</td>
<td>82</td>
</tr>
</tbody>
</table>
LIST OF TABLES

1. Overall Analysis of Variance Table for Achievement (moltotot) and tranfer (tanto) by Cognitive Variables 93

2. Within group Analysis of Variance Table for Achievement (moltotot) and tranfer (tanto) by Cognitive Variables 94

3. Number and Percentage of Subjects by Rule/Example Reliance Table 102

4. Analysis of Covariance (ANCOVA) for Achievement (moltotot) and Rule/Example Reliance Table 103

5. Student Instructional Preference and "Happiness" Ratings with Assigned Group (Observations and Percentages) 106
LIST OF FIGURES

1. Naglieri Nonverbal Ability Test Sample B 76
2. Scatter-plots of Significant Group Variance 96
CHAPTER 1

THE PROBLEM

Introduction

One of the most controversial debates in the field of Second Language Acquisition (SLA) concerns whether new linguistic features ought to be taught, and if so how. Should grammatical structures be introduced via explicit rule presentation and linguistic analysis? Or, conversely, should they be presented via simple exposure to key examples? The first case assumes deductive inference. For example, students are given the rule that all linguistic forms that have a form A, use transformation T. Linguistic form X contains form A. Therefore, use transformation T. To the contrary, the second case assumes inductive inference. Students focus on similarities of features or
relation with other instances. In the case Y transformation T was used. Case X is like case Y. Therefore, use T in case X.

Although the inductive-deductive teaching controversy is in its essence "as old as the teaching profession," it remains far from being solved (Schmidt, 1993, p. 217). Proponents of inductive teaching (Dulay and Burt, 1973; Krashen, 1985; Terrell, 1977) espouse the Chomskian view that human beings are genetically endowed with a language faculty that is independent of other cognitive systems. Because language learning is assumed to proceed very similarly in the child acquiring a native tongue and in the second-language (L2) adult, grammar instruction is avoided, while strong emphasis is put on providing classroom learners with sufficient amounts of comprehensible input, from which they will be able to infer the functions and meanings which underlie the new linguistic forms.

Conversely, proponents of a deductive approach to the teaching of L2 syntax (e.g., Higgs, 1982) conceive L2 learning as a skill, which not unlike other types of learning, is grounded on general cognitive processes such as transfer, simplification, generalization, and restructuring (McLaughlin, 1987). Consequently, classroom practices
informed by the latter view capitalize on overt grammar explanations.

The issue appears to researchers and educators in all its complexity because research findings could be interpreted as supporting both naturalistic and formal approaches to language teaching. On the one hand, evidence indicates that several linguistic structures and elements are acquired according to a natural route which cannot be altered by formal instruction (Ellis, 1989; Pienemann, 1984). On the other hand, findings also show that formal instruction "does make a difference" (Long, 1989). In particular it appears to have a positive impact on speed, accuracy, and ultimate level of L2 acquisition (Ellis, 1989; Harley, 1989; Pienemann, 1984; White, 1991). It has also been suggested that formal instruction may raise learners' consciousness of differences and similarities in their mother tongue and thus prepare the ground for the acquisition of subsequent forms (Fotos, 1993; Rutherford, 1988; Seliger, 1979; Sharwood-Smith, 1991).

The issue is far from being resolved, as little is known of how learners form form-meaning relationships and test linguistic hypotheses (i.e., draw inferences), and of
how teaching and learning strategies interrelate and are affected by individual beliefs and cognitive abilities (see Shore, 1995; and Bialystock, 1985; Wenden & Rubin, 1987 for further discussions). Thus, numerous questions remain unanswered: Once learners are exposed to new syntax structures exclusively in a concrete manner (via examples and in given contexts) will they be able to apply abstract processes and apply linguistic properties in new contexts? And conversely, if instruction relies primarily on abstractions, will learners be able to “instantiate” the rules applying them to specific cases? Do individuals’ beliefs about L2 teaching and learning affect L2 achievement under different teaching modes? In short, what are relationships among inferential ability, type of instruction, and L2 learning?

This study looks at the inductive-deductive teaching debate by examining assumptions on which often rest arguments in favor of such instructional approaches, i.e., that deductive teaching leads to deductive learning, and inductive teaching to inductive learning, but about which very little is currently known. The main purpose of the project is an initial exploration of relationships among
type of teaching on one hand, and achievement and transfer of the rule to new cases on the other, in light of individual abstract reasoning abilities (deduction and induction, alone and in combination), and IQ, and in light of individual preferences for and learner attitudes toward the effectiveness of inductive-, deductive-, and "combination"-based teaching.

Statement of the problem

The American Council on the Teaching of Foreign Languages (ACTFL), in its Proficiency Guidelines (1986), proposes that "form," along with "meaning," and "function," is an essential aspect of L2 learning. "How" to teach grammar, however, "has met with little agreement" (Adair-Hauck & Donato, 1994, p.91). In particular, the issue of whether linguistic features ought to be presented inductively (via examples) or deductively (via grammatical rules), continues to be actively debated and, as Celce-Murcia (1990) stresses, current teaching approaches, from form-centered at one pole and communicative at the other, tend to neglect either meaning and function or form.
A broader understanding of the role of grammar instruction in L2 acquisition is key to both practical and theoretical domains. Such an understanding, however, is crucial because US students are still "at a disadvantage when language fluency and cultural understanding are needed to compete in the world arena" (Chopra, 1994). Moreover, it can help clarify relationships between natural and cognitive aspects of language acquisition, syntax being both an essential part of language and an abstract code which, like mathematics or artificial languages, is governed by rules that can be explicitly analyzed independently of the context in which they appear.

Findings indicating commonalities in the development and acquisition of certain L1 and L2 structures (Larsen-Freeman and Long, 1991) seem to support Chomsky's (1965) view of autonomy and modularity of the language system, at the core of the opinion that syntax instruction may be unnecessary, if not counterproductive (Dulay & Burt, 1973; Corder, 1981; Krashen, 1982; Prabhu, 1987; Terrell, 1977). Several arguments, however, have been put forward by researchers and educators who, like Ausubel (1974) and Carroll (1964), maintain that, because adults' cognitive networks enable
them to understand abstractions, providing learners with abstract rules in a deductive framework, would accelerate the language acquisition process. Evidence suggests that grammar teaching is beneficial to L2 acquisition (Doughty, 1991; Ellis, 1994; Long, 1991), and findings in the field of artificial language indicate similarities in the learning and automatization of L2 grammatical rules and rules in other domains (DeKeyser, 1997). It has also been argued that the similarity of "product" in L1 and L2 features may not be indicative of similarity of "process" (Hakuta, 1986), particularly given child-adult differences in learning settings as well as social, psychological, cognitive (Bialystock and Hakuta, 1994) and neurological (Discover, 1997) grounds.

In fact, findings often interpreted as supporting deductive or inductive teaching are not necessarily incompatible. Spolsky (1989), for example, stressed that any innate language ability or faculty "must be consistent with other aspects of the cognitive system, because it interacts with and makes use of them" (p. 100). Others suggest that there may be more than a single "best" path to communicative competence (Nicholas, 1985, in Ellis, 1994). Thus,
different learners may respond best to different kinds of instruction, and "learning conditions which are optimal for one individual may be inappropriate for another" (Wesche, 1981, p. 125). Findings indicate that learners with high language aptitude (a predisposition for language learning) and field independent learners (i.e., those who perceive the field in terms of its component parts) may benefit from a deductive teaching mode, while their counterparts may benefit from an inductive one (Wesche, 1981; Abraham, 1985). Generally speaking, however, this type of research has been characterized by a number of problems and has produced unclear results. In particular, only few and often not clearly defined individual traits (i.e. learning style) have been taken into consideration and a number of studies have been characterized by methodological weaknesses (Ellis, 1994).

In other words, despite advances in the SLA field, the impact of different teaching modes on individual learners remains obscure. In particular, little is known of the "processing" rules (patterns of associations which connect meaning to linguistic forms) individuals form while learning a L2 (Garrett, 1989) and the common assumption that given
treatments (i.e., inductive vs. deductive teaching) have the intended effect has been disputed. It has been argued that even without explicit instruction students may attempt to extract explicit rules from a set of input data or, conversely, when exposed to rules, they may "fall back on exhaustive learning of individual exemplar sentences and words" (MacWhinney, 1997, p.278).

Scant research has gone to the very roots of the inductive-deductive question and examined the impact of abstract reasoning ability (deductive and inductive reasoning) when learning under such instructional modes. Deductive and inductive reasoning processes are essential to formulating and testing linguistic hypotheses. Yet, findings indicate that a number of factors may affect learners' ability to work abstractly, including age, knowledge base, and processing capacity (Case et al., 1996; Evans, 1993). Although abstract reasoning ability has been found to have considerable impact in other academic areas such as mathematical and scientific learning (Morris, 1995; Morris & Sloutsky, 1998), it is not yet known how the ability to reason abstractly may impact instructed L2 acquisition.
Moreover, in addition to differing in the way they access and employ cognitive mechanisms such as abstract reasoning, it cannot be ignored that individuals also differ with respect to factors influenced by their social context. Evidence indicates that individuals “differ in their preference for inductive versus deductive learning” (Garrett, 1989, p. 22), and aspects of the learner belief system (e.g., attitude towards language learning, past experience, motivation) figure prominently in many models of L2 acquisition. The role of instructional preference in L2 acquisition is not yet well understood, nor are the relationships among belief and cognitive systems.

The proposed study investigates relationships among (1) teaching modes, (2) abstract reasoning abilities, (3) IQ, and (4) learning preferences. It addresses the issue of deductive vs. inductive teaching of grammar in the L2 class by looking at both cognitive and affective learner factors. It asks whether achievement under inductive and deductive modes of teaching differs given learners’ differences in abstract reasoning ability, and whether results also reflect learners’ beliefs and preferences about deductive and inductive teaching and learning.
Because such questions carry implications for areas ranging from teaching methods to testing and to material-, syllabus- and curriculum-design, my study stands to make a global contribution to the teaching of second languages both theoretically and practically. Moreover, theoretical implications of my research are relevant to other fields such as the cognitive science, psychology, and education. Not only is a better understanding of relationships among individual abstract reasoning abilities, IQ, learning preferences, and classroom teaching crucial for instructed L2 learning, but for all educational areas dealing with the teaching of linguistic systems in general—whether mathematical, modern, ancient, native, foreign, or artificial.

**Purpose of the study**

The purpose of this study is to examine empirically how the teaching of specific L2 structures contributes to their acquisition among different learners. Specifically, the study investigates three main areas: (1) the impact of different syntax presentation modes (example-based/inductive, rule-based/deductive, and "combination-based") on achievement
and transfer of the rule to novel cases, in light of two individual traits: (a) the cognitive variable of abstract reasoning ability (inductive and deductive reasoning in combination and separately), and (b) the socio-psychological variable of learner instructional preference; (2) relationships between example-based teaching and use of examples, and between rule-based teaching and use of rules given learner differences in abstract reasoning ability; (3) relationships among teaching mode, abstract reasoning ability, IQ, and instructional preference (example-based/inductive, rule-based/deductive, and "combination-based").

The impact of abstract reasoning ability (inductive and deductive reasoning scores analyzed as aggregates and separately), IQ, and instructional preference on L2 syntax learning (achievement) and rule transfer to new cases when learning under different instructional conditions, was investigated among 66 students at The State University of New York, New Paltz. An experiment was conducted in which the manipulated variable (independent variable), mode of syntax presentation, had three levels (example-based/inductive, rule-based/deductive, and "combination-based").
The other explanatory variables were (a) abstract reasoning ability, which comprised scores on measures of induction and deduction, (b) inductive reasoning ability, which comprised scores on analogy questions, (c) deductive reasoning ability, which comprised scores on logical reasoning questions, (d) IQ, which comprised scores on matrices, (e) learning preference, which had three levels (example-based, rule-based, and “combination-based” instruction) and comprised answers to a questionnaire geared to determine whether students were “happy” or “unhappy” with the instructional group to which they were assigned.

The study consists of three phases. Phase One entails the teaching of the feature “molto,” achievement testing and testing for transfer of the rule underlying “molto” to the feature “tanto,” and completion of a self-recall protocol, geared towards determining whether students understood the rule and whether they employed the instructional examples/rule during the tests. Phase Two is devoted to testing for abstract reasoning ability (inductive and deductive reasoning), and to the completion of a questionnaire geared towards determining students’ L2
instructional beliefs and preferences. Phase Three consists of the administration of the Naglieri Nonverbal Ability Test (1995).

Data were analyzed via Scatterplots, Analyses of Variance and Covariance (ANOVA and ANCOVA), Linear Regression Analyses, Chi-Square Analyses, and simple descriptive statistics (percentages).

Because very little is currently known of the role played by abstract reasoning ability and by instructional preference in L2 acquisition, this study constitutes an initial exploration of their trends as they relate to deductive and inductive modes of syntax presentation. The study investigates two main areas: learning of syntax rules and transfer of learning to novel instances.

Research Questions

This study investigates the interplay among second language (L2) modes of syntax presentation, learners' abstract reasoning abilities, IQ, and instructional preferences. It asks the following questions:
1. What are specific contributions of mode of syntax presentation (example-based, rule-based, combination-based), abstract reasoning (inductive and deductive reasoning), and IQ on L2 rule learning (achievement) and rule transfer to new instances among beginner college students of Italian as a second language?

2. Do beliefs/preferences about L2 syntax modes of presentation (example-based, rule-based, combination-based teaching) have an impact on achievement and transfer of the rule to new cases when learning under example-based, rule-based, or combination-based instructional modes?

**Basic Assumptions**

Several assumptions were made pertaining to subjects, instructional content, and testing materials.

**Subjects**

It was assumed that students would:

1. be motivated to learn the new syntax feature being tested, which was part of their regular curriculum
2. give their best efforts throughout the all the different phases of the study
3. provide honest answers and accurate information about themselves

The features "molto" and "tanto"

It was also assumed that:
1. the syntax rule underlying the feature "molto" constituted a good example of a "new" grammatical rule, i.e., a rule that did not exist in English
2. the feature "tanto" would constitute a valid example of a new feature governed by the same underlying rule for "molto"
3. that, although the feature "molto" might have been encountered incidentally in idioms such as "molto bene" (very well), the students had not previously been taught the underlying rule (as classroom teachers confirmed).


Testing materials

It was assumed that:

1. aggregating scores obtained in three different types of test would provide a valid measures of student learning for the rule underlying the feature "molto"

2. multiple-choice answer tests would provide a valid measure of transfer of the rule underlying the feature "molto" to the feature "tanto"

3. analogy and abstract reasoning questions selected from the Graduate Record Exam (published by Educational Testing Service) would represent a wide range of difficulty and provide a good measure of student inductive and deductive reasoning abilities

4. that data collected via questionnaires and self-reports can provide important insights into student belief and cognitive systems

Definition of terms

Operational definitions for independent variables and other relevant terminology employed in this study are provided below in alphabetical order.
Abstract reasoning comprises the ability to grasp relationships and patterns, especially those not readily detected by the senses (Gardner, Kornhaber, & Wake, 1996).

Achievement tests measure student learning with reference to a set of learning outcomes (Gronlund, 1993). This study does not include standardized achievement tests. Scores are expressed in percentages of right over wrong answers.

Aptitude is thought as the natural ability to learn a language beyond individual learner differences in other traits such as for example, motivation and interest (Richards, Platt, & Platt, 1992).

Cognitive academic language proficiency (CALP) refers to a particular kind of second-language proficiency needed by students to perform school learning tasks which often have to be solved independently by the learner without support from the context (Richards, Platt, & Platt, 1992).

Cognitive process refers to any mental process employed in language learning such as inferencing, generalization, deductive learning, monitoring, and memorizing (Richards, Platt, & Platt, 1992).
Deductive teaching emphasizes learners’ study of grammatical rules and focuses on specific information about a language (Richards, Platt, & Platt, 1992).

Deductive reasoning proceeds from a generalization to particular facts which support it (Richards, Platt, & Platt, 1992). It allows a person to determine with certainty what conclusion, if any, necessarily follows when particular given statements are assumed to be true (Gilhooly, 1988).

Example-based refers to the presentation of a linguistic feature exclusively via examples. No explicit grammatical rules are given to the students who instead must infer the underlying syntax mechanisms from the context, whether through pictures and/or language examples.

Individual learner differences (IDs) partly govern a person’s success in learning something. Such variables may be of a cognitive nature, such as intelligence, memory, and the ability to analyze and evaluate, or of an affective nature, such as attitudes, emotions, motivation, personality (Richards, Platt, & Platt, 1992).
Inductive teaching does not involve direct teaching of grammatical or other type of rules. Learners are left to discover or induce rules from their experience of using the language (Richards, Platt, & Platt, 1992).

Inductive reasoning proceeds from particular facts to generalizations about them (Richards, Platt, & Platt, 1992). It requires a person to test hypotheses, by determining the implications, if any, of some particular observation(s) (Gilhooly, 1988).

Inferencing, making inferences, or inferring, is a process of arriving at an hypothesis, idea, or judgment on the basis of other knowledge, ideas, or judgments. In language learning, inferencing has been discussed as a learning strategy employed by learners to work out grammatical and other kinds of rules (Richards, Platt, & Platt, 1992, p. 178).

Language acquisition device (LAD) is an innate mechanism or apparatus which includes basic knowledge about the nature and structure of human language. According to Chomsky and other philosophers and linguists, the existence of a LAD would explain why children develop competence in
their first language in a relatively short time and merely by exposure (Richards, Platt, & Platt, 1992).

**Monitoring** refers to one’s own utterances to compare the actual spoken words with the intended ones, and to make corrections if necessary (Richards, Platt, & Platt, 1992).

**Native language** (L1) or first language refers to a person’s mother tongue, or to the language first acquired as a child (Richards, Platt, & Platt, 1992).

**Rule-based** refers to the presentation of a linguistic feature via explicit grammatical rules and independently of the context in which it is used.

**Second language** (L2) refers to any language other than a person’s first language (Ellis, 1994). In this study the term “foreign” language is also used as a synonym of second language.

**Second language acquisition** (SLA) is a process of developing proficiency in a second or foreign language (Richards, Platt, & Platt, 1992).

**Transfer** refers to using previously acquired linguistic and/or conceptual knowledge to facilitate a new language learning task (O’Malley & Chamot, 1987).
Delimitations and Limitations of the Study

Because of the complexity of the issue, and the numerous constraints posed by research in classroom settings (e.g., subject availability, instructional time and budgetary limitations), this study is to be seen as exploratory in nature. Moreover, because the study is limited to the teaching of two syntax features, was conducted only at one institution and had a relatively small sample size, findings cannot be immediately generalized to other students, languages or academic fields. Rather, the study constitutes an initial step towards a broader understanding of the role played by individual learners characteristics in L2 learning in classroom settings. Findings are thus to be interpreted with caution and with the purpose of informing future research, rather than with an eye towards immediate applicability to L2 teaching.
CHAPTER 2

REVIEW OF THE LITERATURE

This study sets out to investigate the relationships among modes of syntax presentation, learners’ abstract reasoning abilities, IQ, and learners’ instructional preferences. Due to the issue’s multifaceted nature, the following review of the literature pertains to relevant theory and research from the fields of Second Language Acquisition (SLA), linguistics, and cognitive psychology.

The review of the literature is organized around three main sections. The first section focuses on evidence and theoretical views at the basis of arguments in favor of inductive and deductive modes of presentation, the study’s first independent variable. The second section explores the study’s explanatory cognitive variables of abstract reasoning and IQ (covariates), and focuses in particular on
inferencing based on inductive and deductive reasoning. The third section concerns the study’s socio-psychological explanatory variable, learning preference.

**Inductive vs. deductive teaching**

The issue of whether learners can internalize explicitly formulated rules (via deductive teaching) or assimilate new rule systems by exposure to representative samples (inductive teaching) is crucial to any academic teaching and among the most controversial issues in the history of second language teaching (Kelly, 1969). The debate has not yet been solved (Fisher, 1979). On the one hand, deductive teaching methodologies, such as the “grammar-translation” method, which rely on rules followed by their application in grammar exercises, have been criticized as early as the sixteenth century (Hammerly, 1975). On the other hand, it has been proposed that deductive teaching may constitute a “useful or even an essential aid in L2 learning, or at least in a certain stage of the process” (van Els et al., 1984, p. 258).

The view that knowing one language means already “knowing” a great deal about the underlying structure of
every language has old roots. It can be traced to the
thirteenth century (Fromkin & Rodman, 1998):

He that understand grammar in one language,
understands it in another as far as the essential
properties of Grammar are concerned. The fact that he
can't speak, nor comprehend, another language is due
to the diversity of words and their various forms, but
these are the accidental properties of grammar.
[Roger Bacon, 1214-1294]

The inductive-deductive debate, however, has been
particularly acute throughout the "communicative
revolution." In the 1970s and 1980s, in an attempt to
address the shortcomings of traditional second language (L2)
methodologies, which produced knowledge about the language
rather than the ability to communicate, researchers'
attention turned to first language acquisition. While only
a few adult learners become thoroughly proficient in their
L2 and many struggle or fail, young children seem to acquire
their L1 with limited effort and within a few years simply
by linguistic exposure and interaction.

The Chomskian view that human beings are genetically
pre-wired for language learning, coupled with research
findings indicating striking similarities between L1 and L2
patterns of sequence and order of acquisition of a number of
morphemes (Felix, 1980; Meisel, Clahsen & Pienemann, 1979; Pienemann 1977, 1979) as well as types of errors (Felix, 1980, 1981; Pica, 1983), created grounds for questioning formal instruction and thus the centrality of deduction in grammar teaching. Some researchers even suggested that little time be spent in teaching grammatical rules which was deemed unnecessary, if not counterproductive (Dulay and Burt, 1973; Corder, 1981; Terrel, 1977; Krashen, 1982; Prabhu, 1987). In an effort to re-create classroom learning conditions similar to those of the child, example-based instruction was viewed as a better alternative to form-focused teaching. Thus, early communicative methodologies (e.g., Terrell's Natural Approach) stressed communicative competency and fluency in contrast with the more traditional grammar-translation and cognitive-code approaches.

Viewing L2 development as a mirror of L1 development, implies a modular view of the language faculty and access to principles of Universal Grammar (UG) which, as Chomsky (1965) claims, would be common to all natural human languages and predispose children to organize input in certain ways. Krashen (1981; 1982, 1985, 1994), in particular, argues that because languages are acquired
naturally, L2 syntax should not be taught. It cannot be taught because “learned” knowledge cannot become “acquired” knowledge and, thus, most of L2 acquisition would ensue from “unconscious” processes. His “non-interface” position is grounded on the following claims: that nature poses constraints on the nature and number of rules that can be learned, that only “acquired” knowledge can be used to initiate utterances, that consciously “learned” knowledge is limited to rules that are easy and can only be used to “monitor” speech, i.e. to consciously check what has been or is going to be said.

A non-interface position would explain why some learners may consciously know rules but not be able to apply them, while others have “acquired” rules without learning them (Krashen, 1985, p.39-40). It would also account for Reber’s (1989, 1993) findings on grammaticality judgment tasks that “implicit/memory-based” language learning conditions may be more beneficial than “explicit/rule-searching” conditions. Other studies, however, found “memory-based” instruction less beneficial than instruction which relies on abstract rules (Robinson, 1997).
Other researchers argue that UG may be unavailable or only accessible to adult learners via mediation of the L1 (see Cook, 1993 for a review). Learners may take advantage of L1 knowledge and general problem-solving systems and thus also employ other capacities of the mind (Schachter, 1988; Bley-Vroman, 1989; Clahsen & Muysken, 1989). Whereas some researchers (Reber, 1989, 1993; Schwartz, 1993; Zobl, 1995) support Krashen’s position, others do not make the assumption that language is represented and acquired by the human mind differently from other knowledge, but focus on the way individuals store and acquire knowledge in general. Anderson (1983), for example, claims that “the adult human mind is a unitary construction” and that “the remarkable commonalities between language and other skills” show that, except for a few minor adaptations, “the language faculty is really the whole cognitive system” (p.3). Such a view is supported by evidence from artificial language research which indicates similarities in the learning and automatization of L2 grammatical rules and of those in other domains (DeKeyser, 1997).

In the 1990s, the gap between the two positions has somewhat narrowed. Language learning is seen as combining
both communicative and grammatical competence. In particular, more recently, the views that formal instruction may have a positive impact on L2 acquisition (Ellis, 1990; Fotos, 1993; Larsen-Freeman & Long, 1991; Odlin, 1994; Pienemann, 1989; White, Spada, Lightbown, & Ranta, 1991) has become more prominent, and it has been suggested that “learners, with certain constraints, can learn what they are taught” (Ellis, 1994, p. 360). Conversely, learners do not seem to acquire some morphosyntactic features in unistructed L2 acquisition and immersion programs that do lack focus on linguistic form (Swain, 1988, 1991; Trahey & White, 1993).

Such evidence has been interpreted as an indication of a possible “interface” between learned, or explicit, knowledge and acquired, or implicit, knowledge (DeKeyser, 1977b; Fotos, 1993; Robinson, 1996). Bialystok (1982) proposes that different types of knowledge, which would combine “analyzed” and “automatic” factors, are necessary to perform different types of tasks. Formal instruction would sensitize the learner to new features which would be fully acquired and automatized at later stages (Seliger, 1979; Terrel, 1991), and by providing opportunities to practice them, it would speed up linguistic development (Sharwood-
A number of studies (Cadierno, 1995; Doughty, 1991; DeKeyser, 1995; Herron & Tomasello, 1988; Robinson, 1996; Scott, 1989; VanPatten & Cadierno, 1993) support the hypothesis that instruction promotes "language awareness" (Schmidt, 1992), raises learners' consciousness of linguistic features (Rutherford & Sharwood Smith, 1991), or provides "input enhancement" (Sharwood Smith, 1981, 1991), thus facilitating the process of intake (Ellis, 1993).

A number of studies investigating relationships between learner "attention" and types of instruction (DeKeyser, 1995; Doughty, 1991; Robinson, 1996; Schmidt, 1990, 1993, 1995) are of particular importance for the inductive-deductive debate because they cast a new light on L2 teaching and learning. In particular, Schmidt (1990, 1995) challenges Krashen's view of "subconscious" acquisition by arguing that "noticing," whether it occurs with or without "intention" or "metalinguistic knowledge," is a crucial factor for learning to occur (1995, p. 20). This is not to say, however, that inductive teaching cannot promote L2 learning. To this effect, Tomlin and Villa (1994) stress that "detection" of specific mapping relations between
mental representations and syntactic information, which is crucial for learning to occur, can be enhanced in different ways: by "alertness" (related to factors such as motivation and interest), "orientation" (i.e. sensitivity to a specific feature in the input), and more indirectly, by "awareness" (i.e. linguistic knowledge). Both the explicit teaching of rules and selected inductive instructional techniques, such as "input-flooding" (i.e. providing learners with numerous examples of similar and contrasting linguistic features), can contribute to "orientation" and "alertness" (p. 197). In other words, learning under "implicit" and "explicit" conditions may be "fundamentally similar." In both cases learning ensues from "consciously held processing strategies" needed to perform specific training task demands. Thus, differences in learning would be due to differences in task demands, "not to differential access to conscious and unconscious systems" (Robinson, 1995, p. 52).

The theoretical positions illustrated so far result primarily from the exploration of similarities between child first language acquisition and adult L2 learning, and between L2 acquisition in naturalistic and classroom learning, as well as from direct comparison of the
effectiveness of different teaching methods, and the learning of microlanguages in laboratory settings. In addition to the studies mentioned so far, it is important to stress that the direct comparison of instructional methods with respect to the overall proficiency of L2 learners has failed to provide any conclusive results. For example, studies from the 1960s and 1970s which compared grammar-translation instruction to the audiolingual approach did not yield any significant result (see for example Smith’s Pennsylvania Project, 1970, with French and German high-school students), or simply reached the fairly obvious conclusions such as that instruction focusing on grammar results in better production of reading and writing skills and audiolingual instruction results in better listening and speaking (Scherer & Wertheimer, 1964). Likewise, inconclusive results were obtained for grammar-based methods vs. communicative methods (see for example Palmer’s study, 1979, with Thai ESL learners or Hammond’s study, 1988, with college students of Spanish).

It has been argued (Doughty, 1991) that inconclusive and limited findings in studies comparing first and second language acquisition, naturalistic and instructed settings,
or global instructional methods, can be attributed to weaknesses of research design, to inappropriate measures of assessment (i.e., the tendency to measure "global" L2 proficiency), and particularly to the fact that many studies have failed "to operationalize or even describe the instructional treatment" as it was implemented by individual classroom teachers (p. 431).

A number of recent studies, aimed at the investigation of processes of language acquisition under instruction that focused on explicit grammar explanation, vs. implicit learning (focused and incidental), have attempted to address the shortcomings of past research. Nonetheless, results remain often unclear, due to the inherent difficulty of this type of research. Evidence can be summarized as follows. While de Graaff (1997) found that students who were explicitly taught rules outperformed those in the "implicit" condition, DeKeyser (1995) found no difference between rule-based and exemplar-based learning for categorical (which always apply) morphological rules. Exemplar-based instruction, however, produced better results for prototypical (which have much lower reliability) rules. Robinson (1997) found that students learning under "form-
focusing" conditions outperformed those under "memory-based" conditions. In particular, those who received explicit metalinguistic rule explanations performed best on both accuracy and transfer to new instances. However, students in the "enhanced" group, a partially memory-based condition which combines both focus on form and meaning but requires students to induce the rule themselves, also seemed to develop generalizable rule-based representations. Moreover, this study also suggests that decision-making about new sentences may rely on the interaction of both rule-based and memory-based knowledge (p.242). Results, however, must be interpreted with caution. Not only do many such studies principally rely on the use of microlanguages and thus do not account for classroom conditions, but they generally do not take into account individual learner characteristics.

Linguistics- and pedagogy-based studies have mostly been concerned with the study of regularities, if not universalities of language acquisition, and with the identification of the "best" methodology (Skehan, 1991). They have often ignored that individuals differ on a number of cognitive, psychological, and sociological grounds (see
Bialystock & Hakuta, 1994; Skehan, 1986; 1991 for a review) and approach L2 learning very differently (Wenden & Rubin, 1987).

An exception can be found in Aptitude-Treatment Interaction (ATI) or Condition-Seeking (McLauglin, 1980) research which have investigated relationships between teaching modes (deductive vs. inductive) and particular learner characteristics such as language aptitude, cognitive style, and intelligence. Generally speaking, however, this type of research has produced mixed evidence. It has particularly come under criticism because many studies have been characterized by methodological flaws and weaknesses and because only a limited number of individual characteristics have been examined and affective factors have been particularly ignored (Ellis, 1994). Nonetheless, such research allows for some important considerations and directions for future research and is particularly relevant to the present study.

Major findings from ATI/Condition-Seeking research can be summarized as follows. Learners with high-levels of intelligence seem to perform best under deductive modes of instruction (Carroll and Spearritt, in Cronbach & Snow,
1977), although evidence is somewhat mixed (see summary in Skehan, 1989). It has also been argued that teaching modes may interact with the trait of cognitive style (field dependency, FD, and independency, FI), defined as "the extent to which a person perceives part of a field as discrete from the surrounding field as a whole, rather than embedded, or ... the extent to which a person perceives analytically" (Witkin et al., 1977, p.7). FI learners may produce better results when exposed to deductive language instruction, while FD learners appear to benefit from examples (Abraham, 1985). They would also respectively prefer deductive and inductive methods of instruction (Hartnett, 1985). Although some studies produced inconclusive results (Bacon, 1987; Carter, 1988) it also appears that FI learners may perform better than FD learners even in areas such as communicative ability (Hansen and Stansfield, 1981; Chapelle and Roberts, 1986; Carter, 1988). It must be stressed, however, that considerable disagreement surrounds the investigation of cognitive style because the most commonly employed test of field independency, the Embedded Figure Test (Oltman et al., 1971), would, in fact, test "only the cognitive restructuring ability component"
Chapelle and Green, 1992, p. 51) and thus constitute instead additional evidence for the role played by DLA.

Although limited, the most clear evidence concerns the interaction between instructional methods and the construct of language aptitude (a predisposition for language learning), which is generally considered to be "the single best predictor in second languages" (Gardner and MacIntyre, 1992, p. 215). Wesche (1981) found that learners with high language aptitude (a predisposition for language learning) may benefit from a deductive teaching mode, while their counterparts from an inductive one. Akagawa (1992, in Ellis, 1994), on the other hand, found inconclusive results.

As Skehan (1989) demonstrated, language aptitude tests such as the Modern Language Aptitude Test (MLAT, Carroll and Sapon, 1959) would achieve their predictive power because in addition to measuring an individual's underlying language-learning abilities (phonemic coding ability, grammatical sensitivity, inductive language learning ability, rote learning ability, Carroll, 1981), they also account for decontextualized language ability (DLA). Such a construct can be defined as the capability to handle abstractions and perform language operations based on rules. DLA would be
particularly enhanced among "analytic" learners — those learners who see L2 learning as problem-solving and L2 as a rule-based system. Less "analytic" learners would instead rely more on memory and treat an L2 as an "accumulation of chunks" necessary for communication to occur. DLA may also have an impact on the use of cognitive strategies — "steps or operations used in problem-solving that require direct analysis, transformation or synthesis of learning materials" (Rubin, 1987), and metacognitive learning strategies — strategies that have a planning, directing, or monitoring role (O'Malley and Chamot, 1990).

In conclusion, although the existing body of research provides support for the effectiveness of L2 instruction, it is unclear what factor or combination of factors makes L2 instruction more effective (Tschirner, 1996). Consequently, whether deductive or inductive modes of presentation are more beneficial to syntax learning remains very much an open question. The issue is particularly complex because, to a certain extent, all teaching provides both "instruction" and "exposure" (Ellis, 1984, p. 153), and because the processes of teaching and learning cannot necessarily be equated. Research that emphasizes the interaction of learner
characteristics with instructional features "is crucial if progress is to be made" (Skehan, 1991, p. 295).

**Cognitive variables: Abstract reasoning and IQ**

The following section deals with main theoretical views and research evidence relating to the two cognitive variables of abstract reasoning and IQ.

The role of cognitive processes in second language (L2) acquisition is central to the L2 deductive-inductive debate as it relates to the notion of "interlanguage" (Selinker, 1972) which views the learner as generating and testing linguistic hypotheses (inferencing) to form and apply L2 rules and structures through a personal and evolving grammar. Such a notion is widely accepted in L2 acquisition theory and research and is compatible with both innatist and cognitive accounts of language acquisition.

Individuals rely on abstract reasoning processes to draw inferences (utilize "attributes and context which are familiar" to recognize "what is not familiar," Carton, in Bialystock, 1983) which are necessary to solve problems and make decisions about L2 learning, as well as about innumerable aspects of life, whether pragmatic, social, or
academic. Evidence, however, indicates that individuals differ significantly in their ability to employ reasoning processes when solving verbal and mathematical reasoning tasks (Evans et al., 1993; Cheng & Holyoak, 1985; Johnson-Laird & Byrne, 1991). Although the ability to reason abstractly has been found to have an impact on other academic content areas such as mathematics and science (Morris, 1995; Sloutsky, 1998), it is not yet known how an individual's ability to reason abstractly may affect the learning of a second tongue.

Very little is known about how learners form form-meaning relationships. Consequently, the notion that learners employ deductive reasoning processes when they are exposed to deductive teaching and inductive ones when learning under inductive conditions has been seriously questioned (MacWhinney, 1997).

Individuals draw inferences based on two main types of reasoning: deductive and inductive reasoning. Deduction is a reasoning progression which requires one to determine what conclusion, if any, necessarily follows from given premises. The reasoner starts from axioms, principles, or rules to deduce consequences and formulate applications (Felder,
For example, conclusion (c) can be reached given premises (a) and (b) in the following linear syllogism:

(a) All objects "A" are lighter than objects "B"
(b) All objects "B" are lighter than objects "C"

Thus,

(c) All objects "A" are lighter than objects "C."

Likewise, in the following categorical syllogism, conclusion (c) necessarily follows from the premises (a) and (b):

(a) all plural nouns of a given language are formed by adding the suffix "y," and
(b) "CCC" is a noun in that language, then
(c) the plural of the noun "CCC" is "CCCY"

Conversely, induction is a reasoning progression that "proceeds from particulars (observation, measurement, data) to generalities" such as rules, laws, and theories (Felder, 1995, p. 26). It allows reasoners to test hypotheses (i.e., "determine the implications, if any, of some particular
observation(s) for the truth of possible generalizations), or generate hypotheses (i.e., "make a plausible generalization" from observations) on the objects of interest (Gilhooly, 1996, p. 105). For example, the observation of numerous instances that "As" are "Bs" and that "As" are "Cs" leads to the tentative conclusion that "B" is "C."

Conclusions reached inductively are very different from those reached deductively. While induction implies probability and draws from the context, deduction proceeds by abstractions and allows to conclude that if the premises are true, the conclusions must also be true.

It has been often stressed that pure syllogisms are not very frequent in daily situations and that deductive and inductive reasoning are inextricably linked (Smith, 1990). Moreover, people often make statements about classes of objects and events (e.g. "Businessmen are conservatives" or "College students like rock music") in which the quantifiers that would be key to syllogistic reasoning such as "all," "many," or "some" are not always explicit (Wyer and Podeschi, 1978, p. 101). They may also base their thinking on emotional states or personal beliefs rather than on the
type of premises or judge the empirical truth of a conclusion rather than its logical necessity when solving syllogisms (Revlin & Mayer, 1978).

In academic settings it is particularly important to be able to reason deductively, distinguishing thus between types of premises and conclusions. Evidence, however, indicates that a number of factors such as age, knowledge base, and processing capacity may affect an individual’s ability to work abstractly (Case et al., 1996; Evans et al., 1993). Studies such as those conducted by the "National Assessment of Educational Progress" (NAEP, 1989), show that "American students are seriously lacking in higher-order thinking:" for example, only 39% of American 17 year-olds can "find, understand, summarize, and explain information about the subject they study (Neubert & Binko, 1992, p.7).

It is not yet known whether abstract reasoning develops naturally (Inhelder & Piaget, 1958), whether it is affected by formal instruction (e.g., Cheng, Holyoak, Nisbett & Oliver, 1986; Lehman & Nisbett, 1990), or whether instruction is a necessary condition for its development (Luria, 1976; Vygotsky, 1962). Consequently, some researchers and educators believe that higher-order skills
can be improved through specific teaching of reasoning strategies (Grossen, 1991) or while teaching different content areas (Neubert & Binko, 1992), including foreign languages. Others, to the contrary, such as Smith (1990) claim that independent thinking cannot be taught through systematic instruction but is socially determined.

Schooling that focuses on deductive teaching is seen as favoring only a narrow segment of society whose characteristics are reflected in normative tests, and excluding non-mainstream people such as minorities, lower socio-economical classes and learners with disabilities (p. 127-131).

Different academic content areas have experienced such a tension of views. While the type of inferencing required in mathematical problem-solving such as algebra word problems can easily be seen as an extension of the syllogism (Revlin & Mayer, 1978), other areas, such as foreign language learning, have been seen as better suited to experiential learning. Not coincidentally, the debate mostly concerns the teaching of syntax. Like other codes, such as mathematics and artificial languages, syntax is amenable to syllogistic reasoning. For example, if all
adverbs are invariable and "slowly" is an adverb, then "slowly" is invariable. Yet, as Chomsky (1965) stresses, all normally developing young children become proficient in their mother tongue very quickly and without formal instruction. Because they rely on inductive reasoning processes, the view has been advanced that L2 example-based learning may be (a) more efficient and (b) more egalitarian. Conversely, deductive teaching modes are based on the arguments (reviewed in Neubert & Binko, 1992, p. 30) that adults can employ both inductive and deductive reasoning processes; that deduction is more efficient given the limited amount of exposure to the L2 and the time constraints imposed by educational settings; and that it may be more suitable for particular types of students.

Very little research has directly investigated the interplay of abstract reasoning on L2 achievement. Weshe et al. (1982) explored the underlying abilities tapped by foreign language aptitude measures and their relationship to measures of intelligence. Their findings suggest that abstract reasoning ability plays a principal role in L2 instructed learning, along with the factors of first language verbal knowledge, and the ability to learn new
linguistic elements and associations. Such findings are consistent with the view that not only general language aptitude, but also general mental ability (i.e. intelligence) needs to be taken into consideration to predict L2 performance on academic tasks (Geva and Ryan, 1993, McLaughlin, 1990).

A number of theoretical views see L2 proficiency as constituted by the interplay of a "general factor" (intelligence) and several "specific factors" (Carroll, 1983) which would account for the ability "to understand language with reduced redundancy" as well as for "creative aspects of the language" (Spolsky, 1989, p.75). Oller, for example (1983), proposes that the essence of a "general factor," "pragmatic ability," would enable individuals to implement knowledge systems in given contexts and would underlie "all other cognitive skills" (p. 355). It has also been postulated that general cognitive ability could be the factor responsible for the correlation between the trait of language aptitude and L2 achievement (Skehan, 1989).

Ausubel (1963) and Carroll (1964) proposed that the ability to discover structural patterns presented inductively may be linked to intelligence and suggested
that, at least for concepts that have not yet been learned in a native language, an inductive approach may be too difficult for weaker students. Shaffer's (1989) study, to the contrary, did not corroborate such a view. Although no significant differences were found between deductive and inductive approaches among high-school students of French and Spanish, trends indicated that weaker students benefited as much from inductive methods as brighter students. It must be stressed, however, that in her study the labels "weaker" and "stronger" refer solely to student language performance in the class and no other tests of ability were used.

A number of studies indicate that intelligence may play a significant role in L2 acquisition. Geva and Ryan (1993) produced evidence that children who display a more efficient linguistic-analytic ability in L1 are more likely to be more proficient in areas, such as reading, which involve more unanalyzed or decontextualized linguistic knowledge (p. 37). Measures of underlying intelligence and L2 oral proficiency, combined with information on memory storage and executive control functions more accurately predicted performance on demanding linguistic tasks such as reading. Such evidence
supports models proposed by Cummins (1984) that underlying cognitive processes employed in L1 transfer to L2, and by Bialystock (1985) that such underlying processes are most evident when learners are faced with cognitively demanding linguistic tasks. Genesee (1976) also found that while performance on the reading and language usage tests correlated with measures of intelligence, performance on more contextualized tasks such as listening comprehension and interpersonal communication did not.

It is important to stress that disagreement exists on the nature of intelligence (for a review see Gardner et al., 1996) and that, although abstract reasoning is related to intelligence, intelligence tests do not traditionally measures aspects of deductive reasoning such as the syllogism.

Learning preferences
Beliefs systems help shape the way in which people build an understanding of themselves and of the world and affect their perceptions and behaviors (Pajares, 1992). In the field of L2 acquisition, evidence indicates that learners hold many different opinions about L2 teaching and learning,
and many of such beliefs tend to have more in common with "myths" than with SLA scholars' views (Horwitz, 1987). For example, some learners strongly believe children to be better language learners than adults (Horwitz, 1987), or that acquiring a second tongue primarily consists of learning new vocabulary. Others believe that linguistic accuracy ought to precede communication and that all grammar errors ought to be corrected immediately, while others again equate L2 achievement with the acquisition of a native-like accent (Wenden, 1986; 1987).

Investigating learner views about L2 teaching and learning is extremely complex; beliefs may reflect sociocultural values of countries or institutions (Tumposky, 1991), be shaped by individual goals and needs, past learning experiences (Little & Singleton, 1990), personality and cognitive style (Abraham & Vann, 1987). It is, however, of particular importance because learner beliefs may affect innumerable aspects of learning, ranging from the amount of learner speaking, to the learner's desire to acquire new rules, read, write, communicate, do drills or exercises (Fanselow, in Wenden & Rubin, 1987).
Despite the importance of this area of inquiry, however, very little research has investigated the relationships between learner beliefs and L2 achievement (Ellis, 1994). Evidence suggests that beliefs may directly have an impact on learning outcomes. Abraham and Vann’s (1987) study, for example, although limited to the observation of two subjects, suggests that an individual’s philosophy of L2 acquisition would guide the approach taken in learning situations. Such an approach, manifested in the strategies (both observable and not) used in learning and communication would, in turn, directly influence an individual’s degree of learning success (p. 96). The hypothesis has also been advanced that tension may result from a discrepancy between learners’ personal agendas and curricular agendas set by teachers or institutions (Nunan, 1993), and that differences between teaching methods and students’ beliefs and goals affect an individual’s learning strategies (Rubin, 1981; Wen & Johnson, 1997; Wenden, 1987).

Although an in-depth analysis of the nature of such beliefs lies outside the scope of the present study, in this study it was essential to take into account possible
discrepancies between teaching and individual learning preferences.

As Hosenfeld (1978) highlights, learners form "mini theories" of L2 acquisition. After thousands of hours of general schooling, students may hold definite views of what constitutes effective or ineffective teaching (Richards & Lockhart, 1994, p.54). In particular, it is possible that learners may feel biased towards or against the particular teaching modes they will be assigned to. It is indeed possible, for example, that "students who expect language teaching to consist of formal instruction may be more receptive to it than others" (Ellis, 1984, p. 140).

To control for the possibility that this study’s results were not to be attributed to possible students’ preconceptions about the teaching mode to which they were assigned, students were asked to respond to a questionnaire geared to determine individual beliefs and preferences about the effectiveness of the instructional modes in questions.
CHAPTER 3

RESEARCH DESIGN AND METHODOLOGY

This study has several purposes: (a) examining the effects of different L2 syntax teaching modes on achievement and transfer of the rule to new cases, (b) exploring relationships between response variables (achievement and transfer) and explanatory variables of a cognitive nature, abstract reasoning abilities, and IQ, (c) gathering information about L2 syntax learning process, and (d) exploring relationships between response variables (achievement and transfer) and explanatory variables of a socio-psychological nature, syntax instructional mode preference.

Following a description of the features being tested, "molto" and "tanto," this chapter discusses the study's
design, participants, variables, instrumentation, data collection, data analysis, and limitations.

The features "molto" and "tanto."

All teaching conditions entail the presentation of a new L2 syntax structure of Italian, the feature "molto," which in English can have several meanings including "many," "much," "a lot of," "lots," and "very." It is a feature regularly taught during the first semester of Italian, as is commonly used in conversation. Some students, however, find it difficult to learn this feature and tend to use it incorrectly even when they reach higher levels of competency in Italian. The inherent difficulty consists of the fact that "molto" can be used either as an adjective or as an adverb. When it is an adjective (i.e., it modifies a noun or a pronoun), it ends in one of four vowels "a,e,o,i" according to the gender and number of the noun/pronoun it modifies. When it is used as an adverb, however (i.e., it modifies an adjective, another adverb, or a verb), "molto" remains invariable and its ending is always "o." Some students tend to produce the feature correctly when it occurs in the same instances it was encountered in the
textbook or in classroom examples. For example, the ending “o” in the expression “molto bene” (“very well”) rarely presents a problem for learners, probably due to the high frequency with which it occurs in Italian. For some learners, however, it is difficult to use “molto” with a less frequently employed adverb, such as for example, “allegramente.” Thus, in the sentence “Maria balla molto allegramente” (Mary dances very happily) “molto” may appear as “molta” or “moltə” in some students’ written work and conversation. Likewise, for some learners, it is difficult to see a difference in the use of “molto” between “Maria mangia molta pasta,” i.e., “Mary eats a lot of pasta” (where the adjective “molto” agrees with the feminine singular noun “pasta”) and “Maria è molto bella,” i.e., “Mary is very pretty” (where the adverb “molto” modifies the adjective “bella”), thus producing the error “Maria è molta bella.”

Other features may be employed as adjectives or adverbs in Italian, such as for example “tanto,” a synonym of “molto,” “troppo” (too much, too many), and “poco” (little, a little, few, a few). Because of its close similarity of meaning to “molto,” the feature “tanto” was chosen to
further investigate transfer of the rule that underlies the use of "molto" to a new instance.

**Design**

In order to investigate the impact of teaching mode on students with different abstract ability, an experiment was conducted. The treatment, or independent variable, was instructional mode of syntax presentation and consisted of three levels: example-based/inductive, rule-based/deductive, and "combination-based" teaching modes. Outcomes (dependent variables) for learning of the rule "molto" and transfer to "tanto" were test achievement scores. Results were examined in light of five other explanatory variables, student differences in overall abstract reasoning ability (covariate), inductive reasoning ability (covariate), deductive reasoning ability (covariate), IQ (covariate), and instructional preference (coded variable).

Data were analyzed via Analyses of Variance and Covariance (ANOVA and ANCOVA), Scatterplots, Linear Regression Analyses, Chi-Square Analyses, and simple descriptive statistics (percentages).
Participants, variables, instruments, data collection procedures, and statistical analyses employed in the study are discussed below.

**Participants**

Subjects were 66 undergraduate students (47 females and 19 males) enrolled in three beginning classes of Italian at the State University of New York (SUNY) at New Paltz. Each class was randomly administered one of three treatments: example-based, rule-based, or combination-based instructional mode, as illustrated in the sections below. 21 students (6 male, 15 female) participated in the example-based group, 21 students (8 male, 13 female) in the rule-based group, and 24 (5 male, 19 female) in the combination-based group.

All participants were volunteers, began learning Italian in college and had not previously been taught the rule which was tested in the experiment. Students who selected to take part in the study received extra-credit points for their year's final grade.
Variables

The experiment examined relationships between the explanatory variables of abstract reasoning abilities, IQ, and learner instructional preference on the one hand, and the outcome measures of achievement and transfer of the rule to new cases on the other hand, under different instructional modes. Three teaching levels (example-based, rule-based, and combination-based) were taken into consideration for the independent variable.

Variables and rationales for their selection are presented below.

I. Instructional mode (independent variable).

Teaching in this study was done by means of three computer assisted (CAI) lessons written by the investigator using the multimedia program Director 5 (Micromedia, 1995). CAI instruction was preferred to traditional instruction so as to limit possible confounds, due for example to teacher biases towards a particular teaching mode, teacher-student interaction differences among the three classes or among students within each class, and to ensure better that all teaching conditions provided learners with comparable length
of instruction. All programs were projected in class on a large screen with voice over provided by the experimenter.

The following three modes of syntax presentation were taken into account because of their relevance to the inductive-deductive controversy in the teaching of L2 syntax: "example-based," "rule-based," and "combination-based" teaching. They can be described as follows:

(a) Condition 1 (example-based).
This lesson took an inductive approach to teaching and students were taught exclusively via examples without explicit grammatical rules. Consequently, the underlying syntax principles are discovered exclusively from the context, provided by pictures and words.

After a short introduction briefly illustrating the goal of the lesson, the program showed a "comparative" screen on which four main categories appeared one at the time on a different quadrant of the screen. Each category was identified by the numbers #1, #2, #3, and #4, and by a key image which provided a context for a sentence employing the feature "molto." Students were told that the word "molto" took different forms, but only in certain
circumstances, and that they had to discover when it did and when it did not by comparing the four different categories they could see on the screen. Students noticed immediately that the ending in category #1 was different from that of categories #2, #3, and #4. They were told that to help them determine why and how “molto” changed its endings in category #1 but did not in the others, each category would be shown in detail and would be further illustrated by a number of other examples. The following pattern was used throughout the program: first, each category was always introduced by the number and the picture used in the “comparative” screen. The same image reappeared immediately after and students were told the action illustrated in the picture under a question form. For example, when the picture of a boy eating a heaping plate of cookies appeared, they were asked in Italian: “mangia i biscotti?” (is he eating cookies?). Students replied “Sì!” (yes!). A few instants after, the following sentence appeared below the image and was read emphatically by the investigator: “mangia MOLTI biscotti!” (he eats A LOT OF cookies!). Each category contained different examples and always included a number of examples of given situations in which the same action was
performed by a male, a female, or more that one subject. This had the purpose of illustrating that the feature “molto” (in active sentences) changes only when it functions as an adjective, not as an adverb, and does so irrespectively of the subject’s gender/number. All examples of a given category appeared again, arranged in two summary screens, before the onset of the next category. In the final part of the program, the “comparative” screen shown at the beginning of the lesson, was shown again with each image appearing with a few second delay on a different screen quadrant, but sentences appeared a few seconds after each picture/number was introduced.

(b) Condition 2 (rule-based).

This lesson took a traditional deductive approach and students were taught explicit syntax rules, following a review of relevant terminological definitions.

The program opened with an introductory screen which explained that the feature “molto” took different endings when it functioned as an adjective, but remained invariable when it functioned as an adverb. Because formal knowledge of syntax varies a great deal among undergraduate students,
it could not be assumed that all students clearly remembered
differences among basic parts of the speech such as nouns,
adjectives, adverbs and verbs, which were taught in early
school grades.

Thus, Part One of the program was constituted by a
quick grammar review of adjectives and adverbs. It
contained screens with definitions of adjectives and adverbs
and examples in English, followed by training exercises (in
English) containing adjectives and adverbs used in separate
sentences or a paragraph. Examples were given with the
following pattern: an English sentence containing an adverb
or an adjective appeared in large capital letters in the
middle of the screen, followed by a new screen in which the
adjective or the adverb used in the previous sentence
appeared again but with question mark and voice-overs asking
what role it played in the sentence. The solution appeared
on the same screen a few seconds after, followed by a new
screen with more detailed explanations. For example,
students saw the sentence “she drives very quickly” which
was read aloud by the experimenter. When the word “VERY?”
replaced the sentence students were asked: “now, think of
what very is in this sentence, what’s its function?” The
solution appeared below: "it's an adverb" and students were asked: "why? How do we know?" A new screen appeared with the explanation: "because very modifies another adverb, the adverb quickly." Then students heard: "now look at the next example and, again, think whether it is an adjective or an adverb."

Part Two of the program concentrated on the feature "molto." The explanation of the underlying rule was given in the first screen. A series of subsequent screens explained that when "molto" is an adjective it can have four endings, resulting in "molto, molta, molti, molte," and according to the gender and number of the noun/pronoun it modifies. In subsequent screens, each form of "molto" appears respectively with a masculine singular, feminine singular, masculine plural, and feminine plural noun. The same pattern is followed for "molto" used as an adverb which appears in conjunction with an adjective, with a verb, and with another adverb.

(c) Condition 3 (combination-based).

This lesson constituted a base-line (control group) against which the effectiveness of the two other lessons were
measured. It combined both example-based (1/2 of the examples) and rule-based (initial definitions and section two) approaches in equal combination and students were exposed to "examples" and "rule" explanations selected from the two conditions above. To account for possible effects due to order of mode presentation, one half of the subjects were taught by examples followed by explicit rules, the other half by explicit rules followed by examples.

II. Abstract reasoning ability (covariate).

In order to understand better the effectiveness of different modes of L2 syntax instruction among individual learners, the study took into account individual differences in abstract reasoning ability. Because such differences were not directly manipulated in the study, abstract reasoning ability was initially used as a covariate.

For the variable "abstract reasoning ability" two measures were selected:

1. measures of induction: analogy questions
2. measures of deduction: logical reasoning questions
Inductive reasoning involves drawing logical consequences from the relative frequency with which a certain event occurs and proceeds as follows: all observed instances of "A" are "B". All observed instances of "A" are "C". Therefore, it is likely that "B" is "C." When thinking proceeds from examples, empirical checks are needed. It is possible to presume that induction may play a stronger role when instruction is mainly constituted by examples, as students are asked to hypothesize whether a feature behaves in a certain manner based on how it behaved in a number of observed instances.

Deductive reasoning, to the contrary, involves drawing logical consequences from true premises and proceeds in the following manner: "All As are Bs. A is C. Therefore, B is C." When thinking proceeds from rules in a cause-effect manner, empirical checks are not needed, and the conclusions reached are true given true premises. It is possible to hypothesize that deduction may play a stronger role when instruction is mainly constituted by rules.

It has been argued, however, that there is no guarantee to warrant the common assumption that students who are exposed to a particular method of teaching employ
correspondent modes of learning. Explicit rules may be extracted from examples alone in the absence of explicit instruction or, conversely, some students may "fall back on exhaustive learning of individual exemplar sentences and words" even though they have been instructed via rules (MacWhinney, 1997, p.278). Consequently, given that very little is known of how teaching and learning interact and of how individuals employ induction and deduction when reasoning abstractly, relationships between teaching mode and reasoning were examined by considering total scores obtained when solving inductive reasoning tasks, and total scores obtained when solving deductive reasoning tasks in combination and separately.

Moreover, because of the impossibility of knowing what actually happens in the "black box," the study also employed a student recall instrument, designed by the researcher to provide additional insights to students' learning processes. All students were asked to reply in great detail to four questions. Section #1 asked students to recall the rule illustrated in the multimedia program and to explain in their own terms how it worked. Follow-up questions asked
students to recall what was most important in their selecting answers during the testing phase. Students in the "example-based" mode were asked whether they primarily based their answers on particular examples, and if so whether they were explicitly given in the program or others they might have modified from the program, whether they focused on the role particular words might have played in the examples, or whether they used a combination of both. Students in the "rule-based" mode were asked whether they primarily based their answers on the particular functions of words, and if so whether they used the rule exactly as it was given to them or modified it in any manner, whether they primarily based their choice on particular examples, or whether they used a combination of both. Students in the "combination-based" groups were also asked whether they primarily used examples (explicitly given or not), based their choice on word functions, or whether they used a combination of both.

III. IQ (covariate).

Literature findings indicate that abstract reasoning ability may relate to intelligence. Although intelligence was not a primary variable of interest in the study, it was
nonetheless necessary to control for the possible impact of IQ. Criteria for selecting the Naglieri Nonverbal Ability Test (NNAT form G, 1995) are illustrated in the Measurement section below.

IV. Learning preference (coded factor).

This study set out to investigate the impact of different modes of syntax presentation given differences in the student body. The impact of the belief system on L2 achievement is not yet well documented. Examining possible relationships between learner beliefs and teaching, however, is extremely important given the acute controversies that have surrounded the teaching of grammar in our field. It was deemed key to this study, given that students may have reacting differently to particular methods of instruction. For example, some students might have been prejudiced against learning exclusively via examples. Conversely, as Ellis (1984) remarks, “students who expect language teaching to consist of formal instruction may be more receptive to it than others” (p. 140).

A questionnaire was designed. Because pilot testing of the questionnaire indicated that some students interpreted
some of the answers relatively to their own individual preferences as learners, while others looked at their relevance for all college students of Italian, the questionnaire comprised two sections. Section I referred to college teaching of new syntax structures of Italian among students in general. Section II contained the same questions but students were asked to express preferences and beliefs as they saw them relate to their own learning. In both sections students were asked to express preferences for learning Italian syntax features when their presentation consists: (a) exclusively of grammatical rules, (b) exclusively of key examples and learners are allowed to figure out rules for themselves, (c) of rules and examples in similar proportions (with rules first), and (d) of examples and rules in similar proportions (with examples first). Answers to categories (c) and (d) was collapsed into one category, combination-based teaching preference. Because the study explores L2 syntax learning given individual characteristics, only section II of the questionnaire, which pertains to learners’ individual preferences as they have an impact on their own learning, was employed in the analyses. Students were additionally
classified according to (a) a dichotomous category: "happiness" vs. "unhappiness" with the instructional mode to which they were assigned.

**Instrumentation**

In order to answer the research questions considered in this study, several instruments were employed. For each variable examined in the study, instrumentation is illustrated and discussed below.

**Instrumentation for the variable mode of syntax presentation**

Because performing different tasks may involve different kinds of knowledge (Bialystock, 1982), three different kinds of tasks, commonly found in L2 textbooks and classrooms, were employed to assess student L2 achievement designed for the feature "molto." To limit possible effects of testing, only one task was devised for the feature "tanto." Scores on the three tasks for "molto" were examined as aggregates. Tasks can be described as follows:

1. a multiple-choice exercise offering four choices for the feature "molto" (i.e. molto, molta, molti,
molte) which was used either as an adjective or an adverb in 10 sentences

2. a guided paragraph-writing of four sentences, each one containing the feature “molto” in conjunction with a key word to be selected from four groups. Each group of words comprised nouns, adjectives, adverbs, or verbs.

3. a guided story retelling. Students were asked to supply the right ending for the feature “molto” in a seven sentence passage. Each sentence was given between brackets and was identical in meaning to the preceding sentence in which, however, the word “molto” never appeared.

4. a multiple-choice exercise offering four choices for the feature “tanto” (i.e. tanto, tanta, tanti, tante) which was used either as an adjective or an adverb in 10 sentences

Additional measures for the feature “molto”:

In order to gain a better understanding of the role played by the variables under investigation in the learning of the feature “molto,” subjects completed a recall
questionnaire. Three versions of the questionnaire, found in appendix C, were administered. Questionnaires were similar in number of questions, length, format and content, but the wording differed in the order questions were asked and for one subsection. They can be described as follows:

All subjects were asked two main questions: (1) to explain, with their own words, the rule for the feature “molto” (2) to write what was most important in deciding what which ending to use for the feature “molto” when they were tested on it. The second question differs slightly in the three groups and is composed of three subsections as follows. For the example-based group, question (a) asked whether students primarily recalled particular examples and based their choice on some similarities of such examples with the sentence they were asked to complete. Whether they answered positively or not, students were asked to explain and give specific examples. If they answered yes, they were asked whether such examples were given explicitly in the program or whether the student had modified them or created new ones. Students were asked to explain and give specific examples. Subsection (b) asked students whether they based themselves on particular functions given words played in
given sentences (e.g., whether they focused on verbs, adjectives etc.). Students were asked to explain and give details. Subsection (c) asked whether both (a) and (b) played a major role. Students were asked to explain and give specific examples.

The questionnaire for the rule-based group was as follows: question (a) was question (b) from the example-based questionnaire, but with three subsections: 1. students were asked whether they used the rule that was given to them, 2. students were asked whether they used a modified version of the rule that was given to them, 3. students were asked to explain and give details. Question (b) was question (a) from the example-based group but without subsections, and question (c) was identical to question (c) in the example-based group.

The questionnaire for the “combination-based” group asked questions (a) from the rule-based group, with subsections, first; question (a) from the example-based group, with subsections, second, and question (c) third.
Instrumentation for the variable abstract reasoning ability

This study was designed to be carried out in classroom settings. Because of time and economic constraints, it was not possible to administer full-length abstract reasoning tests. 24 questions were thus selected from tasks devised for the General Record Exam (GRE) by Educational Testing Service (ETS), which granted royalty-free permission for their use in this study. Questions comprised:

(a) 12 analogies questions

(b) 12 logical reasoning questions

Another criterion used in selecting questions was relative difficulty. For both analogies and logical reasoning categories, equal number of questions were selected taking into account percentiles, provided by ETS, which ranged from 20th to 90th. All items were selected from the GRE Big Book (1998). Question identification numbers, relative pages, and percentiles are found in appendix E.

Analogy questions were chosen as a measure of induction because, as delineated by Educational Testing Services in the General Test Big Book (1998), they "test the ability to
recognize relationships among words and the concepts they represent and to recognize when these relationships are parallel" (p. 12). For example (GRE, 1998, sample question #1, p. 12):

Directions: In each of the following questions, a related pair of words or phrases is followed by five lettered pairs of words or phrases. Select the lettered pair that best expresses a relationship similar to that expressed in the original pair.

1. COLOR : SPECTRUM : :
   (a) tone : scale
   (b) sound : waves
   (c) verse : poem
   (d) dimension : space
   (e) cell : organism

When answering analogy questions, subjects must formulate and analyze the relationships linking a given pair of words with those in five answer choices, recognize the pair most nearly analogous to the given pair, and eliminate four incorrect answer choices. Selection may be made based on relationships such as kind, size, contiguity, or degree.

Logical reasoning questions were chosen as a measure of deduction because they “test the ability to understand, analyze, and evaluate arguments” by requiring subjects to recognize points made in given arguments, recognize the
assumptions at its bases, form hypotheses and draw conclusions, evaluate arguments and counterarguments and analyze evidence (p. 24). Questions are based on a short argument, and answers do not require any specialized content knowledge or knowledge of formal logic. The 12 questions selected always presented arguments in which premises were given as true and reasoning proceeded in a cause-effect (syllogistic) manner. For example (GRE 1989-90, sample question #45, p. 41):

Directions: Each question or group of questions is based on a passage, graph, table, or set of conditions. In answering some of the questions, it might be useful to draw a rough diagram. For each question, select the best answer choice given.

If Ruth was born in New York State, then she is a citizen of the United States.

The statement above can be deduced logically from which of the following statements?

(A) Everyone born in New York State is a citizen of the United States.

(B) Every citizen of the United States is a resident either of one of the states or one of the territories.

(C) Some people born in the United States are citizens of the United States.

(D) Ruth was born either in New York or in California.

(E) Ruth is a citizen either of the United States or of Sweden.

Instrumentation for the variable IQ

To ensure that differences in abstract reasoning ability were not due to differences in intelligence, the
Naglieri Nonverbal Ability Test (form G, 1995) was administered and raw scores were used as a covariate.

The test lasted 30 minutes and comprised 38 matrices. For each matrix, students are to observe shape and color patterns organized in designs, and chose responses that complete such patterns. Students recorded answers with a pencil on NNAT answer sheets provided by the manufacturer. Sample matrices are as follows (sample B, p.1):

![Sample B matrices](image)

Figure 1: Naglieri Nonverbal Ability Test Sample B
The NNAT was selected because it meets the following criteria, as delineated in the Directions for the test administration (1995, p. 3-6): the test provides a valid and reliable assessment of students' ability; is fair across gender, race, and ethnicity; does not require students to write, read, or speak; does not require factual knowledge and vocabulary, mathematics, and reading skills as a prerequisite; is relatively brief (30 minutes), and can be administered easily to a wide variety of students in a group format.

**Instrumentation for the variable instructional preference**

In order to determine whether instructional preference played a significant role in determining student achievement under an "example-based," "rule-based," and "combination-based" mode of syntax presentation, a questionnaire was designed by the experimenter. The instrument contained two sections, of four questions each. Section 1 asked students to indicate their opinions about the effectiveness of different modes of syntax presentation when used in teaching college students of Italian. Students were asked to rate their answers according to the following Likert-type scale:
1=strongly agree, 2=agree, 3=neutral, 4=disagree, 5=strongly disagree.

The second section contained the same four questions, but students were asked to answer based on how they learned best, not for their beliefs about syntax teaching to college students. The distinction between beliefs pertaining to their own learning vs. beliefs about what would be best for all college students in general was made during the instrument fine-tuning which took place with volunteer college students of French. Students were asked to rate beliefs and preferences about teaching and learning when:

(a) given primarily grammatical rules and the strictly necessary number of examples to illustrate them; (b) given primarily examples and allowed to figure out rules by themselves as much as possible; (c) given both rules and examples in similar proportions, but rules are given first, examples after; (d) given both rules and examples in similar proportions, examples are given first, rules after. The instrument can be found in appendix D.
Data Collection Procedures

The study was carried out in three main phases during regular classroom hours, when classroom instructors had planned to teach the feature "molto" to their classes for the first time. The second phase took place two weeks after and the third phase the week after phase two.

Procedures were slightly different for the "combination-based" group, where half the students (group C-1) were randomly selected to be instructed via key "examples" followed by explicit "rule" explanations, while the other half (group C-2) were taught via explicit "rule" explanations followed by key "examples." C-2 students were initially assigned to an adjacent classroom, where they were supervised by an Italian instructor. They exchanged classrooms with C-1 students after 15 minutes. C-1 students continued with the other steps of the experiment in the other classroom where the Italian instructor helped with data collection. All steps were of equal length for both C-1 and C-2 students. Such a design was possible thanks to the fact that class for this group meets twice per week for 90 minutes, instead of one hour three times a week, as in the case of the two other groups.
I. **Phase One**: the first phase of the study involved four separate steps, (a), (b), (c), and (d):

(a) **Teaching of “molto”**

Each class of was randomly assigned to one of three learning conditions, “example-based,” “rule-based,” or “combination-based.” The instructional phase lasted approximately 13 minutes and was carried out via four multimedia programs.

(b) **Testing of “molto.”**

Data collection took place immediately after the presentation of the feature “molto” and lasted a total of twenty minutes. First, students completed the following exercises (fifteen minutes): a multiple-choice exercise, a short guided paragraph, and a brief guided story retelling.

(c) **Explanation and testing of “tanto.”**

Students were subsequently told that another feature, “tanto,” a synonym of “molto,” behaves exactly like “molto” from a syntactical point of view, and thus changes its endings in exactly the same manner “molto” would. No further explanations or examples were offered. Immediately
after, students completed a multiple-choice exercise with ten missing instances of “tanto.” Teaching and testing took five minutes.

(d) Recall protocols for “molto.”
Students were asked to explain how the feature “molto” behaves in Italian, using their own words. Subsequently, they were asked to recall whether they relied on particular rules and or examples during the testing phase, and whether such rules and or examples were given in the program or whether and how they had modified them. Recall protocols were returned within 10 minutes.

Phase II
The second phase of the study took place two weeks after the beginning of the experiment and was carried out during regular classroom hours. It entailed two main steps: (a), and (b):

(a) testing for “abstract reasoning.”
The first step entailed the administration of the 24 analogy and logical reasoning questions developed by the Educational
Testing Service (ETS) for the Graduate Record Examination (GRE). Testing took 30 minutes.

(b) Preference and Belief questionnaire administration
All students completed questionnaires within five minutes.

**Phase III**
The third phase of the study took place the week after the second phase. It lasted 30 minutes and entailed the administration of the Naglieri Nonverbal Ability Test (1995).

**Data Analysis**
Relationships between L2 syntax achievement and transfer of the rule to new instances and the explanatory variables of instructional mode, abstract reasoning (inductive and deductive reasoning in combination and separate), IQ, and instructional preference, were examined via the statistical package S-PLUS (MathSoft, 1996). The following steps were followed during data analysis.
**Step One:** An Analysis of Variance (ANOVA) was performed to investigate the impact of instructional mode on the two outcome variables achievement and transfer.

**Step Two:** A scatterplot was produced for each of the following explanatory variables: (a) abstract reasoning ability (inductive and deductive reasoning combined), (b) inductive reasoning, and (C) deductive reasoning, against each response variable, achievement (moltotot) and transfer (tanto), for each mode of syntax presentation. To minimize the possibility that student performance could be affected by the type of achievement test, scores for the three tasks (multiple choice, sentence writing, and story retelling) were aggregated into the single score "moltotot."

In order to explore trends among the explanatory variables, individual Linear Regressions were fitted across and within the three instructional groups for both achievement and transfer. The possibility to examine findings via Multiple Regression Analyses was considered, but ruled out because no more than one explanatory variable was significant within each group.
**Step Three:** Subsequently, it was investigated whether students had understood the syntax rule for the feature "molto." To check relationships between teaching mode and understanding of the rule, Chi Square Analyses were performed. Analyses of Variance (ANOVAS) were also performed to ensure that there was not a discrepancy between students' understanding of the rule underlying the feature "molto," and their actually ability to implement such rule. This was a precautionary measure. A number of different other factors could influence testing in a L2 (such as for example, degree of familiarity with testing mode and/or with vocabulary) and have an impact on achievement. Because Linear Regression Analyses indicated that inductive reasoning significantly related to achievement in the example-based group, and deductive reasoning in the combination-based group, separate analyses of Covariance (ANCOVAS) were also performed. Within each group, results of the Analysis of Variance were adjusted for the explanatory variable that had proved significant which was used as a covariate.
Step Four: Chi-Square Analyses were performed in order to investigate whether, during test completion for the feature "molto," students relied on the rule or the examples given in the programs they were exposed to or whether they relied on rules and or examples they might have produced on their own.

Step Five: The impact of instructional preference was also analyzed. Students were asked to indicate their beliefs and preferences regarding different modes of L2 syntax presentation: example-based, rule-based, and combination-based. Although in the questionnaire subjects were asked to indicate beliefs about L2 syntax teaching mode as they relate to American college students of Italian in general, only the second part of the questionnaire, which relates exclusively to the students' personal learning, were taken into account. Answers were aggregated as follows.

To determine whether a student being assigned to a preferred or disliked instructional mode had an impact on achievement and/or transfer, students were labeled "happy" or "unhappy" about the group they were assigned to and received respectively codes 1=happy, 0=unhappy. If subjects
rated their instructional group highest, or equal to any other group, they were categorized as "happy" with the instructional mode they received. To the contrary, if they listed their instructional group lower than any other group, or tied with the lowest group, they were categorized as "unhappy" with the instruction they received.

To determine instructional preference and its relation to achievement and transfer, students' preferred teaching modes were rated as 1=example-based, 2=rule-based, 3=combination-based, 4=tied score with preferred and another mode. In other words, subjects who preferred the example-based mode received code = 1, while those who expressed a preference for examples received code = 2, and those who rated the combination-based mode as highest, received code =3. If equal preference was given for the preferred group and another group, code =4 was assigned.

For each group, an Analysis of Variance (ANOVA) was performed with group preference as independent variable and achievement and transfer as response measures.

Step Seven: The last step involved examining the possibility that the students' level of "happiness" with the
instructional mode they were assigned may favor or impede achievement and/or transfer. To this effect, an Analysis of Variance was performed.
CHAPTER 4

RESULTS

The following chapter illustrates results pertaining to the research questions posed in this study. Findings regarding cognitive and socio-psychological variables against measures of achievement and transfer across and within the three teaching conditions are presented and discussed with attention to the implications, limitations and future directions of L2 syntax learning in classroom situations. As described in Chapter Three, data were collected from 66 subjects enrolled in beginning Italian classes at the State University of New York, New Paltz.

Results

Mode of syntax presentation

In order to answer the first research question, and thus determine whether different instructional modes
resulted in differences of achievement and/or transfer, an Analysis of Variance (ANOVA) was performed, with mode of syntax presentation as independent variable and aggregate achievement scores ("moltototot") and transfer ("tanto") as dependent variables. No significant differences were found across instructional modes for achievement or for transfer of the rule. Overall Means (with standard deviations in parentheses) were 12.70 (4.20) for achievement, and 5.48 (2.57) for transfer. Means and standard deviations for achievement were respectively 12.19 (4.64) for the example-based group, 13.00 (3.55) for the rule-based group, and 12.88 (4.44) for the combination-based group. Means and standard deviations for transfer were 5.38 (2.20) for the example-based group, 5.38 (2.89) for the rule-based group, and 5.67 (2.68) for the combination-based group.

Means and standard deviations for each groups also indicate that the three conditions were homogeneous with respect to inductive reasoning (M = 5.43, SD=2.23, for the example-based group; M = 6.25, SD=2.07, for the rule-based group; M = 5.29, SD=2.18, for the combination group), for deductive reasoning (M = 6.10, SD=2.61, for the example-based group; M = 6.35, SD=2.28, for the rule-based group; M
= 6.05, SD=2.50, for the combination group), and for IQ (M = 26.65, SD=5.22, for the example-based group; M = 26.10, SD=5.78, for the rule-based group; M = 24.8, SD=6.72, for the combination group), which might account for the inconclusive findings for the role of instruction.

Results for cognitive and psycho-sociological variables across the three instructional conditions and by group, are presented below.

Cognitive variables: abstract reasoning ability (inductive/deductive reasoning) and IQ

(a) Overall results

A scatterplot was produced for the explanatory variables abstract reasoning (inductive and deductive scores combined), inductive reasoning, deductive reasoning, and IQ, against the response variables achievement (moltotot) and transfer of the rule (tanto). Individual Linear Regressions were fitted. As shown in Table 1, the Linear Regression Analysis for abstract reasoning ability, an explanatory variable consisting of aggregate scores of inductive and deductive reasoning abilities, was highly significant, for
both achievement $F(1, 63) = 12.26, p < .0009$, and transfer of the rule, $F(1, 63) = 8.45, p < .005$. To investigate whether variance, across groups, was to be attributed to the role of inductive or deductive reasoning, further Linear Regressions were fitted. Inductive reasoning was significant, $F(1, 63) = 11.32, p < .0013$, across groups for achievement, but not for transfer, while deductive reasoning was significant for achievement, $F(1, 61) = 5.43, p < .0231$, and transfer $F(1, 61) = 8.57, p < .0047$. IQ was not significant across instructional modes of syntax presentation for either response variable.

(b) Results by instructional mode of syntax presentation

Table 2 and Figure 1 illustrate significant findings for the role of abstract reasoning, inductive reasoning ability, deductive reasoning ability, and IQ. Scatterplots and Linear Regression Analyses indicated that abstract reasoning ability made a difference in the example-based group, $F(1, 19) = 6.34, p < .02$ for achievement, and in the combination-based group for transfer $F(1, 22) = 5.90, p < .02$. Trends for induction and deduction were further examined.
Inductive reasoning played a statistically significant role only in the example-based/inductive mode of presentation (examples), both in the case of achievement (moltotot), $F(1, 19) = 13.16, \ p < .0018$ and transfer (tanto), $F(1, 19) = 4.95, \ p < .038$. Deductive reasoning appeared to play a role only in the combination-based instructional condition, where it significantly related to transfer, $F(1, 20) = 9.58, \ p < .0057$, and achieved near significance for achievement, $F(1, 20) = 4.27, \ p < .0519$. To the contrary, no differences in achievement and or transfer were found for induction or deduction in the rule-based/deductive teaching mode, but significance was found for IQ, $F(1, 18) = 9.01, \ p < .0077$ in the case of transfer.
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<td>Residual</td>
<td>63</td>
<td>969.3271</td>
<td>15.3861</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>64</td>
<td>1126.9530</td>
<td></td>
<td></td>
</tr>
<tr>
<td>( R^2 ) = 0.1522757</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Deductive reasoning</td>
<td>1</td>
<td>91.7340</td>
<td>91.7340</td>
<td>5.43*</td>
</tr>
<tr>
<td>Residual</td>
<td>61</td>
<td>1030.2660</td>
<td>16.8896</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>62</td>
<td>1122.0000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>( R^2 ) = 0.08175906</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Transfer (tanto)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Abstract reasoning</td>
<td>1</td>
<td>50.8942</td>
<td>50.8942</td>
<td>8.45**</td>
</tr>
<tr>
<td>Residual</td>
<td>63</td>
<td>379.3519</td>
<td>6.0215</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>64</td>
<td>430.2461</td>
<td></td>
<td></td>
</tr>
<tr>
<td>( R^2 ) = 0.1182909</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Deductive reasoning</td>
<td>1</td>
<td>51.9620</td>
<td>51.9620</td>
<td>8.57**</td>
</tr>
<tr>
<td>Residual</td>
<td>61</td>
<td>369.7451</td>
<td>6.0614</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>63</td>
<td>421.7071</td>
<td></td>
<td></td>
</tr>
<tr>
<td>( R^2 ) = 0.1232332</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

** p. < 0.01  *p. < 0.05

Table 1: Overall Analysis of Variance for achievement (moltotot) and transfer (tanto) by cognitive variables
<table>
<thead>
<tr>
<th>Source</th>
<th>DF</th>
<th>SS</th>
<th>MS</th>
<th>F</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Achievement</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Abstract reasoning</td>
<td>1</td>
<td>107.8976</td>
<td>107.8976</td>
<td>6.34*</td>
</tr>
<tr>
<td>Residual</td>
<td>19</td>
<td>323.3405</td>
<td>17.0179</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>20</td>
<td>431.2381</td>
<td>124.9155</td>
<td></td>
</tr>
<tr>
<td>$R^2$</td>
<td></td>
<td>0.2502042</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Inductive reasoning</td>
<td>1</td>
<td>176.5080</td>
<td>176.5080</td>
<td>13.16**</td>
</tr>
<tr>
<td>Residual</td>
<td>19</td>
<td>254.7301</td>
<td>13.4068</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>20</td>
<td>431.2381</td>
<td>189.9148</td>
<td></td>
</tr>
<tr>
<td>$R^2$</td>
<td></td>
<td>0.4093053</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Transfer</strong> (tanto)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Inductive reasoning</td>
<td>1</td>
<td>20.0379</td>
<td>20.0379</td>
<td>4.95*</td>
</tr>
<tr>
<td>Residual</td>
<td>19</td>
<td>76.9145</td>
<td>4.0481</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>20</td>
<td>96.9524</td>
<td>24.0860</td>
<td></td>
</tr>
<tr>
<td>$R^2$</td>
<td></td>
<td>0.2066775</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Rule-based group</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Transfer (tanto)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>IQ</td>
<td>1</td>
<td>55.6428</td>
<td>55.6428</td>
<td>9.01**</td>
</tr>
<tr>
<td>Residual</td>
<td>18</td>
<td>111.1572</td>
<td>6.1754</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>19</td>
<td>166.8000</td>
<td>61.8182</td>
<td></td>
</tr>
<tr>
<td>$R^2$</td>
<td></td>
<td>0.33359</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 2: Within-group Analysis of Variance for achievement (moltotot) and transfer (tanto) by cognitive variables
Table 2 (Continued)

**Combination-based group**

<table>
<thead>
<tr>
<th>Transfer (tanto)</th>
<th></th>
<th>Abstract reasoning</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>34.9412</td>
<td>34.9412</td>
</tr>
<tr>
<td>Abstract reasoning</td>
<td>1</td>
<td>50.8711</td>
<td>50.8711</td>
</tr>
<tr>
<td>Residual</td>
<td>22</td>
<td>106.2198</td>
<td>5.3110</td>
</tr>
<tr>
<td>Total</td>
<td>23</td>
<td>157.0909</td>
<td>56.1821</td>
</tr>
<tr>
<td>( R^2 )</td>
<td></td>
<td>0.32338321</td>
<td></td>
</tr>
</tbody>
</table>

**p. < 0.01    *p. < 0.05**
Figure 2: Scatter-plots of Significant Group Variance
Figure 2: (Continued)

Transfer by Deductive Reasoning by Group

Transfer by IQ by Group
Figure 2: (Continued)

Transfer by Abstract Reasoning by Group

Abstract Reasoning (total) vs. Taniq

Examples
Rules
Combinatorial
The possibility that individual learners might have, in fact, understood the rule, but encountered difficulties in applying it due to other factors pertaining to L2 testing and/or to abstract reasoning abilities and IQ was taken into account. Analysis of Variance (ANOVA) indicated that this was not the case. The factor rule understanding has a statistically significant effect on achievement ($F = 13.54, p = 1.2821$).

**Reliance on examples/rules**

In order to investigate whether students rely on examples/rules provided during instruction, further statistical analyses were performed. Relationships among the students' reliance on the rule and/or on the examples given in the three instructional conditions, significant cognitive factors, and students' scores on achievement and transfer were examined. After coding procedures (illustrated in Chapter Three), student responses to the recall questionnaire (see appendix C) were examined. As shown in Table 3, results indicate that within the example-based group, 8 subjects reported relying both on examples given in the program and on self-formulated rules,
while 13 subjects reported never making use of particular examples but relying exclusively on rules they derived on their own while watching the program. Within the rule-based group, 13 students reported basing their answers exclusively on the rule which was explicitly given in the program, 3 subjects indicated that they used examples they formulated while watching the program, and 1 subject reported guessing at the answer. Within the combination group, 11 students used only rules, 2 students relied only on examples, 10 employed both rules and examples, and 1 guessed at the answer.

Coded answers were further analyzed. A Chi-Square Test was performed and no relationship was found. Analyses of Variance and of Covariance (ANOVAS and ANCOVAS) for each group were also executed. Rule/example reliance was employed as an independent variable, inductive reasoning ability (example-based group) and deductive reasoning ability (combination based group) as covariates, and achievement scores as dependent variable. No significant differences were found for the variable rule/example reliance. As expected, however, inductive reasoning ability made a significant difference for the example-based group and
deductive reasoning ability for the combination-based group.

Results are illustrated in Table 4.
<table>
<thead>
<tr>
<th>Group and Variable</th>
<th>Observation</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Example-based group</strong>*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Examples</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Rules</td>
<td>13</td>
<td>62</td>
</tr>
<tr>
<td>Both</td>
<td>8</td>
<td>38</td>
</tr>
<tr>
<td>Guesses</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td><strong>Rule-based group</strong>*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Examples</td>
<td>3</td>
<td>14</td>
</tr>
<tr>
<td>Rules</td>
<td>13</td>
<td>62</td>
</tr>
<tr>
<td>Both</td>
<td>4</td>
<td>19</td>
</tr>
<tr>
<td>Guesses</td>
<td>1</td>
<td>5</td>
</tr>
<tr>
<td><strong>Combination-based</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Examples</td>
<td>2</td>
<td>8</td>
</tr>
<tr>
<td>Rules</td>
<td>11</td>
<td>46</td>
</tr>
<tr>
<td>Both</td>
<td>10</td>
<td>42</td>
</tr>
<tr>
<td>Guesses</td>
<td>1</td>
<td>4</td>
</tr>
</tbody>
</table>

* N = 21
** N = 24

Table 3: Number and Percentage of Subjects by Rule/Example Reliance
<table>
<thead>
<tr>
<th>Source</th>
<th>DF</th>
<th>SS</th>
<th>MS</th>
<th>F*</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Achievement (moltotot)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Example-based group</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Inductive reasoning</td>
<td>1</td>
<td>156.3419</td>
<td>156.3419</td>
<td>11.13*</td>
</tr>
<tr>
<td>Residual</td>
<td>18</td>
<td>252.7351</td>
<td>14.0408</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>19</td>
<td>419.0770</td>
<td>170.3827</td>
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</tr>
<tr>
<td>Combination-based group</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Deductive reasoning</td>
<td>1</td>
<td>79.0244</td>
<td>79.0244</td>
<td>5.04*</td>
</tr>
<tr>
<td>Residual</td>
<td>17</td>
<td>267.4756</td>
<td>15.7339</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>18</td>
<td>346.5000</td>
<td>94.7583</td>
<td></td>
</tr>
</tbody>
</table>

* p. < 0.05

Table 4: Analysis of Covariance (ANCOVA) for Achievement (Moltotot) and Rule/Example Reliance
Socio-psychological variable: instructional beliefs-preference

In order to investigate the study's second question, answers to section (b) of the preference and belief questionnaire (see appendix D) were analyzed. As described in Chapter Three, answers were coded and categorized according to two criteria: (a) student instructional preference, and (b) students' "happiness" or "unhappiness" with the instructional mode of syntax presentation they were assigned to. Overall, 5 subjects expressed preference for the example-based condition (four from the example-based and one from the rule-based), 20 for the rule-based (9 in the example-based, 10 in the rule-based, and 1 in the combination based), 33 for the combination-based (5 in the example-based, 5 in the rule-based, and 23 in the combination based), and 8 (3 in the example-based and 5 in the rule-based) for either the example-based alone or in combination with the rule-based. Overall, 40 subjects were "happy" with the instructional mode to which they were assigned. Number of subjects and percentages for instructional preference and "happiness" with assigned groups are summarized in Table 5.
To determine if there is a relationship between mode of syntax presentation and teaching preference, a Chi-Square Test was performed. Significant relationship was found ($x^2 = 35.4685, p = 0$). An Analyses of Variance (ANOVAs) was subsequently performed to investigate whether group preference and/or "happiness" with the instructional group the student learned the rule for the feature "molto" had an impact on achievement and/transfer. The analyses did not yield any significant results.
<table>
<thead>
<tr>
<th>Group</th>
<th>Preference</th>
<th>&quot;Happy&quot;</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N percentage*</td>
<td>N percentage</td>
</tr>
<tr>
<td>Example-based group*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Examples</td>
<td>4</td>
<td>19</td>
</tr>
<tr>
<td>Rules</td>
<td>9</td>
<td>43</td>
</tr>
<tr>
<td>Both</td>
<td>5</td>
<td>24</td>
</tr>
<tr>
<td>Rules or both equally</td>
<td>3</td>
<td>14</td>
</tr>
<tr>
<td>Rule-based group*</td>
<td>10</td>
<td>48</td>
</tr>
<tr>
<td>Examples</td>
<td>1</td>
<td>5</td>
</tr>
<tr>
<td>Rules</td>
<td>10</td>
<td>48</td>
</tr>
<tr>
<td>Both</td>
<td>5</td>
<td>24</td>
</tr>
<tr>
<td>Examples or both equally</td>
<td>5</td>
<td>24</td>
</tr>
<tr>
<td>Combination-based group**</td>
<td>23</td>
<td>96</td>
</tr>
<tr>
<td>Examples</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Rules</td>
<td>1</td>
<td>4</td>
</tr>
<tr>
<td>Both</td>
<td>23</td>
<td>96</td>
</tr>
<tr>
<td>Examples or Rules equally</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

* N = 21  **N = 24  
Note: percentages do not add up to 100.

Table 5: Student instructional preference and "happiness" ratings with assigned group (observations and percentages)
Discussion

The results of this study provide empirical evidence for the role of individual learner factors in the learning of L2 syntax. This project's findings indicate that the mode of syntax presentation does not appear to have a significant impact on the learning of new syntax rules among beginner college students of Italian, or on rule transfer to new cases. In other words, students appear to learn equally well whether they are presented with examples only and asked to infer underlying rules, whether they are instructed by rules, or whether instruction is based on a combination of both examples and rules. Although such results are not surprising, given that they are consistent with a number of
larger scale studies in the SLA literature, which also failed to find direct cause-effect relationships between teaching mode and learning, this project produced significant insights into the L2 syntax learning process.

The investigation of the role played by the cognitive variables examined, indicates that learner differences in inductive and deductive reasoning ability, as well as in IQ, significantly relate to achievement and transfer of rules to new cases under particular teaching modes.

It is possible that no significance was achieved for mode of syntax presentation and achievement/transfer because fairly homogeneous groups were used and the number of subjects who were affected by any given instructional mode within each group might have been cancelled out by those who benefitted from such modes. Overall and within-group positive relationships between abstract reasoning abilities and achievement/transfer may in fact signal that, at an individual level, given methods of syntax presentation may prove particularly hard for people with lower levels of inductive/deductive reasoning ability.

In particular, this hypothesis may prove valid for achievement and transfer when learning under example-
based/inductive instructional conditions. This study’s findings seem to suggest that example-based/inductive teaching may involve inductive-based inferences in the learner, given that significant relationships exist between the ability to solve analogy questions and achievement/transfer only in the example-based condition. To this extent, Ausubel (1963) and Carroll (1964) argue that an inductive approach may prove too difficult for "weaker" students. This study is consistent with their view and further suggests that inductive teaching may prove particularly difficult for students who have difficulties solving analogical tasks. Such a view, however, goes against current trends in L2 teaching, which tend to consider the teaching of grammar via induction easier for "learners of all abilities" Shaffer (1989) and thus "more egalitarian" (for a review see Neubert & Binko, 1992).

The impact of teaching via rules (in the rule-based/deductive condition) on rule learning and its transfer to new cases, appeared to be unrelated to measures of abstract reasoning ability, whether induction or deduction was taken into account. Positive relationships were found
for IQ and transfer, although significance was not strong enough to make a difference across conditions.

For the combination-based mode, no relationships were found for induction, but deductive reasoning appeared to play a role in the case of transfer of the rule. It is important to highlight that while in the case of inductive teaching and inductive reasoning significance was high both in the case of achievement and transfer, for the rule-based and the combination conditions, significance was low, and only related to transfer of the rule, not to achievement. Consequently, due to the limited number of subjects, findings for deductive reasoning and IQ must be taken with caution.

This study also provides evidence suggesting that given modes of instruction may not necessarily lead to corresponding methods of learning. This is consistent with the hypothesis recently put forward in the literature, that even without explicit instruction students may attempt to extract explicit rules from a set of input data or, conversely, when exposed to rules, they may "fall back on exhaustive learning of individual exemplar sentences and words" (MacWhinney, 1997). Although this study’s data
consisted of self-accounts and, consequently, it is not
generalizable to other populations, findings suggest that no
matter whether only rules are provided or only examples are
given during the instructional phase, learners rely on both,
thus also making use of rules and examples they formulate on
their own during instruction. In other words, it is
possible that both examples and rules may be needed to learn
L2 grammar and that learners, consciously or not, may
formulate their own rules when instruction is heavily biased
towards examples, and examples when teaching is heavily
biased towards rules.

The possibility that students may supply either
elements or rules on their own, however, does not appear to
account for lack of significant differences in achievement/
transfer under different instructional modes. Student degree
of reliance on the rules/examples provided during
instruction, did not significantly relate to learning
outcomes.

This study also took into account the possibility that
results may be influenced by difficulties in applying the
rule during testing conditions, rather than to the actual
understanding of the rule. Such a possibility was ruled
out: students who understood the rule could also apply it and vice-versa.

Evidence from this project provided insights into another area, learner instructional preference. Subjects in this study, regardless of the teaching condition under which they were instructed, appeared to prefer a combination of examples and rules, or rules alone. Such a finding has numerous pedagogical implications. Learner preference, however, does not appear to have an impact on learning outcomes (achievement or transfer) and being instructed under a syntax presentation mode that is not congruent with one's individual instructional preference, does not appear to impede learning. Similarly, preferences and beliefs do not appear to have an impact on whether learners actually rely on examples/rules provided during instruction or on those they formed on their own.

Delimitations and limitations of the study

A number of delimitations and limitations characterize this study. First of all, only one grammar feature was taken into consideration, and it is possible that, although this feature was part of the regular student curriculum and was
taught following the syllabus in agreement with all classroom teachers, different findings may be obtained when examining other rules, particularly those which also exist in the English language and may be learned more easily by American students.

Moreover, this study's subjects consist only of American college learners enrolled in beginning L2 classes, and cannot be generalized to learners in naturalistic settings, from other countries, or of different age groups.

Other limitations were due to subjects, teaching and testing conditions, and economical and time constraints. For instance, because only 66 students were observed and the experiment took place during regular classroom hours, it was possible to randomly assign teaching conditions to students, but abstract reasoning ability and IQ were treated as covariates (i.e., they were not directly manipulated but observed as they occurred in the population sample). Results pertaining to such variables, thus, indicate trends rather than cause-effect relationships. Consequently, findings cannot to other subjects, syntax rules, other foreign languages or academic instructional areas.
Implications

Although no statistical significance was found for the role played by different instructional modes of syntax presentation on achievement and transfer, this study comports a number of implications for future research and for classroom teaching in the following three main areas.

(1) Future research is needed to corroborate the preliminary findings suggested by this study which indicate that the ability to solve analogies has an impact on learning outcomes (both achievement and transfer) when instruction consists of inductive teachings. This is of particular importance given that many grammar lessons, as well as syllabi and textbooks, are built around the assumptions that learning by examples is easier for all learners. (2) Although students’ preferences for given syntax presentation modes do not appear to significantly relate to learning outcomes, the findings suggested by this study, that learners do in fact prefer either a combination of rules and examples, or rules alone, needs to be further explored. Implications range from syllabus- and curriculum-design to testing in addition to possibly play a role on student educational choices, such as for example the amount and
quality of time they may decide to devote to L2 learning, or determine whether they will decide to take further courses beyond those necessary to meet graduation requirements. (3) The finding that students appear to use both rules and examples when learning L2 syntax, and that they may build their own rules or examples when instruction is heavily biased towards induction or deduction, also has numerous implications for L2 acquisition theory as well as for cognitive psychology. Large-scale experiments are needed to examine the effects of teaching method on interlanguage development and to explain learning in different populations.

Conclusions
This study examined the long-standing inductive-deductive controversy in L2 acquisition by focusing on the role played by learner cognitive and psychological factors. Mainly, this study set out to determine whether inductive and deductive presentations of L2 syntax resulted in differences of achievement and or transfer, when differences in abstract reasoning ability, IQ, and instructional preference were taken into account.
Additionally, this research project focused on gathering evidence on a little-understood areas of inquiry: how learners form-form meaning relationships.

Findings of this study are congruent with other evidence in the L2 research literature which indicates that teaching mode does not appear to significantly determine learning outcomes. This study indicates that achievement (and actual rule understanding) as well as transfer of the rule to new cases does not vary across instructional modes (example-based/inductive, rule-based/deductive, and combination-based modes of syntax presentation).

Strong relationships, however, were found for the role of inductive reasoning ability in the example-based/inductive condition both for achievement and transfer. This finding questions the assumption which can be commonly found among many L2 educators and researchers that inductive teaching is easier for learners of all abilities. Such a view stems from research in child L1 research and linguistics. This study argues that although children can acquire their first tongue by relying on inductive reasoning, this does not imply that adult learners will
learn a L2 in a similar manner, nor that all adults can effectively employ inductive reasoning when learning an L2.

Relationships were also found for transfer and deductive reasoning ability in the combination-based group, and for IQ in the rule-based one.

Although the exploratory nature of this study did not permit to establish cause-effect relationships for the role of abstract reasoning and IQ in L2 syntax learning under different instructional modes, such preliminary evidence has numerous implications for research and classroom instruction.

Additionally, the study suggests that another assumption, that learners prefer to learn by example, may not be true for all populations. This did not prove true for the sample examined which, independently of the learning condition, perceived learning via examples as less effective than via a combination of rules and examples, or rules alone. Further research is needed to explore other consequences (besides purely academic achievement) which may have an effect on the learners' study and enjoyment of L2s.

More fine-tuned research is needed to further explore initial evidence provided by this study which suggests that
learners employ both rules and examples when learning syntax, even when this requires constructing their own rules/examples.
APPENDIX A

ACHIEVEMENT TESTS

"MOLTO:" TASKS A, B, C

NAME: ___________________________________ TIME ____________
Your name and answers will be used exclusively for data analysis purposes and WILL BE KEPT
CONFIDENTIAL!

A: CIRCLE THE RIGHT ANSWER.

1) I gelati sono ____ buoni. [MOLTO, MOLTA, MOLTI, MOLTE]

2) Tu hai ____ amiche italiane. [MOLTO, MOLTA, MOLTI, MOLTE]

3) Le ragazze sono ____ gentili (kind). [MOLTO, MOLTA, MOLTI, MOLTE]

4) I signori Verdi bevono (drink) ____. [MOLTO, MOLTA, MOLTI, MOLTE]

5) A New Paltz ci sono ______ studenti. [MOLTO, MOLTA, MOLTI, MOLTE]

6) Gianni beve _____ Coca-Cola. [MOLTO, MOLTA, MOLTI, MOLTE]

7) La macchina di Marta é ____ bella. [MOLTO, MOLTA, MOLTI, MOLTE]

8) Gli italiani parlano _____ velocemente (quickly). [MOLTO, MOLTA, MOLTI, MOLTE]

9) Generalmente (generally), le pizze americane sono ____ grandi (big). [MOLTO, MOLTA, MOLTI, MOLTE]

10) Marisa va ____ frequentemente (frequently) al cinema. [MOLTO, MOLTA, MOLTI, MOLTE]
8: Write a very short story about Laura, your Italian friend. You must use one word from each one of the 4 categories given below. Each word you choose must be accompanied by the right form of "MOLTO." Because you may not yet know all the words you need in Italian, you may also use some English words if you need to.

1
dischi (records)
opere liriche (operas)
strumenti musicali (musical instruments)
arie (arias)

2
famosa (famous)
ricca (rich)
intelligente (intelligent)
diligente (diligent)

3
frequentemente (frequently)
raramente (rarely)
bene (well)
veramente (really)

4
studia (studies)
lavora (works)
canta (sings)
balla (dances)

La mia amica Laura ........................................................................................................
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120
APPENDIX B

TRANSFER

"TANTO"

NAME: ____________________ TIME ____________________

Your name and answers will be used exclusively for data analysis purposes and WILL BE KEPT CONFIDENTIAL!

A: CIRCLE THE RIGHT ANSWER.

(1) I genitori di Anna mangiano (eat) ____.
   (TANTO, TANTA, TANTI, TANTE)

(2) Laura va ____ raramente (rarely) a lezione.
   (TANTO, TANTA, TANTI, TANTE)

(3) Roberto beve ____ acqua.
    (TANTO, TANTA, TANTI, TANTE)

(4) I miei amici sono ____ bravi.
    (TANTO, TANTA, TANTI, TANTE)

(5) In classe oggi non ci sono _____ uomini.
    (TANTO, TANTA, TANTI, TANTE)

(6) Marina e Laura sono ____ simpatiche (nice).
    (TANTO, TANTA, TANTI, TANTE)

(7) I giovani guidano ____ rapidamente (quickly).
    (TANTO, TANTA, TANTI, TANTE)

(8) Le automobili di "Formula 1" sono ____ grandi (big).
    (TANTO, TANTA, TANTI, TANTE)

(9) La casa di Teresa é ____ bella.
    (TANTO, TANTA, TANTI, TANTE)

(10) Maria ha ____ sorelle.
    (TANTO, TANTA, TANTI, TANTE)
APPENDIX C

LEARNING PROCESS QUESTIONNAIRES

Example-based group

1. PLEASE EXPLAIN THE RULE FOR THE FEATURE “MOLTO.” Feel free to use your own words, no need to use technical terms!

2. WHEN YOU WERE TESTED ON THE FEATURE “MOLTO,” WHAT WAS MOST IMPORTANT IN DECIDING WHICH ENDINGS TO USE?

(a) Did you primarily recall particular examples and base your choice on their similarity to the sentences you were asked to complete? YES ____ NO _____
Please explain:

If you answered yes,
1. did you use examples that were explicitly given to you in the program? YES ____ NO _____
2. did you use examples that you modified from the program? YES ____ NO _____
3. Please explain your answers to (1) and (2) above and give specific examples:

(b) Did you primarily base your choice on the particular functions given words played in given sentences (e.g., did you focus on verbs, adjectives etc.)? YES ____ NO _____
Please explain what you did and give specific examples:

(c) Did both (a) and (b) play a major role in your decisions? YES ____ NO _____
Please explain and give specific examples:
Rule-based group

Name: ___________________ Time: ___________________

Please Note: Your name will remain strictly confidential and your answers will be used exclusively for research purposes.

This questionnaire complies to guidelines established by The State University of New York at New Paltz Review Board. Your involvement is strictly voluntary and you may choose not to answer any questions which you find objectionable.

1. PLEASE EXPLAIN THE RULE FOR THE FEATURE "MOLTO." Feel free to use your own words, no need to use technical terms!

2. WHEN YOU WERE TESTED ON THE FEATURE "MOLTO," WHAT WAS MOST IMPORTANT IN DECIDING WHICH ENDINGS TO USE?

(a) Did you primarily base your choice on the particular functions given words played in given sentences (e.g., did you focus on verbs, adjectives etc.) YES ______ NO _______

Please explain:

If you answered yes,
1. did you use the rule that was given to you? YES ______ NO _______
2. did you use a modified version of the rule that was given to you? YES ____ NO ____
3. Please explain your answers to (1) and (2) above and give specific examples:

(b) Did you primarily base your choice on particular examples? YES ____ NO ______

Please explain what you did and give specific examples:

(c) Did both (a) and (b) play a major role in your decisions? YES ____ NO ______

Please explain and give specific examples:
Combination-based group

Name: ___________________________ Time: ___________________________

Please Note: Your name will remain strictly confidential and your answers will be used exclusively for research purposes. This questionnaire complies to guidelines established by The State University of New York at New Paltz. Your involvement is strictly voluntary and you may choose not to answer any questions which you find objectionable.

1. PLEASE EXPLAIN THE RULE FOR THE FEATURE "MOLTO." Feel free to use your own words, no need to use technical terms!

2. WHEN YOU WERE TESTED ON THE FEATURE "MOLTO," WHAT WAS MOST IMPORTANT IN DECIDING WHICH ENDINGS TO USE?

   (a) Did you primarily base your choice on the particular functions given words played in given sentences (e.g., did you focus on verbs, adjectives etc.)? YES ______ NO ______

      Please explain:

      If you answered yes,
      1. did you use the rule that was given to you? YES ______ NO ______
      2. did you use a modified version of the rule that was given to you? YES ______ NO ______
      3. Please explain your answers to (1) and (2) above and give specific examples:

   (b) Did you primarily recall particular examples and base your choice on their similarity to the sentences you were asked to complete? YES ______ NO ______

      Please explain:

      If you answered yes,
      1. Did you use examples that were explicitly given to you in the program? YES ______ NO ______
      2. Did you use examples that you modified from the program? YES ______ NO ______
      3. Please explain your answers to (1) and (2) above and give specific examples:

   (c) Did both (a) and (b) play a major role in your decisions? YES ______ NO ______

      Please explain:
APPENDIX D

PREFERENCE AND BELIEF QUESTIONNAIRE

NAME: ___________________________________ TIME __________________

Please Note: Your name will remain strictly confidential and your answers will be used exclusively for research purposes. This questionnaire complies to guidelines established by The State University of New York at New Paltz Review Board. Your involvement is strictly voluntary and you may choose not to answer any questions which you find objectionable.

Instructions: Please read carefully all the statements below and for each one indicate your opinions by circling the appropriate number. Rate your answers as follows:

1 = strongly agree  2 = agree  3 = neutral  4 = disagree  5 = strongly disagree

(I) I believe that, to best learn Italian in college, new grammar structures are best introduced to students by:

(a) giving primarily grammar rules and the strictly necessary number of examples to illustrate them

1  2  3  4  5

(b) giving primarily examples and allowing students to figure out rules by themselves as much as possible

1  2  3  4  5

(c) giving both rules and examples in similar proportions, but rules should be given first

1  2  3  4  5

(d) giving both rules and examples in similar proportions, but examples should be given first

1  2  3  4  5

(II) When I learn a new grammar feature of Italian, I prefer when I am given:

(a) primarily grammar rules and the strictly necessary number of examples to illustrate them

1  2  3  4  5

(b) primarily examples and am allowed to figure out rules by myself as much as possible

1  2  3  4  5

(c) both rules and examples in similar proportions, but I am given rules first, examples after

1  2  3  4  5

(d) both rules and examples in similar proportions, but I am given examples first, rules after

1  2  3  4  5

126
APPENDIX E

ABSTRACT REASONING QUESTIONS

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(a) Analogy questions

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<th>SECTION</th>
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(b) **Logical reasoning questions**

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