

Introduction

Inductive instruction creates a context of autonomous, meaningful learning (Decoo, 1996; Gollin, 1998; Haight, Herron & Cole, 2007; Hammerly, 1975; Wang, 2002). It encourages active rather than passive participation of students in the learning process. In contrast to a conventional deductive approach, an inductive approach involves a process of generalizing or discovering rules from given examples rather than learning rules directly (Erlam, 2003; Fischer, 1979; Gollin, 1998; Herron & Tomasello, 1992; Richards, Platt & Platt, 1992; Seliger, 1975; Shaffer, 1989; Wang, 2002). Via this rule-discovering process, learner autonomy and meaningful learning are achieved. Note that some empirical studies have claimed that an inductive approach, in particular, in foreign language grammar instruction allows students to discover grammar rules on their own and thus facilitates their recall of linguistic structures (e.g., Fischer, 1979; Herron & Tomasello, 1992; Shaffer, 1989; Takimoto, 2005). A hot debate has been raised by such inductive research. Namely, can students who are required to generalize grammar rules by themselves in inductive instruction learn better than those who are offered explicit rules in the first place in traditional deductive instruction? The present study attempted to explore such issue, in particular, in the context of EFL classroom. More precisely, this study intended to determine if EFL students were able to use known facts (i.e., illustrated sentences) to produce general grammatical laws on their own via inductive instruction.

Deductive approach is a conventional way to teach grammar in the ESL/ EFL classroom. In deductive grammar instruction, rules are given before the illustration of examples, and learners are required to memorize these rules so that they can apply them to make meaningful sentences (Decoo, 1996; Erlam, 2003; Fischer, 1979; Gollin, 1998; Herron & Tomasello, 1992; Scott, 1989; Scott, 1990; Seliger, 1975; Shaffer, 1989). Rao (2002) indicated that explicit instruction was usually provided by EFL English teachers who often taught English grammar deductively. In fact, EFL students in Taiwan have received this explicit, deductive grammar instruction for years. They have to recall grammar rules so well as to cope with English written exams at school. With the constraint and the

exam-oriented curriculum, inductive approach to teach grammar is rarely practiced here.

The aim of the current study was to probe the effect of inductive approach in teaching English grammar, in particular, of “relative clauses” for junior high school students of differing English proficiency. To be more specific, this study attempted to examine four main areas: (a) effect of inductive approach in contrast to conventional deductive approach; (b) interaction effect of English proficiency to teaching approach; (c) interaction effect of gender to teaching approach; (d) interaction effect of task complexity to teaching approach.

Up to date, few ESL/ EFL research studies have suggested accessible new approaches in teaching English grammar (e.g., Chang, 2002; Chang, 2005; Cheng, 2006; Cheng, 2007; Herron & Tomasello, 1992; Huang, 2004; Lu, 2005; Scott, 1989; Scott, 1990; Wu, 2003; Xu, 2001). This present study intended to explore an alternative approach (i.e., inductive approach) in comparison with a widely-used traditional deductive approach in the EFL context of Taiwan. English teachers here could thus compare and adapt these two different approaches to suit the differing English proficiency of individual learners and the differing complexity nature of learning tasks. For ages, nonnative teachers of EFL have generally embraced a myth that the way they studied English before is the best way for their students. Student individual differences such as English ability and gender are often neglected. It was in the hope that the results of this study would shed light on the effectiveness of inductive approach in relation to learner individual differences.

Review of the Literature

Inductive approach is effective in teaching second or foreign language grammar (Fischer, 1979; Haight et al., 2007; Herron & Tomasello, 1992; Paesani, 2005; Shaffer, 1989; Takimoto, 2005; Wang, 2002). Basically, in inductive instruction, grammar rules are induced from sentences provided by the instructor. Fischer (1979) and Takimoto (2005) asserted that students who learned grammar rules inductively could remember the rules longer. Takimoto further claimed that

inductive approach was effective when both form and function were included in the teaching process. Wang (2002) indicated that learning via such approach helped develop rule-discovering skill and thus enhanced student performance.

Decoo (1996) divided inductive approach into four types in terms of the varying degrees of induction. The first type was conscious induction as guided discovery, in which students were exposed to certain sentences. Teachers then asked some key-questions to prompt their students to discover and formulate the target rules on their own. The second type was induction leading to an explicit summary of rules. In this type, students practiced certain structures in an intense way and were expected to, more or less, generate the target rules in the process. At last, teachers summarized the rules explicitly for their students. The third type was subconscious induction on structured material, in which there were no prompting acts or explicit rules given by teachers, and “the students were exposed to language material that has been structured in such a way to help the inductive process.” (Decoo, 1996, p. 97) The fourth type, subconscious induction on unstructured material, was similar to the third type but even closer to the process of natural language acquisition in which students engaged in the intensive practice of authentic input or text, and no well-structured material was given. They had to figure out the rules all by themselves.

Note that Decoo’s categorization on inductive approach appeared a little complex in such a way that in the first two types of induction, the rules were either prompted or summarized by teachers, and the remaining two types, without any teachers’ assistance on student rule formation. It was the type I, guided induction, that was of great concern in the present study. It was chosen because of its feasibility and adaptability for an EFL classroom.

A few research studies have examined the effects of inductive and deductive approaches in teaching foreign or second language grammar in the past decades (e.g., El-Banna & Ibrehim, 1985; Erlam, 2003; Fischer, 1979; Hammerly, 1975; Herron & Tomasello, 1992; Nagata, 1997; Rose & Ng, 2001; Seliger, 1975; Shaffer, 1989; Takimoto, 2005; Wang, 2002; Xia, 2005). These studies have, however, produced inconsistent results. Herron and Tomasello (1992) conducted an

experimental study to compare the effects of an inductive approach and a conventional deductive approach in teaching the beginning level of French grammatical structures. Twenty-six American college students from two French classes were recruited as subjects. Ten French grammatical structures were selected from the students' lab manual, and were randomly assigned to two types of instruction (i.e., induction and deduction), five for each. All subjects received both types of instructional treatments, and the treatments were counterbalanced in the two classes. In inductive instruction, the teacher began with contextualized oral drills, and students hypothesized the underlying grammatical structures via the drills without any assistance. In deductive presentation, the teacher began with rule demonstration. Students then applied the learned rule in a contextualized oral drill. After the instruction, a fill-in-blank post-test was administered to the two groups. A duplicate delayed post-test was conducted a week after the post-test to examine students' retention. The results indicated that an inductive approach was superior to a deductive one in teaching beginning level of French, in both of the immediate test and delayed test. Induction helped memorize the grammatical structures more than deduction.

Inconsistent with the results produced in aforementioned Herron and Tomasello (1992), Erlam (2003) found deduction a better approach than induction in teaching French grammar. The researcher conducted a similar study to examine the effects of the two different approaches on the learning of direct object pronouns of French. Sixty-nine New Zealand high school students were recruited in this study. The subjects were randomly allocated into deductive, inductive, and control groups. In deductive group, the usage of the direct object pronouns was explained by the teacher, and the sample sentences were provided. The students then worked on the exercise of pronoun replacement followed by correction and error explanation from the teacher. In inductive group, students did not receive any rule explanation. Instead, a handout with pictures and statements was given, and they were asked to match these statements to the appropriate pictures. The students then saw some other pictures presented via an overhead projector and, meanwhile, listened to two statements describing each picture. They had to

decide which statement correctly matched the picture being presented. The purpose of such activities was to elicit the right usage of the direct object pronouns from the learners. The control group students did not receive any target structure instruction but a form-focused instruction. A post-test was executed right after the instruction for each group. A delayed post-test was also conducted six weeks after the experiment. The results indicated that the deductive group significantly outperformed both of the inductive and control groups on the two immediate and delayed tests.

In Seliger (1975), the effect of inductive and deductive methods in grammar teaching was also examined. Fifty-eight students in an American language institute were randomly assigned into an inductive, a deductive, and a control group. The grammatical structure being taught was the order of pre-noun modifiers in English. All lessons were written and recorded on tapes in a language laboratory recording room. In inductive group, the tape was played to the students with the written material. They were then asked to summarize in paper the rule they had found via the practice. In deductive presentation, the target grammar was explained by a teacher, and the students applied it into exercise. The control group received no rule instruction but engaged in silent reading. A recall test was administered one day after the instruction, and a retention test was carried out three weeks after the instruction. No significant difference was found in the recall test between the two experimental groups. The results of the retention test, however, indicated that the deductive group significantly outperformed the inductive one. Deduction helped longer rule retention.

The three aforementioned studies (i.e., Erlam, 2003; Herron & Tomasello, 1992; Seliger, 1975) have produced mixed results. Although Herron and Tomasello (1992) found the inductive approach superior to conventional deduction in foreign language grammar instruction, Erlam (2003) and Seliger (1975) found the deductive approach more effective in teaching second language grammar. In addition to grammar instruction, Rose and Ng (2001) and Takimoto (2005) explored the effects of the two approaches on pragmatic use. The former found that deductive approach was effective on developing socio-pragmatic proficiency,

while the latter revealed that students retained the pragmatic use longer under inductive instruction. Unfortunately, the effectiveness of induction in contrast to deduction was still uncertain.

Generally, quite a few research studies have explored the effect of inductive vs. deductive approach in grammar instruction in past decades (e.g., El-Banna & Ibrahim, 1985; Erlam, 2003; Haight et al., 2007; Herron & Tomasello, 1992; Nagata, 1997; Rose & Ng, 2001; Seliger, 1975; Shaffer, 1989; Takimoto, 2005; Wang, 2002; Xia, 2005). However, very few of them have examined the interaction between teaching approach and learners' language proficiency (e.g., Shaffer, 1989; Wang, 2002) or that between teaching approach and task complexity (e.g., Wang, 2002). Besides, the aforementioned studies did produce contradictory results; some of them claimed inductive approach to be effective (Haight et al., 2007; Herron & Tomasello, 1992; Takimoto, 2005; Wang, 2002), and some, deductive one (Erlam, 2003; Nagata, 1997; Rose & Ng, 2001; Seliger, 1975), and even three studies produced no significant difference between the two approaches (El-Banna & Ibrahim, 1985; Shaffer, 1989; Xia, 2005). Such inconsistency found in the literature suggests that further exploration on inductive and deductive approaches in the context of grammar instruction is very necessary. In addition, the factors of English proficiency, gender, and task complexity in relation to an inductive approach have not been thoroughly examined to date. They would be covered in the current research.

Methodology

The aim of the current study was to probe the effect of an inductive approach in teaching English grammar, in particular, of “relative clauses” for junior high school students. The interaction effects of teaching approach with English proficiency, gender, and task complexity were also examined. To be more specific, the design itself was a factorial experimental study with four main factors: (a) teaching approach (induction vs. deduction), (b) English proficiency (high, mid, and low), (c) gender (male vs. female), and (d) task complexity (simple vs. complex). A summary table of the entire experiment is presented in Table 1.

Table 1
Summary Table for Entire Experiment

Procedures	Experimental Group (induction)	Control group (deduction)	Time (70 mins)
1. Pre-instruction	Orientation to the study	Orientation to the study	6 mins
2. Presentation I	Self-study: silent reading on structured material	Lecture: explicit rule explanation by the teacher on structured material	13 mins
3. Presentation II	Prompting: prompts given by the teacher via exercise	Read-aloud exercise: read the structured material aloud	12 mins
4. Presentation III	Rule description: describe in words the self-generalized rules after the prompting exercise	Self-study: read the structured material silently	9 mins
5. Practice	Sentence combination	Sentence combination	15 mins
6. Post-test	Written test	Written test	15 mins

Subjects

The subjects recruited in this present study were from two intact classes of total 70 eighth graders at a junior high school in Kaohsiung City. The two classes had been taught by the same English teacher. These two classes were randomly assigned to an experimental group which received inductive instruction and a control group which received conventional deductive instruction. More specifically, in the experimental group, guided inductive practice was provided to elicit target grammar rules from the students; in the control group, the students were provided with explicit instruction on the use of these rules at the outset of instruction. An identical post-test was administered immediately after the instruction in the two groups.

English proficiency was an important factor in the current study. Language proficiency between the two groups was found to be equivalent via a statistical test on the students' English term grades of previous semester ($t(69) = .810, p = .421$

>.05). Based on the grades, the students who were identified as the top-one-third in their respective classes were classified as high-achievers, and the mid- and bottom-one-third, as mid- and low-achievers, respectively. The subjects were not aware of such classifications. In addition, they were unfamiliar with the target structures (i.e., relative clauses) to be taught in this study. The demographic data of the subjects are presented in Table 2.

Table 2
Demographic Data of Subjects

Research Group	Deductive Group		Inductive Group		Total
	Male	Female	Male	Female	
High	5	7	4	7	23
Mid	6	5	6	7	24
Low	5	6	5	7	23
Total	16	18	15	21	70
Grand Total	34		36		70

Instruments

The instruments employed in this present study included separate handouts of learning material for the inductive and deductive groups, and a common post-test for both groups. The vocabulary used in teaching target grammar (i.e., relative clauses) was learned by the subjects before. This message was confirmed by their English teacher, which was to eliminate the unwanted interference of unfamiliar vocabulary. All of the learning material and post-test were reviewed and revised by three professors from the field of English teaching and one experienced junior high school English teacher. Modifications were made accordingly. This reviewing procedure was to ensure good content validity of the instruments and consistency between the studied material and evaluation test.

Structured Material in Inductive Group. Samples drawn from the stages of self-study, guided instruction and exercise are provided in Tables 3, 4, and 5.

Table 3
Sample Sets in Inductive Material for Self-study

RP	Sample Sets	
who	<p>1. I have <u>a friend</u>. My <u>friend</u> lives in Taipei. I have a friend <u>who lives in Taipei</u>.</p> <p>2. <u>The teacher</u> teaches well. <u>The teacher</u> wears red glasses. The teacher <u>who wears red glasses</u> teaches well.</p>	<p>我有一個朋友。 我朋友住在台北。 我有一個<u>住在台北的</u>朋友。</p> <p>那位老師教書教得很好。 那位老師戴紅色眼鏡。 <u>戴紅色眼鏡的</u>那位老師教書教得很好。</p>
whom	<p>1. John loves <u>the singer</u>. I met <u>the singer</u> yesterday. John loves the singer <u>whom I met yesterday</u>.</p> <p>2. <u>The girl</u> is Mark's sister. John likes <u>the girl</u>. The girl <u>whom John likes</u> is Mark's sister.</p>	<p>John喜愛那位歌手。 我昨天遇到那位歌手。 John 喜愛<u>我昨天遇到的</u>那位歌手。</p> <p>那個女孩是Mark的姐姐。 John喜歡那個女孩。 <u>John 喜歡的</u>那個女孩是 Mark 的姐姐。</p>
which	<p>1. I bought <u>a dog</u>. <u>The dog</u> has a short tail. I bought a dog <u>which has a short tail</u>.</p> <p>2. <u>The comic book</u> is cheap. <u>The comic book</u> is interesting. The comic book <u>which is interesting</u> is cheap.</p> <p>3. The man stole <u>the bag</u>. Mary bought <u>the bag</u> last month. The man stole the bag <u>which Mary bought last month</u>.</p> <p>4. <u>The cat</u> is cute. She bought <u>the cat</u> yesterday. The cat <u>which she bought yesterday</u> is cute.</p>	<p>我買了一隻狗。 那隻狗有條短尾巴。 我買了一隻<u>有條短尾巴的</u>狗。</p> <p>那本漫畫很便宜。 那本漫畫很有趣。 <u>很有趣的</u>那本漫畫很便宜。</p> <p>那個男人偷了那個袋子。 Mary上個月買了<u>那個袋子</u>。 那個男人偷了 <u>Mary 上個月買的</u>的袋子。 那隻貓很可愛。 她昨天買了那隻貓。 <u>她昨天買的</u>那隻貓很可愛。</p>

Table 4
Guided Instruction in Inductive Handout

Sample Set	I have a <u>friend</u> . My <u>friend</u> lives in Taipei. I have a friend <u>who lives in Taipei</u> .	我有一個朋友。 我朋友住在台北。 我有一個 <u>住在台北的</u> 朋友。
Guided Instruction	上面例句中，第二句的朋友是（人 非人），且在（主詞 受詞）的位置，所以關係代名詞用（who whom which）	
Sample Set	John loves <u>the singer</u> . I met <u>the singer</u> yesterday. John loves the singer <u>whom I met yesterday</u> .	John喜愛那位歌手。 我昨天遇到 <u>那位歌手</u> 。 John 喜愛 <u>我昨天遇</u> <u>到的那位歌手</u> 。
Guided Instruction	上面例句中，第二句的歌手是（人 非人），且在（主詞 受詞）的位置，所以關係代名詞用（who whom which）	
Sample Set	I bought a <u>dog</u> . <u>The dog</u> has a short tail. I bought a dog <u>which has a short tail</u> .	我買了一隻狗。 那隻狗有條短尾巴。 我買了一隻 <u>有條短尾巴的</u> 狗。
Guided Instruction	上面例句中，第二句的狗是（人 非人），且在（主詞 受詞）的位置，所以關係代名詞用（who whom which）	

Table 5
Samples in RP Sentence Combination Exercise

Relative Pronoun (RP)	Sentence Combination Exercise
who	{ She likes the boy. The boy wears a black jacket.
whom	{ The teacher is nice. We like the teacher.
which	{ The pen is expensive. The pen is useful.

Structured Material in Deductive Group. All the model sentences and exercise in the deductive handout were exactly the same as those used in inductive group except that explicit RP rules were listed at the beginning of respective RP sections of “who,” “whom,” and “which” for the deductive group.

Post-test. Both groups received the same post-test with 16 fill-in-blank questions (part I) of three possibilities (i.e., who, which, and which) and 8 sentence

combination questions (part II). The test items here were of equivalent difficulty level as the sample sets in the presentation stage and exercise items in the practice stage. Two types of RP questions were given evenly in the two parts of questions to assess task complexity in relation to the placement of relative clause in the noun phrase or in the verb phrase of a sentence. Based on Hsin and Wang (2005), a relative clause embedded in the noun phrase (before main verb) was viewed as a complex task (e.g., The girl whom John likes is Mark's sister.), and that in the verb phrase (after main verb) was regarded as a simple one (e.g., I have a friend who lives in Taipei). The learning material and test were of equivalent difficulty level for either complex or simple task. This message was confirmed by the afore-mentioned four reviewers.

Procedures

An experienced English teacher at a junior high school in Kaohsiung City was asked to help with the experiment. The purpose and the procedures of the study were clearly explained to her in the first place, and permission to conducting an experimental study in her two classes was gained. These intact classes were randomly assigned into a control group and an experimental group via coin flipping. The experimental group was taught by a guided inductive method, and the control group, a conventional deductive approach for learning relative pronouns of who, whom, and which.

In the inductive group, the orientation of the instruction was given by the instructor at the beginning. The students were then asked to silently read the handouts and describe in words the usage of relative pronouns they had observed. They continued to read another handout characterized by a Chinese guided sentence in each set of model sentences. They were required to circle an appropriate prompt, or hint, in each guided sentence. When the circling task was completed, these students described in words the underlying usage of relative pronouns. After the rule-description, they did the exercise of sentence combination. The sentences in the exercise were similar to those in the handout. After the exercise, the instructor provided answers to the exercise without any further rule explanation, and the students checked the answers by themselves. A

test was administered right after the instruction.

In the deductive group, the orientation of the instruction was also provided by the instructor at first. The rules of the relative pronouns were explicitly taught. The students then followed the instructor to read aloud each of the model sentences. Afterwards, they read the sentences silently to themselves. They then did the exercise of sentence combination after their silent study. Similarly, the instructor provided answers to the exercise without any further rule explanation, and the students examined their own performance. An immediate test was also administered at the end of instruction.

Data Analysis

Two experienced teachers were asked to grade the post-test. The criterion of rating was informed to them. Pearson correlation coefficient procedures were used to compute scores from the two raters to generate inter-rater reliability for the post-test. The detected coefficients of the experimental group ($r = 1.00$, $p < .01$) and the control group ($r = .99$, $p < .01$) suggested high scoring agreement between the two scorers on the post-test. All the data were analyzed via the SPSS statistical package. To compare the effects of inductive vs. deductive approach on student performance, an independent t -test was used. In addition, three two-way analysis of variance (ANOVA) tests were executed to examine the interaction effects: (1) between the two approaches (i.e., inductive vs. deductive) and the three levels of English ability (i.e., high, mid, and low), (2) between the two approaches and gender (i.e., male vs. female), and (3) between the two approaches and task complexity (i.e., simple vs. complex). The level of statistical significance for the t -test and ANOVA tests was set at .05.

Results

Effects of two teaching approaches. Descriptive statistics for the students' performance on post-test in both groups are shown in Table 6. An independent t -test was conducted to examine if there was any significant mean difference between the two groups. No significant mean difference was found ($t(69) = 1.06$, $p = .30 > .05$); both groups performed equivalently on the post-test. This result

suggested that the inductive approach was as effective as the deductive one in grammar instruction.

Table 6
Means and Standard Deviations for Two Groups on Post-test

Research Groups	N	M	SD
Inductive Group	36	51.54	21.60
Deductive Group	34	58.09	29.49

Interaction between teaching approach and English proficiency. The mean scores and standard deviations of performance on post-test as a function of teaching approach and English proficiency are presented in Table 7. A 2 (teaching approach) X 3 (English proficiency) analysis of variance (ANOVA) was conducted to examine the interaction effect between the two variables (see Table 8). Such interaction effect was found significant at .05 level ($F(2, 69) = 5.38, p = .01 < .05$). Namely, there was a significant interaction between the two teaching approaches and the three levels of English ability. This result suggested that English proficiency affected the effectiveness of teaching approaches. An interaction plot of teaching approach by proficiency is illustrated in Figure 1.

Figure 1
Interaction Plot of Teaching Approach by English Proficiency

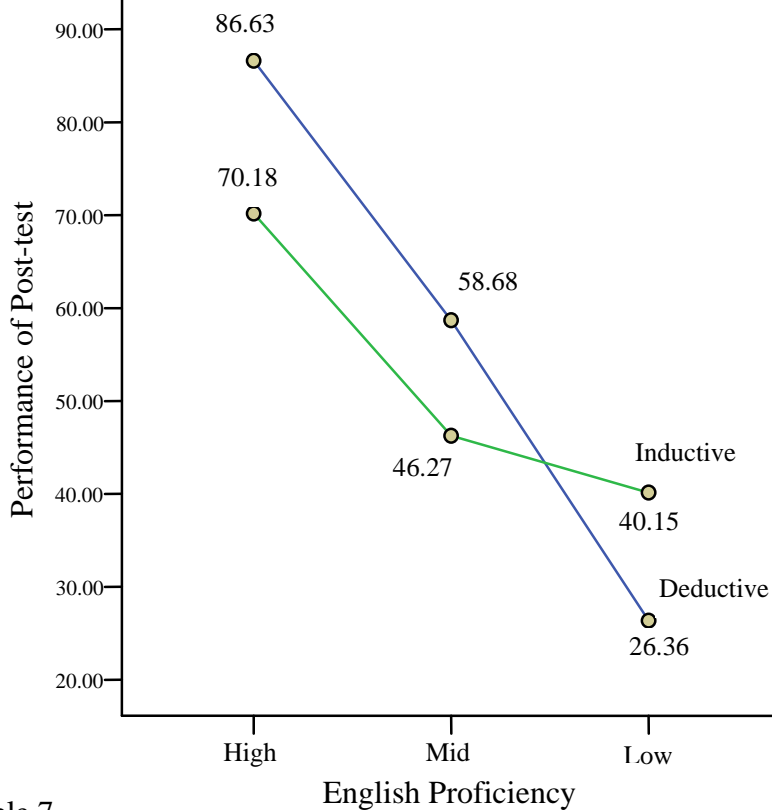


Table 7
Descriptive Statistics on Post-test of Two Groups (by English Proficiency)

Research Groups	N	M	SD
Inductive Group	High = 11	70.18	17.92
	Mid = 13	46.27	21.07
	Low = 12	40.15	13.66
Deductive Group	High = 12	86.63	17.61
	Mid = 11	58.68	9.43
	Low = 11	26.36	18.87

Table 8
Two-way ANOVA on Teaching Approach by English Proficiency

Source	SS	df	MS	F	Sig.
Teaching Approach	440.06	1	440.06	1.53	0.22
English Proficiency	23573.76	2	11786.88	40.88*	0.00
Approach X Proficiency	3103.27	2	1551.63	5.38*	0.01
Error	18452.75	64	288.32		
Total	255375.56	69			

* $p < .05$, two-tailed

Table 9 presents the results of further t -tests, or Scheffe post-hoc tests, on the performance of high-, mid-, and low-achievers across the two groups. Note that significant mean difference was only detected in high achievers ($t(22) = 2.22, p = .04 < .05$). High-achievers in deductive group ($M = 86.63$) significantly outperformed their counterparts in inductive group ($M = 70.18$). Namely, high-ability learners benefited more from deductive approach than from inductive method in grammar instruction. No significant mean difference was found in mid-achievers ($t(23) = 1.91, p = .07 > .05$) or low-achievers ($t(22) = -2.02, p = .06 > .05$), which suggested varying teaching approach did not affect mid- or low-achievers' learning of English relative clauses.

Table 9
Post-hoc Tests on Teaching Approach by English Proficiency

	t	df	Sig.
high-achievers	2.22*	22	.04
mid-achievers	1.91	23	.07
low-achievers	-2.02	22	.06

* $p < .05$, two-tailed

Interaction between teaching approach and gender. Table 10 presents the mean scores and standard deviations of performance on relative clauses as a function of teaching approach and gender. The statistics of the 2 (teaching approach) X 2 (gender) ANOVA are listed in Table 11. The interaction plot of the two factors is shown in Figure 2. It was found that the interaction effect of teaching approach by gender was not significant ($F(1, 69) = 0.01, p = 0.91 > .05$), suggesting gender did not affect the effectiveness of inductive or deductive approach. Therefore, there was no specific benefit of inductive or deductive instruction to specific gender.

Figure 2
Interaction Plot of Teaching Approach by Gender

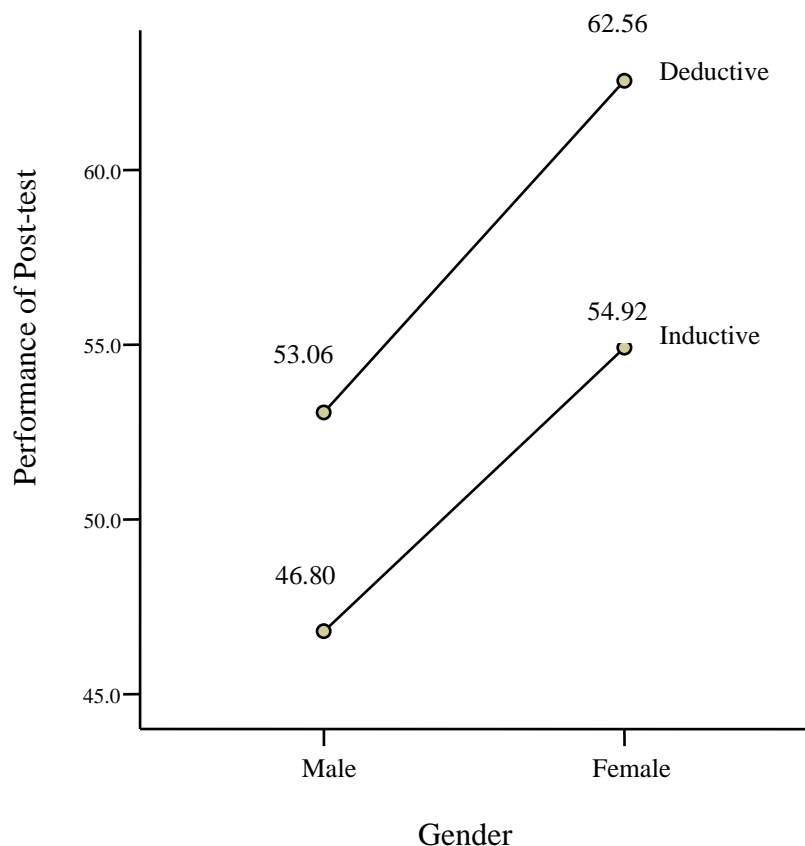


Table 10
Descriptive Statistics on Post-test of Two Groups (by Gender)

Research Groups	N	M	SD
Inductive Group	Male = 15	46.80	23.46
	Female = 21	54.92	20.06
Deductive Group	Male = 16	53.06	31.34
	Female = 18	62.56	27.88

Table 11
Two-way ANOVA on Teaching Approach by Gender

Source	SS	df	MS	F	Sig.
Teaching Approach	831.75	1	831.75	1.26	0.27
Gender	1334.69	1	1334.69	2.02	0.16
Approach X Gender	8.15	1	8.15	0.01	0.91
Error	43701.70	66	662.147		
Total	255375.56	69			

Interaction between teaching approach and task complexity. Table 12 presents the descriptive statistics of subjects' performance on simple and complex grammatical structures in post-test. The results of the 2 (teaching approach) X 2 (task complexity) ANOVA are shown in Table 13. The interaction plot of the two variables is given in Figure 3. No significant interaction effect of teaching approach by task complexity was found ($F(1, 139) = .121, p = .728 > .05$). This result suggested there was no specific teaching approach advantage in teaching simple or complex task of relative clauses. Task complexity did not affect the effectiveness of inductive or deductive instruction.

Figure 3

Interaction Plot of Teaching Approach by Task Complexity

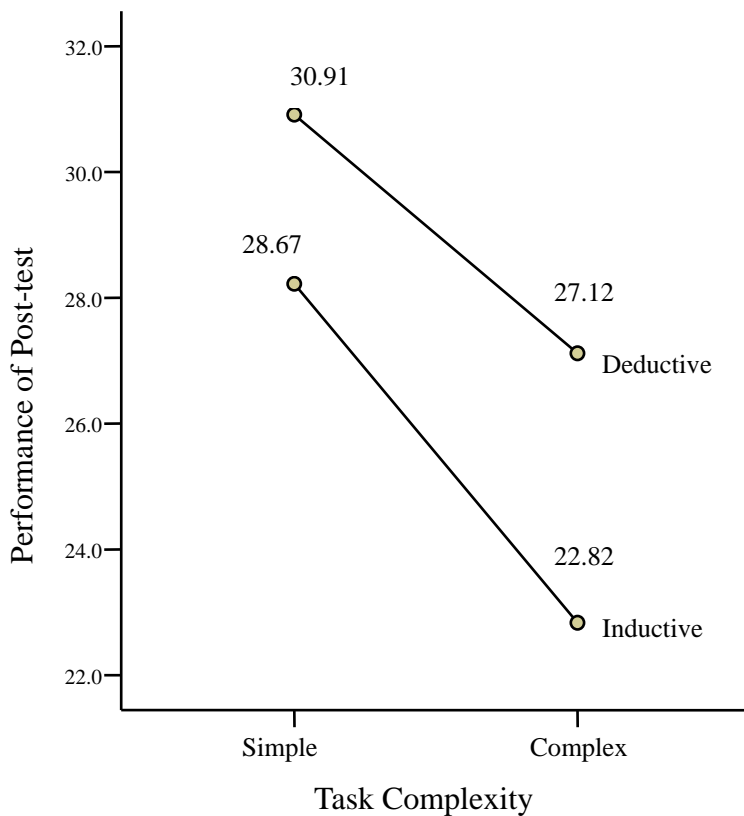


Table 12
Means and Standard Deviations on Post-test of Simple and Complex Tasks in Two Groups

Task Complexity	N	M	SD
Simple	Inductive = 36	28.67	11.30
	Deductive = 34	30.91	15.40
Complex	Inductive = 36	22.82	12.05
	Deductive = 34	27.12	14.79

Table 13
Two-way ANOVA on Teaching Approach by Task Complexity

Source	SS	df	MS	F	Sig.
Teaching Approach	425.206	1	425.206	2.315	.130
Task Complexity	737.264	1	737.264	4.015*	.047
Approach X Complexity	22.236	1	22.236	.121	.728
Error	24975.487	136	183.643		
Total	26168.136	139			

* $p < .05$, two tailed

Discussion

Effects of two teaching approaches. This study found that there was no significant mean difference between inductive and deductive groups. Students in both groups performed equally on the post-test, which revealed the equivalent value of these two teaching approaches on English grammar instruction. This result was consistent with the findings of Shaffer (1989) and Xia (2005), but contradicted those of Haight et al. (2007), Herron and Tomasello (1992), Takimoto (2005), and Wang (2002) in which induction was superior to deduction and those of Erlam (2003), Nagata (1997), Seliger (1975), and Rose and Ng (2001) in which deduction was found more beneficial to second/foreign language grammar or pragmatic instruction. Such mixed results called for further research on the relative effect of the two methods, in particular, in teaching English grammar.

Interaction between teaching approach and English proficiency. In this present study, significant interaction effect was found between teaching approach (inductive vs. deductive) and students' English ability (high, mid, and low). Note that high-achievers significantly benefited more from deductive approach.

However, such instructional benefit was not found in mid- or low-achievers since either group performed equivalently across the two teaching approaches. This finding conflicted with what was found in Shaffer (1989) and Wang (2005) that no interaction effect existed between the two teaching approaches and students' foreign language ability. Generally, the effect of individual differences on English ability toward teaching method was well-disclosed in the present study. In particular, in the EFL context like Taiwan, more proficient learners are used to explicit, deductive instruction on grammar rules rather than inductive instruction with a rule-discovering process. An innovative approach may dilute their academic performance. In contrast, their less proficient counterparts are more flexible in adapting themselves to different teaching approaches in grammar instruction.

Interaction between teaching approach and gender/ task complexity. No gender-by-teaching approach interaction effect was detected in this study. There was no specific benefit of inductive or deductive approach to specific gender in English grammar instruction. Such result suggested gender did not affect the effectiveness of teaching approaches. Besides, there was no significant interaction effect between teaching approach and task complexity. Specific teaching approach advantage was not found in teaching the two types of structures of English relative clauses (simple vs. complex). Such result was inconsistent with those of Wang (2002) in which inductive approach was more suitable for teaching simpler grammatical patterns and those of Nagata (1997) in which deductive feedback was suggested to teach more difficult grammatical tasks. This inconsistency between the current study and past literature called for more profound studies on the interaction of task complexity to teaching approach.

Pedagogical Implications

Inductive instruction promotes autonomous and meaningful learning (Decoo, 1996; Gollin, 1998; Haight et al., 2007; Hammerly, 1975; Wang, 2002). This study found inductive approach was as effective as conventional deductive approach in teaching English grammar. It is thus recommended that induction may serve as an alternative method for EFL grammar instruction. In Taiwan,

students are used to memorizing English grammar rules and applying them to learn various sentence patterns and structures. Such grammatical learning via rote memory was not always meaningful. In contrast, inductive method can create a more meaningful learning context through self-discovery of rules. Thinking promotes learner autonomy and brings about deeper learning. Using these two approaches alternately in the EFL classroom would be an ideal.

Furthermore, this study found that high-achievers benefited more from deductive approach than from inductive one. It is, therefore, suggested that English teachers explicitly instruct grammar rules to high-proficient learners when individual difference in ability is taken into account in instruction. As to mid- or low-achievers, both methods could be applied alternately to enhance their learning motivation. In addition, to promote the theory and practice of inductive method, in-service teacher training programs incorporating such teaching approach should be available for all English teachers. Generally, induction and deduction are different but complementary approaches. Variations in teaching would, in turn, promote student learning (Brown, 2000; El-Banna & Ibrahim, 1985; Ellis, 2002).

Suggestions for Future Studies

With regard to the limitations of this study, there are some suggestions for future research. First, in this present study, the subjects were recruited from two intact classes of the same school in southern Taiwan. Future studies may incorporate the procedure of random assignment of a true experimental design with more subjects of different educational levels (e.g., senior high school) from other areas of Taiwan. Second, this study focused on probing three factors (i.e., English proficiency, gender, and task complexity) in the context of inductive instruction. For future research, other variables such as learning motivation and learning style are worth exploring. Besides, to date, little has been done on the gender effect in relation to inductive approach. It calls for further study on this issue. Third, the grammar structures examined in this study were English relative clauses. Other grammar usages such as tenses and collocations deserve our attention. Fourth, additional interviews and questionnaires may be incorporated into the experimental design to validate the results. Last but not least, several studies (e.g., Erlam, 2003;

Herron & Tomasello, 1992; Nagata, 1997; Seliger, 1975) have detected longer retention of rules via delayed post-test. Future research may add such duplicate test to evaluate learners' long-term memory of grammar rules in the context of inductive instruction.

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