An Investigation of the Effects of Processing Instruction in the Online Learning of the Past Perfect Tense: A Case at a University

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ABSTRACT

Vietnamese learners and teachers experienced enormous difficulty in online learning during COVID-19 due to their previous limited exposure to virtual learning. The primary purpose of the study is to develop an appropriate and effective grammar instruction approach for virtual learning. To achieve that purpose, this study compared the relative effects of two types of grammar instruction (Traditional Instruction and Processing Instruction) on online learning of the Past Perfect Tense. More than 160 learners from two elementary classes at a university in Ho Chi Minh City participated in the study with two treatment groups: Traditional Instruction (TI) and Processing Instruction (PI). All the lessons were conducted in a virtual classroom. Pre-test and post-test involving comprehension and production tasks were measured. Overall, the learners who experienced PI gained significantly better results than the TI group in comprehension tasks, while both groups performed similarly in production tasks. Moreover, many features of Processing Instruction are well-suited for the nature of online learning, which benefits learners while they are struggling with virtual classrooms.

Keywords: Processing Instruction, Traditional Instruction, virtual learning

Introduction

Grammar instruction has aroused considerable controversy among researchers about its effectiveness and usefulness. Therefore, approaches to teaching grammar have experienced a development through a long history thanks to a large number of theoretical and empirical studies in the field. Some approaches focus on forms, namely Grammar Translation Method (GTM), Audio-lingual Method (ALM), while some concentrate on meaning, such as Communicative Language Teaching (CLT) or Immersion Instruction. However, Long (1991) claimed that Form-focused Instruction pays attention to both meaning and forms. In the Vietnamese grammar instruction context, Traditional Instruction with three stages of Presentation, Practice, and Production has become widely prevalent in many language schools. It is notable that this approach leads to a plateau in gaining communicative skills. Learners are

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unable to communicate fluently outside the classroom, which represents the inferiority of productive skills in Vietnamese learners' IELTS achievement. This is due to the formulaic and decontextualized features of the Practice and Production stage, while the form is a main focus in this stage. In order to develop learners' communicative skills, a focus on meaning in teaching grammar should be seriously considered.

Moreover, in the Covid-19 era, most of the classes were switched to online versions, where learners need help developing their communicative skills. The elaboration of conducting an online lesson accompanied by poor infrastructure as well as insufficient preparation from both educators and learners has prevented learners from improving their communicative skills. Moreover, both teachers and learners are not in good preparation for online learning in terms of teaching methodology and online learning infrastructure (Pham, 2022). Due to the fact that it is incapable of changing the physical features of online learning, changing the grammar instruction method become more feasible. Among many types of instruction in Form-focused instruction, Processing Instruction seems to fit the nature of online lessons. For that reason, this study is going examine the effectiveness of both Processing Instruction and Traditional Instruction through online learning. Although the education system has switched back to face-to-face lessons, many learners still favor online learning due to its convenience in the technological era. As a result, the investigation of the effects of Processing Instruction on the learning of Past Perfect university students in virtual classrooms is still necessary.

Literature review

Definition

Processing Instruction is a part of Comprehension-based language instruction in which learners process the input to connect form and meaning, leading to the vital role of input. 'Input' is described as a "sample of language that learners are exposed to and attempt to process for meaning." (Nassaji & Fotos, 2011, p. 20). Input processing is the process of converting input into the intake in a learners' acquired system, which is a second language acquisition model developed by VanPatten (1993). The strategies and mechanisms promoting form-meaning connections during comprehension are involved in this stage (VanPatten, 1993).

Framework

Processing Instruction (PI) is based on VanPatten's principles of Input Processing, aiming to help learners abandon inappropriate processing strategies and apply the appropriate ones because learners do not always use efficient strategies when processing input (VanPatten, 2004). Processing Instruction focuses on the input processing stage by manipulating the input (as in Figure 1), while Traditional Instruction (TI) concentrates on the output practice (as in Figure 2) because asking learners to produce the structure when they are not ready is like putting the cart before the horse (Lee & VanPatten, 1995)

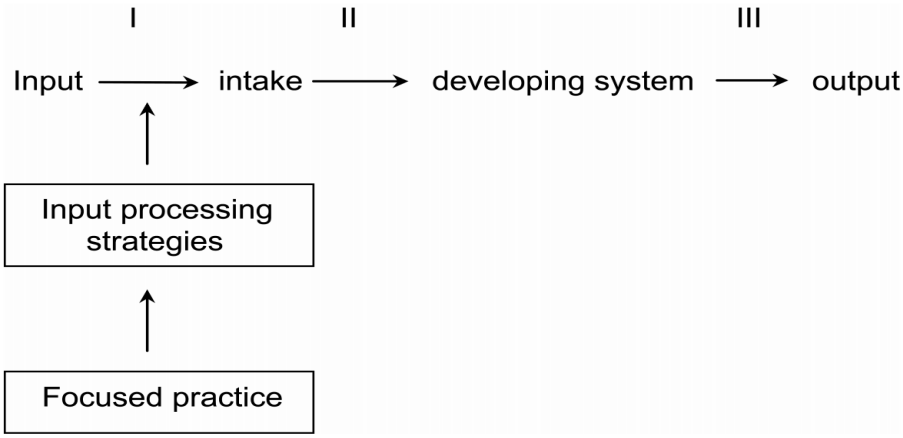

Figure 1. Processing Instruction model (VanPatten, 1993)

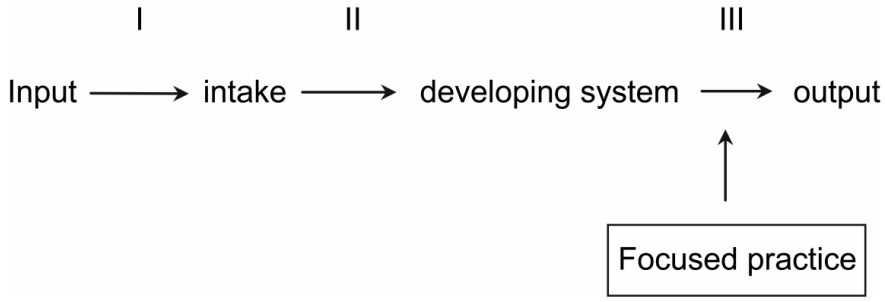

Figure 2. Traditional Instruction model

Previous studies

Many previous studies put forward an overall view of the effectiveness of Processing Instruction in the classroom version. VanPatten and Cadierno (1993) initiated the concept of Processing Instruction according to VanPattern's model of Input processing in second language acquisition. Through time, there was a wide range of studies examining this type of instruction and confirming the significant improvement among learners who experience Processing Instruction. There was some particularly remarkable research that proved that Processing Instruction exerts a noticeable effect on learners' second language processing, namely Cadierno (1995), Benati (2001 and 2005), Benati, Lee and Houghton (2008), Benati and Lee (2010) and Chan (2018 and 2019). Cadierno (1995) proved that PI has a considerable effect on both interpretation and production tasks even though there was no output practice during PI treatment, while TI only improves the production tasks. Furthermore, PI outperformed TI on interpretation tasks and had the same effects as TI on production tasks. Benati's (2001 and 2005) studies achieved similar results as VanPatten and Cadierno's (1993, 1995), which presented the enhancement of both TI and PI groups from pre-test to post-test. PI is also proven to surpass TI in interpretation tasks and has the same effects as TI on production tasks. Benati, Lee and Houghton explained to the superior of PI that "TI practice only makes the form available for production; it cannot make it available to processing mechanisms" (Benati, Lee & Houghton,

2008, p. 118). PI was designed for learners to comprehend the meaning of the structures instead of the memorization of physical features of the structure as TI did for learners.

Wong and Ito (2018) confirmed the superiority of Processing Instruction in French acquisition. Besides, Henry (2022) also compared the effects of Processing Instruction among German learners and acknowledged the outperformance of PI on the sentence interpretation task. The study also explained that PI was superior due to the alteration of learners' processing strategies. Moreover, PI activities played a role as an assistant to teachers in implementing effective strategies to enhance L2 learners' knowledge and acquisition (Patra et al., 2022).

Research gaps

On the one hand, PI has an essential feature of structured-input activities that do not require production during the practice stage. On the other hand, the virtual classroom has a lot of difficulties in conducting production practice because of low bandwidth Internet speed, technological issues, and even distractions (Ky, 2021). Moreover, students also claimed that learning in a virtual classroom caused considerable difficulty in practicing speaking because they had little chance to raise their voices in this type of class as they were afraid of interrupting the flow of the lesson (Ky, 2021). Another difficulty during online lessons was the lack of interaction between teachers and students (Pham et al., 2022). Pham (2022) also suggested that teachers need more careful preparation for online lessons, encouraging learners to join the class activities actively. In addition, Pham et al. (2022) recommended some approaches to conducting Writing, Speaking, and Listening lessons online. To be specific, the teacher could teach Writing skills through Google Docs or ask students to turn on the camera for Speaking practice and create some activities to engage students in listening lessons. However, that study did not recommend solutions for teaching Grammar online.

For those reasons, the characteristics of Processing Instruction may help solve online learning difficulties in terms of grammar instruction. Students who experienced the PI approach were not required to produce the target structure immediately in the lesson. They only need to engage in structured input activities which seem to fit the characteristics of the virtual classroom.

The purpose of the research

This study is going to compare the effects of PI and TI in teaching Past Perfect in virtual classrooms among university students.

Research Questions

To fulfill the purpose of the study, the study was seeking to answer the following research questions:

1. How do learners receiving PI and TI improve from pre-test to post-test in the comprehension and production tests of English Past Perfect tense?
2. Would learners receiving PI make more significant gains in comprehension tests and production tests than the TI group in the learning of Past Perfect tense?

Methods

Pedagogical Setting & Participants

The study was conducted at Ton Duc Thang University, which consists of a wide range of fields from finance, design, and information technology to civil engineering or electricity. There are six levels of English classes at the university, ranging from elementary to advanced level. This study focuses on the learning of Past Perfect tense, which is considered to be appropriate for the elementary level, and this grammar point is in the syllabus for this level. The course book used in this course is Empower A2. The lessons were conducted in a virtual classroom.

The participants in this study were freshmen and at the elementary level (A2, according to CEFR). They were at the second level of six levels in the university language program. There were 169 students in total assigned to two groups: Processing Instruction (PI) and Traditional Instruction (TI). There are 82 students in the PI group and 87 students in the TI group. The subject pool involved adult learners who were mostly Vietnamese native speakers, while there were two Lao students in the Processing Instruction class. The English lessons were conducted completely in English. The participants rarely use English outside the classroom because Vietnamese people mainly use their first language in daily activities.

Design of the Study

This study employed a quantitative and quasi-experimental research method to find the answer to two research questions. Pre-tests and post-tests were employed to examine and compare the effects of PI and TI on learners' learning of Past Perfect Tense.

Tests

The tests used in this study were adapted from previous studies (Benati, 2005; Benati, Lee & Houghton, 2008; Benati & Lee, 2010; Chan, 2018, 2019) and some grammar tests. Those tests were conducted online and concentrated on measuring learners' input comprehension competence and structure production ability. There were two types of tests in this study: Comprehension and Production.

There were also two versions of the test, namely version A and version B. In order to ensure validity and reliability, half of the class did version A and the other half did version B for both pre-tests. The test consisted of 40 items in total for both comprehension and production tests and lasted for an hour, with 30 minutes for the comprehension test and 30 minutes for the production test. Comprehension tests measured learners' ability to interpret the meaning of the input, while Production tests were employed to measure learners' competence in producing the target structure. There were five tasks in comprehension tests, including listening with multiple choices and True False choices, choosing the interpretation of the sentences, reading, and choosing True or False. The production tests included filling in the blank of a sentence, open-ended questions, and writing a story.

Practice packages

The tokens of practice items remained approximately the same among groups with a balanced number of input sentences. PI practice consisted of 80 tokens, while TI involved 60 tokens with two story writing tasks. Vocabulary items are exactly similar between the two groups, which

were extracted from the Cambridge A2 Vocabulary list. The practice activities are designed according to the feature of each instruction.

Before conducting the practice stage, the teacher explained how the structure works to learners. Learners were provided with handouts about the Past Perfect tense forms and usages. The explicit explanation remained unchanged in the two groups. However, the PI group mentioned the Lexical Preference principle in processing the structure, while the TI group did not. The principle reminds learners that attention should be paid to the verb to identify the time of the events instead of relying on the temporal verbs. The handout mentioned all 3 forms of Past Perfect tense in affirmative, negative, and interrogation forms. Learners were already familiar with the basic notion of verbs, nouns, and adjectives.

Traditional instruction involved presenting learners the metalinguistic explanation about the forms and uses of the Past Perfect tense and then giving them practice in the application of the structure in context. The way learners process the input was not mentioned in this group. Practice activities in the TI group consist of 3 main phases: mechanical drills, meaningful drills, and communicative activities. Mechanical drills involved filling-in-the-blank exercises, while meaningful drills included writing sentences according to the picture, deciding the tenses of the given verbs, and writing sentences according to given words. Communicative activities in the TI group consist of open-ended questions and writing a story.

Processing Instruction packet directed learners' attention to the Past Perfect form in the input and provided some activities which required learners to respond to the content and make form-meaning connections. The packet had two phases which were explicit explanation and Structured Input activities. The explanation stage followed the same procedure as TI, with the only difference, which was to instruct learners on how to instill appropriate processing strategies (VanPatten, 1993, 1995, 2004; Benati & Lee, 2010). Structured Input activities followed the guideline of VanPatten about developing SI activities strictly. The Structured Input activities in this study were adapted from Benati (2005), Benati, Lee and Houghton (2008), Benati and Lee (2010), and Chan (2018, 2019). Structured input activities included referential activities and affective activities. Referential activities were with right or wrong answers, such as multiple choice or True False, while affective activities referred to students' real life without right or wrong answers, including deciding whether the sentences were true to students' life.

Data collection

The treatment lasted two weeks with four days of class meetings in total, with 30 minutes each day for the target structure instruction. There were two hours in total for the Past Perfect instruction. The rest of the time for each day was used for other skills depending on the syllabus. The treatment took place online via virtual classroom on Zoom due to the outbreak of Covid-19 pandemic. The teacher conducted the treatment while students listened and did the practice according to the teacher. The researcher was also the teacher for both two groups PI and TI groups. On the first day of the treatment, the explicit explanation was delivered in 30 minutes, followed by 30 minutes of practice stage each day until the fourth day. The practice stage occurred differently for each group according to the distinctive features of each type of grammar instruction mentioned above. Learners did the post-tests on the last day of the treatment after

the final practice for Past Perfect Tense. The tests were also organized online, where learners were required to turn on the cameras and complete the test under the teacher's surveillance as in the face-to-face classroom. The tests were sent to students via Google Forms, and students completed them directly on the link and were able to submit them only once after one hour.

Data analysis

Before conducting the experiment, pre-tests took place to measure learners' abilities before the treatment. The results of the pre-tests were compared between two groups to make sure learners' competence before the study remained similar across the groups. Pre-tests were conducted for both groups one week before the treatment. All the learners who score higher than 50% will be eliminated from the result of the study. The first research question investigated the improvement of participants from pre-tests to post-tests. In order to find the answer to these questions, a comparison of the results of the pre-tests and post-tests of each group was made. The second research question dealt with the different effects of two types of instruction. There were two groups, namely Processing Instruction and Traditional Instruction groups (PI and TI). The control group in this study was the group that employed Traditional Instruction, which was widely applied in all grammar lessons in Vietnam. Different types of grammar instruction were applied to each group accordingly. The instructed structure was a part of the syllabus, which was in the course book. The results of the two groups' post-tests were considered to compare the effects and determine the more advantageous and appropriate instruction for learners. The results of post-tests were submitted to a t-test to examine the significant differences between the two groups.

Reliability and Validity

Reliability refers to the consistency of the measure in experimental research. The reliability of the experimental groups was illustrated through the process of designing the test. To ensure the reliability of the results, the tests were adapted from previous studies. The format of the tests in this study resembled the test design of previous studies. Each task in the test was adapted from many different studies to ensure the reliability of the tests.

Validity involves accurately measuring what is intended to evaluate that reflects the situation. This study intended to assess learners' competence in understanding and using the structure at both sentence and discourse levels. The test concentrated on designing a task that can measure those criteria. Learners are tested on what they have already learned. Past Perfect Tense is a focus in the test where comprehension of the structure and the ability to use the structure are tested. The tests also used the vocabulary at the A2 level, which was the learners' current level, to ensure the validity of this test. The tests were designed according to previous studies as well as adhered to the theory of comprehension and production of the target structure, which was the input processing theory (VanPatten, 1993). Moreover, the tests were conducted online and were under strict surveillance of the teacher. Students were also asked to submit their screen recordings during the test time to ensure the validity of the tests. For those reasons, the tests were reliable and valid.

Results/Findings

Results

How do learners receiving PI and TI improve from pre-test to post-test in the comprehension and production tests of English Past Perfect tense?

Students' performance before treatment

One week before the treatment, students had to complete the pre-test in order to ensure the similarities between the two groups and to measure the improvement through the treatment. The similarities between the two groups in pre-tests demonstrated that any differences in the post-tests are due to the treatment. The scores were analyzed separately between comprehension tests and production tests. According to the mean score, the results of PI and TI in the comprehension pre-tests were nearly the same, with 4.086 for the TI group and 4.006 for the PI group; a similar trend was true for the results of the two groups in production tests ($M_{PI} = 3.756$; $M_{TI} = 3.77$) (as in Table 1 and 2)

Table 1

Comparing pre-tests results in comprehension tests

Variable	N	M	SD	t	df	p
TI	87	4.086	.8964	.609	167	.543
PI	82	4.006	.8069			

Table 2

Comparing pre-tests results in production tests

Variable	N	M	SD	t	df	p
TI	87	3.7701	.9639	.098	167	.922
PI	82	3.7561	.88277			

The Independent Means t-test was administered on the Pre-test for both groups determining no significant differences between the groups' means according to Tables 1 and 2 below. Specifically, the comprehension tests witnessed a similar mean with p-value = .543, and the mean scores of production tests were also nearly similar with p = .922. For those reasons, there was no change in the mean scores that were witnessed among the tests in the two groups.

Student's improvement from pre-tests to post-tests

Table 3

Comparing the effects of PI on the comprehension tests from pre-test to post-test

Variable	N	M	SD	t	df	p
Pre-test	82	4.0061	.80697	19.073	162	.000
Post-test	82	7.5732	1.48889			

The pre-test and post-test results were compared to examine whether learners in both groups have improved after treatment. The comparison of the scores was used to discover the answer to research question 1. Learners' scores were submitted to the Independent Sample t-test to analyze the differences.

As can be seen in Table 3, the Mean score and Standard Deviation of Pre-tests and Post-tests in comprehension tests for the PI group showed that the participants in the PI group experienced a significant increase in the mean score (from 4.0061 to 7.5732). The maximum score on the comprehension tests was 10. The scores were submitted to the Independence Mean t-test and gave the results that PI had a significant improvement with p = .000 (with t-value = 19.073, which was higher than the critical t-value ($t_{(162,0.05)}$ = 1.9747).

Table 4

Comparing the effects of TI on the comprehension tests from pre-test to post-test

Variable	N	M	SD	t	df	p
Pre-test	87	4.0862	.89640	16.076	172	.000
Post-test	87	6.9253	1.38205			

Similarly, the results from pre-tests to post-tests among TI students in production tests were submitted to the Independence Mean t-test, which clearly showed that TI students have improved from pre-tests to post-tests with p = .000. The t-value in this situation was 16.076 higher than critical t-value ($t_{(172,0.05)}$ = 1.9739), which led to the conclusion that TI students experienced growth in comprehension tests. Moreover, the mean scores also saw an increase from pre-tests to post-tests by 2.8391 points.

In conclusion, both the PI and TI groups witnessed a positive change from pre-tests to post-tests in comprehension tests.

Table 5

Comparing the effects of PI on the production tests from pre-test to post-test

Variable	N	M	SD	t	df	p
Pre-test	82	3.7561	.88277	18.768	162	.000
Post-test	82	7.3720	1.50475			

Table 6

Comparing the effects of TI on the production tests from pre-test to post-test

Variable	N	M	SD	t	df	p
Pre-test	87	3.7701	.96390	18.101	172	.000
Post-test	87	7.2644	1.52086			

In production tests, both TI and PI groups enhanced from pre-tests to post-tests. According to Tables 5 and 6, there was a sharp rise in post-test scores among both groups. Specifically, PI students have improved from 3.7561 to 7.3720, while the TI group increased from 3.7701 to 7.2644. Regarding the Independence sample test, both TI and PI groups experienced growth with p-value = .000. The t-value of the TI group was 18.101, which was higher than the critical t-value ($t_{(172,0.05)} = 1.9739$). Besides, the PI group recorded that the t-value was higher than the critical value ($t_{(162,0.05)} = 1.9747$). In conclusion, both the PI and TI groups improved from pre-tests to post-tests which were represented through mean scores and t-value.

Would learners receiving PI make more significant gains in comprehension tests and production tests than the TI group in the learning of Past Perfect tense?

Table 7

Comparing the effects of PI and TI on the comprehension tests

Variable	N	M	SD	t	df	p
PI	82	7.5732	1.48889	2.934	167	.004
TI	87	6.9253	1.38205			

Table 7 gives information about the comparison of the effects of PI and TI on the comprehension tests. According to the table, the mean score of the PI group was 7.5732, while the mean score of the TI group was a bit lower ($M_{TI} = 6.9253$). The scores were also submitted to the Independent Means t-Test to specify the significant difference. The t-value is 2.934, which is higher than the critical value ($t_{(167,0.05)} = 1.9743$). The PI group performed significantly better than the TI group in discourse comprehension with a p-value = .004 (as presented in Table 7).

The difference is attributed to the significant improvement of PI due to the treatment because the p-value was lower than .05. In short, the PI group outperformed the TI group in comprehension tests.

Table 8

Comparing the effects of PI and TI on the production tests

Variable	N	M	SD	t	df	p
PI	82	7.3720	1.50475	.462	167	.645
TI	87	7.2644	1.52086			

Table 8 shows information about the effects of PI and TI on production tests. The mean scores of the PI and TI groups were equally represented (M_{PI} = 7.3720; M_{TI} = 7.2644). The scores were also submitted to Independence sample tests, where no significant change was recorded in this situation. The t-value was significantly lower than the critical value ($t = .462 < t_{(167,0.05)} = 1.9743$). In addition, the p-value was higher than .05 (p-value = .645 > .05). For those reasons, PI and TI students performed similarly in production tests.

In conclusion, the answer for research question 2 is yes for comprehension tests. Students in the PI group were superior to the TI group in comprehension tests, whereas both groups had similar results in production tests.

Discussion

How do learners receiving PI and TI improve in the comprehension and production tests of English Past Perfect tense from pre-test to post-test?

The first research question considered the improvements of PI and TI learners in both comprehension and production tests. The statistical analysis results determined the significant increase from the pre-test to the post-test of two treatment groups on comprehension and production tests.

Regarding PI group, learners' gain in comprehension post-tests was confirmed by previous studies, namely VanPatten and Cadierno (1993), Cadierno (1995), Benati (2001, 2005), Farley (2001), Benati, Lee and Houghton (2008), and Qin (2008). As many researchers explained, PI improved on both comprehension and production tests because the instruction focuses on the way learners process the input with a view to helping learners make form-meaning connections that affect the developing system. The developing system helps learners comprehend the structure by accessing the knowledge source in the developing system (VanPatten & Cadierno, 1993). The improvement of PI participants in this study also put forward the same explanation as previous studies that Processing Instruction has altered the learners' input processing which enhances learners' developing system to acquire the structure. Many previous studies reinforced PI learners' production improvement (VanPatten & Cadierno, 1993; Cadierno, 1995; Benati, 2001, 2005; Farley, 2001; Benati, Lee & Houghton, 2008; Qin, 2008). Many previous

researchers stated that PI learners had never practiced producing the structure, but they were still able to produce the structure after the instruction (VanPatten Cadierno, 1993; Cadierno, 1995; Lee & VanPatten, 1995; Benati, 2001, 2005; Farley, 2001; Benati, Lee & Houghton, 2008; Qin, 2008). Those researchers explained for this situation that PI affects learners' developing systems which they can access to produce the structure. Resembling many previous studies, this study also reached the same conclusion that the improvement of production tests among learners was due to the gain in developing the system during the instruction progress. The gain in developing systems led to access to the developing system to produce the target structure. Lee and VanPatten (1995) found out that the lack of production practice did not hinder learners' ability to provide the output. They will produce whenever they are ready so that learners' ability to produce the structure depends on their level of understanding of the form.

Similar to the PI group, the TI group also experienced a significant gain from pre-tests to post-tests in comprehension and production tests. In the comprehension post-tests, the result showed significant gains among Traditional Instruction students. These results were confirmed by many previous studies (Allen, 2000; Benati, 2001). The improvement of TI students in comprehension tests could be explained that the production practice also affected learners developing systems where they accessed to produce the structure (VanPatten & Cadierno, 1993). In comprehension tests, TI learners were also considered to access that system to interpret the input. Moreover, other students' output becomes incidental input for learners, which helps them make form-meaning connections in developing systems (Cadierno, 1995; Benati, 2001; Short & Bowden, 2006). For that reason, learners were able to access the developing system to interpret the structure, so the performance of TI students in comprehension had an enormous rise. Besides, the improvement in production tests of the TI group was certain and was in conformity with previous studies VanPatten and Cadierno (1993); Cadierno (1995); and Benati (2001, 2005) because TI students focused on production practice which was responsible for the production gain.

Would learners receiving PI make more significant gains on comprehension tests and production tests than the TI group in the learning of Past Perfect tense?

Comprehension tests

The results indicated that Processing Instruction outperformed Traditional Instruction in comprehension tests. The results were consistent with previous studies that PI appeared to have a discernible effect on developing a system of learners learning new structure compared to TI (VanPatten & Cadierno, 1993; Cadierno, 1995; Benati, 2001, 2005; Benati, Lee & Houghton, 2008; Lee & Benati, 2010). This study also suggested that PI holds the upper hand in learners' accomplishment in interpreting the structure.

The advantage of PI over TI in comprehending the structure is due to a substantial improvement in the developing system, which learners can access when interpreting the meaning of the sentence through the structure. TI learners actually gained after instruction but in a different system. In this situation, TI learners focused tremendously on production practice. Therefore, it is possible that the TI group made less improvement in comprehension tests than the PI group because of the lack of input practice and input exposure. It is plausible to deduce that input

practice works for comprehension tests while output practice improves production. TI, including output practice, facilitates fluency and sometimes accuracy in production because learners have chances to practice thoroughly, while PI instructing learners to process the input properly is responsible for getting the structure into their heads. Learners then are able to access the developing system to comprehend the structure. For that reason, the fact that PI was proven to be better than TI in comprehension tests was expected.

Besides, although other learners' outcomes and teachers' feedback may serve as incidental input, which explains the improvement in interpretation tests in the TI group, the amount of the exposed output needs to be more and better-structured than the PI group. While the PI group exposed and processed the well-prepared input consciously through structured input activities, the TI group only let learners discover the input during the feedback stage incidentally. TI learners only processed the input when the teacher gave feedback, which was likely to be impossible for those who pay little attention in class. Therefore, PI students performed better in comprehension tests.

Last but not least, Cheng (2002) proclaimed that the limited effect of TI learners in interpreting the target form as compared to the PI group is because learners' pressure of producing the structure prevents them from establishing the form-meaning connection to comprehend the appropriate grammatical structure in the specific context. This study seems to put forward this explanation that PI outperformance in comprehension tests is attributed to input processing. While TI learners focus too much on producing the output grammatically, PI learners concentrate on processing the input. For that reason, PI learners have more room to digest the form so that they are better at interpretation tests.

Production tests

The results of production tests in this study confirmed previous results that the two treatment groups had no significant difference in the production tests (VanPatten & Cadierno, 1993; Cadierno, 1995; Benati, 2001, 2005; Cheng, 2002; Benati, Lee & Houghton, 2008). They argued that learners who experienced PI have never had a chance to produce the structure during instruction, but they were able to complete the production tests as a TI group. This phenomenon was explained by Cadierno (1995) that "TI resulted in Learned Linguistic Knowledge."

The results of this study about the similar effects of PI and TI on production tests suggest that the way that learners comprehend sentences, as well as the way that learners produce sentences, are susceptible to PI effects. PI has clearly manipulated the way learners process the input, which influences the developing system where the learners' access production tests. In addition, TI group improvement in production tests was absolutely certain because TI concentrated on production practice. However, this study suggests that although TI mainly focuses on production practice, PI students also performed as well as TI students. This result shows that manipulating input plays a role in the ability to produce structure.

While the effects of managing input processing during the practice stage bring benefits to learners in both comprehension and production tests, PI outperformed TI. Moreover, in a virtual classroom context where learners are reluctant to practice producing structure, as in the TI group, PI dominates the TI group in this field. As Ky (2021) contended that learners are

unwilling to produce the structure via the computer where interaction is limited, PI, which does not require learners to produce the structure during the treatment, seems to be preferable in the virtual classroom. PI students have improved significantly from pre-tests to post-tests in both comprehension and production tests, while PI students were superior to TI students in comprehension tests and performed similarly in production tests. Moreover, the feature of not concentrating on production practice in the PI group fits perfectly with the characteristics of the virtual classroom. Students' reluctance to produce the structure which is considered to be a hinder in virtual classrooms but is regarded as an advantage with PI instead of TI. For that reason, PI is totally appropriate for virtual classrooms.

Conclusion

The study has arrived at the results that PI positively impacts learners' learning of Past Perfect. Moreover, Processing Instruction was also proved to be more beneficial to learners than Traditional Instruction in comprehension tests and no significant difference in production tests. This study also pointed out that the characteristics of PI fit the virtual classroom features perfectly. Students seem to get the benefits from PI during online learning through virtual classrooms.

Implication

The study has proved that ability to interpret the structure helps learners to comprehend and use the structures accordingly. Further studies need to investigate whether learners are able to use that ability to distinguish the features of different structures. When students understand how the structure works through PI practice, students may be able to distinguish the remarkable features of each structure. A longitude study should be conducted to discover that PI has effects on the distinguishing of structure features among learners. Besides, this study only focused on the Past Perfect tense. There should be another study on this issue with other structures because the different structures may have different characteristics which may be suitable to different teaching approaches.

Limitation

Only writing skill is measured in this study because of the limited scale of the study. Moreover, assessing speaking skills is a challenge to some non-native researchers, so speaking is not applied in this study. Besides, this study was conducted online, which was extremely hard for the researcher to manage the class as the researcher was unable to recognize what the students were doing during class time. Therefore, asking students to turn on the camera during the lesson and comprehension check questions were employed during the practice stage to manage the class.

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