The Effects of Seven Types of Thinking on Academic Writing

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Received 2 May 2024; Accepted 28 June 2024; Published 30 June 2024

Abstract

"Writing Is Thinking" is a well-known expression because both relate closely to each other. The purposes of this study were 1) to investigate the effects of 7 types of thinking on Thai university undergraduates' perceived difficulty in academic writing at the prewriting stage, 2) to find the rank orders of their effects and their relationships, 3) to construct a set of instructional innovations for the students to solve their problems and 4) to evaluate its effectiveness in various aspects. The study was conducted in 2 phases. In phase I a large sample size of 350 was needed for an SEM to investigate the first 2 objectives while only 47 undergraduate students were required in phase II for the last objective. The study employed only a quantitative approach; therefore, the samples were randomly selected to utilize some parametric tests. A set of questionnaires was used in the first phase, and a pretest, a posttest, and another set of questionnaires were used in the second phase to collect data. Based on the findings from the first phase, 12 lessons of instructional materials named NITF were constructed based on Bloom's Revised Taxonomy and Vygotsky's Zone of Proximal Development (ZPD) for the students to use for 45 hours via Google Classroom to solve their problems in academic writing at the prewriting stage. The data were analyzed using SEM (Structural Equation Modeling), Paired-Sample t-tests, and One-Sample t-tests. It was found that 1) 4 out of 7 types of thinking had significant effects on students' perceived difficulty in academic writing at $p = 0.05$, 2) the rank orders of the 4 types of thinking were critical, abstract, creative, and convergent thinking, and the relationships between the 7 types of thinking were very high and significant at $p = 0.05$. Besides, 3) the content validity of NITF was 0.875, indicating a substantial level, and 4) its effect

size was very large (d = 1.625), and, on average, the students were extremely satisfied with the instructional innovation. Some suggestions to use the findings were provided for teachers of English and some research topics were also offered.

Keywords

effects of thinking, academic writing, perceived difficulty, instructional innovations

Statement of the problems

Levels of English Writing Proficiency of Thai Students at the Present

In 2021, a meta-analysis of 330 primary research studies was conducted by Sukamolson et al. (Sukamolson et al., 2021) to compare the levels of English proficiency of Thai and international students in many countries. It was found that, on average, during 2015 and 2020 (15 years), the English proficiency levels of Thai students in primary and secondary education were deficient, and that of university students was at A2 (pre-intermediate level) according to CEFR criteria. The effect sizes of English teaching methods at primary, secondary, and tertiary education were 0.522, 0.754, and 1.144, indicating medium, medium, and large levels, respectively. Therefore, it implicitly means that the English writing ability of the students at the university was and is very low.

The Effects of Perceived Writing Tasks and Anxiety on Writing Achievement

In 2023, an exciting research study was conducted by Osuwanna et al. (Osuwanna et al., 2023), who found that perceived difficulty in argumentative writing tasks caused students significantly at a university to have anxiety, and it, in turn, affected their writing achievement at p = 0.05. Perceived difficulty and learning anxiety could take up 62% of the total variance in students' writing achievement, indicating a huge effect (Hopkins, 2002).

The Importance of Prewriting Activities or Strategies and Students' Writing Achievement

Many research studies found that prewriting activities or strategies are important for writing. For example, a study shows how student writing can be improved with even the simplest prewriting strategy. Students don't need the newest technology to gain support in their writing (Lan et. al., 2011). Based on another study with 15 students, it was found that students who used prewriting strategies can perform better quality writing. Therefore, it was concluded that prewriting strategies, e.g. brainstorming, listing, freewriting, clustering, asking questions, and drafting, are essential for students to learn and use throughout their school career, college, and university. These strategies can take on the role of not only organizing student writing, but

also helping them form ideas, define their voice, and develop higher-level word choice (Servati, 2012). Recently, a study was conducted in Iraq with 15 male and female sophomore students learning English as a foreign language and found that prewriting strategies are important for their writing production (Amed et al., 2023)

The Relationship between Thinking Skills and Writing Achievement

It is a well-known, accepted fact worldwide that out of 4 language skills, writing is the most difficult skill to achieve because it requires a command over vocabulary, grammar, and sentence structure (Taylor, 2023; Rao, 2019). When someone starts writing a short paragraph, it also involves establishing links among different sentences and requires thinking. Therefore, there have been many research studies on the relationship between thinking and especially writing; for example, Prastya et al. (Prastya et al., 2014) found that the correlation coefficient between critical thinking and writing argumentative achievement of 30 university students was 0.364, and significant ($p = 0.05$). They also mentioned that there are 6 dimensions of critical thinking used in argumentative writing, namely, 1) identify the basis of the writing topic, 2) analyze the writing materials, 3) address different perspectives of the writing, 4) examine the context of the writing, 5) identify the author's position, and 6) conclude. Rahmat et al. (Rahmat et al., 2020) also investigated the connection between critical thinking and academic writing of 207 university students in Malaysia learning English as a second language. They found that the students' previous English proficiency levels did not significantly influence the learners' writing process and also had no influence on critical thinking skills ($p = 0.05$). In a study conducted by Rahmat (2020), she proposed a connection between writing and thinking in 5 stages, namely:
1) beginning writing, 2) reading for information, 3) using critical thinking skills to make decisions, 4) writing a draft, and 5) evaluating the draft by reading critically. Besides, Yancey (Yancey, 2015) discovered the relationship between writing and critical thinking in many universities and fields of study and concluded that 1) writing is very different from one discipline to the next with some patterns of similarity, 2) critical thinking in different disciplines varies because of the writing materials, and 3) students need to develop a capacious, process-based and audience-oriented conception of writing that can provide a foundation for their development as writers. In 2018, Suputra (Suputra, 2018) investigated the correlation between critical thinking and writing achievement of 84 students in a university and found that their correlation coefficient was 0.796 and statistically significant at $p = 0.01$, indicating that critical thinking had a significant effect on students' writing achievement 63%. The finding agrees with the results of Nikou et al. (2015), who found significant Pearson correlations between 3 kinds of critical thinking: analysis,

evaluation, inference, and writing achievement of 140 university students at 0.619, 0.587, and 0.597, respectively. The path coefficients of the 3 kinds of critical thinking on the writing achievement were 0.32, 0.50, and 0.35, respectively.

On the contrary, a study conducted by Lustyantie et al. (2021) to explore 54 students' critical thinking skills at a university learning French in Indonesia and their performance in a writing argumentative essay found that there was no significant direct association between the two variables at p = 0.05. The authors stated that the study was conducted online, which caused the lack of researchers' direct involvement with the subjects and the small sample size.

However, according to some research studies, most of the thinking skill was critical thinking, and many types of thinking have yet to be investigated for their effects on academic writing achievement. Therefore, their effects are worth investigating. Many authors classify thinking skills into many types, for example, 4 (Drew, 2023), 7 (Metivier, 2022), and 15 (Babel, 2023).

Research objectives

1. To investigate the effects of 7 types of thinking on perceived difficulty in academic writing of Thai EFL undergraduates
2. To explore the relationships between the 7 types of thinking, and the rank orders of their effects
3. To construct NITF, a set of instructional innovations for Thai EFL undergraduates to solve the problems mentioned above.
4. To evaluate the effectiveness of the constructed innovation in terms of:
    a.Its effect size and
    b.Students' satisfaction with the innovation

Scope of the Study

1. Only 7 types of thinking skills were explored, namely: 1) concrete thinking, 2) abstract thinking, 3) divergent thinking, 4) convergent thinking, 5) analytical thinking, 6) critical thinking, and 7) creative thinking.
2. The subjects were undergraduate students learning academic writing at the prewriting stage in universities in Thailand.
3. To compare the effects of the 7 types of thinking, standardized path coefficients (β weights) were utilized.

4. This study employed only a quantitative approach.

Significance of the Study

1. The English instructors can learn whether each type of thinking has any significant effect and its effect size on academic writing or not, especially at the prewriting stage, so that they can find suitable ways and approaches to solve problems if such things happen.

2. Suppose the instructional innovation or NITF yields a high effect size; it can be used to teach undergraduate students academic writing, especially at the prewriting stage, and a similar type of innovation for teaching other language skills can be constructed similarly. In short, the NITF can be used as a model for constructing online lessons using Google Classroom free of charge.

Research Methodology

Population and Samples for Phrase I

The study in this phase aims to investigate the effects of the 7 types of thinking on perceived difficulty in academic writing, their interrelationships, and their rank of difficulty. The population of this phase was the students studying in the second and third years in government and private universities all around Thailand in the second semester of the academic year 2022. They were learning academic writing, and the number was unlimited, unknown, or indefinite.

Since there are many observed and latent variables in an SEM (Structural Equation Modeling) study in this phase, the model needs a large sample size. To have a sufficient sample size, an optimal sample was calculated using the following formula (Soper, 2006):

1. Anticipated effect size: 0.50
2. Desired statistical power level: 0.90
3. No. of latent variables: 7
4. No. of observed variables: 22
5. Probability level: 0.05

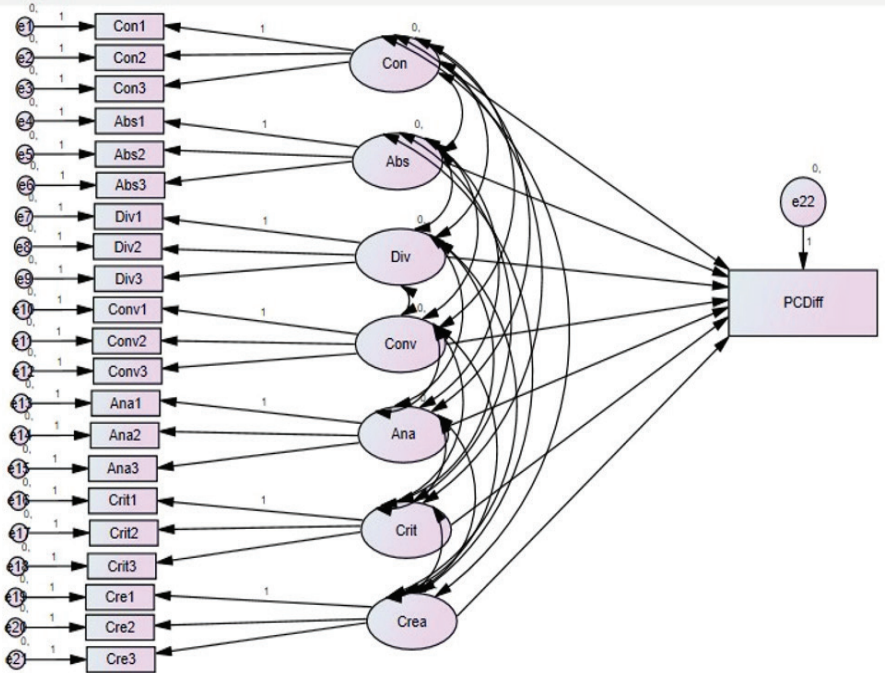
Where:

• Anticipated effect size: 0.10 = small, 0.30 = medium and 0.50 = large

• By convention, the desired statistical power level should be greater than 0.80.

It was found that n = 180 was the recommended minimum sample size. To get a good representative of the population, especially in an SEM (Structural Equation Modeling) study, a larger sample is needed (Newsom, 2018) and 350 samples were randomly selected using an online sampling method when the research tool was distributed.

Figure 1: Conceptual Framework of the Study for Phase I



Where:

Con = Concrete thinking, Abs = Abstract thinking,

Div = Divergent thinking, Conv = Convergent thinking, Ana = Analysis thinking, Crit = Critical thinking,

Crea = Creative thinking, and PCDiff = Perceived writing task difficulty Population and *Samples for Phrase II*

The population of this study was 54 undergraduate students taking an academic writing course at Phra Nakhon Rajamangala University of Technology, a government university in Bangkok. An optimal sample size was calculated using the formula below (Krejcie & Morgan, 1970), and 47 were randomly selected using a simple random sampling technique because the data would be analyzed by parametric tests for generalizable purposes.

$$S = \frac{\chi^2 NP(1-P)}{d^2 (N-1) + \chi^2 NP(1-P)}$$

Where:

s = required sample size

χ^2 = the table value of chi-square for 1 df at the desired confidence level (3.841)

N = the population size

P = the population proportion (assumed to be 0.50)

d = the degree of accuracy expressed as a proportion (0.05)

Figure 2: Conceptual Framework of the Study for Phase II

This study used a One-Group Pretest-Posttest Design.

Where:

R = Random sampling of the samples

$O_{1=}$Pretest the samples on their background in using 7 types of thinking for academic writing.

X = Give the treatment to the samples (Provide the newly constructed instructional materials to the samples so they can study by themselves under the supervision of the researcher).

$O_{1,2}$ = Posttest the samples on their learning achievement and satisfaction with the instructional innovation

Research Instruments

Five sets of research instruments were constructed and implemented in this study. They were as follows:

1. A set of 5-level Likert scale questionnaires was used to assess students' perceived difficulty when they were assigned to write a piece of academic writing and how often they used 7 types of thinking when performing academic writing at the prewriting stage. There were 8 items for each type of thinking and 57 items in the questionnaires. To find its content validity, 5 content specialists in the field of English language teaching, especially in academic writing and educational psychology, were invited to judge the congruence between each item and its objective, and the data were analyzed using the following formula (Rovinelli & Hambleton, 1977; Turner et al., 2002):

$$I_{ik} = \frac{(n-1)\sum_{j=1}^{n} X_{ijk} - \sum_{i=1}^{n}\sum_{j=1}^{n} X_{ijk} + \sum_{j=1}^{n} X_{ijk}}{2(N-1)n}$$

Where:

I_{ik} = the index of item-objective congruence for item k on objective i,

N = the number of objectives (i = 1, 2, ..., N),

n = the number of content specialists (j = 1, 2, ..., n), and

X_{ijk} = the rating (1, 0, -1) of item k as a measure of objective I by content specialist j, when 1 = agree, 0 = questionable, and -1 = disagree

The data were collected and analyzed by a computer program using the above formula (Sukamolson & Sonthi, 2021). It was found that, on average, the IOC index of the questionnaires was 0.957, which is considered a very high content validity (Turner et al., 2002).In addition, to find the reliability of the questionnaires, they were translated into Thai and distributed online to 29 samples using a Google Form with the assistance of instructors teaching academic writing in some universities. The data were analyzed by the SPSS 29 Program, and it was found that Cronbach's alpha reliability was 0.974, which is excellent (Stat-U, 2020).

2. A set of 56 4-choice multiple tests on how to use the 7 types of thinking for academic writing at the prewriting stage was constructed to cover 8 test items in each type of thinking. It was used as the Pretest and Posttest. The test items in the Posttest were reshuffled to make the sequence of the test items differ from that of the Pretest. The tests were constructed in this manner to make the Pretest and post-test actual parallel forms. It was tried out with a pilot group of 35 students from another writing class at the same university, and the data were analyzed by the CTIA program (Sukamolson, 1999). It was found that, on average, its difficulty index was 0.572 (moderately difficult), discrimination index was 0.475 (high), item validity index was 0.426 (high), and its reliability coefficient was 0.842 (high).

3. A set of 12 instructional lessons or NITF on using 7 types of thinking for academic writing at the prewriting stage was constructed mainly based on the concepts of Bloom's Revised Taxonomy of Learning and Lev Vygotsky's Zone of Proximal Development (Sideeg, 2016). The materials were presented as Powe Point via Google Classroom and evaluated by 2 English instructors using a set of checklists for instructional material evaluation. The instructional lessons were presented in the form of an asynchronous class. The data were

analyzed by Fleiss' kappa using the SPSS 29 program, and it was found that its congruence index or content validity was 0.875, which indicates a substantial level (Hartling et al., 2012). The materials were implemented for the target samples to use for 45 hours, utilizing individualization learning, a learner-centered approach, or synchronic online lessons.

4. A set of 47 5-level Likert Scale checklists for evaluating instructional materials was constructed to cover 4 aspects, namely 1) layout and design, 2) objectives and content, 3) learning activities, and 4) online learning. The researcher constructed this instrument based on the questionnaires adapted from 4 sources (Abdel-Wahab,2013; Mengesha &Selassie, 2015; Ontario Ministry of Training, 2011; Sukamolson, 2006). 2 instructors of English validated the checklists, and the data were analyzed by Fleiss' kappa using the SPSS 29 program. Its congruence index or content validity was 0.875, which indicates a substantial level (Hartling et al., 2012).

5. A set of 33 5-level Likert Scale questionnaires for evaluating students' satisfaction with the instructional innovation for academic writing, or NITF was constructed to cover 3 main aspects or factors, namely, 1) the general quality of the learning materials, 2) the didactic adaptation of the innovation, and 3) the ability to motivate academic writing. The items were mainly adapted from the questionnaires written by Garcia-Hernandez and Gonzalez-Ramirez (2022). Its original qualities were 1) reliability indexes (Cronbach's Alpha) of Factor 1 = 0.821, Factor 2 = 0.832, Factor 3 = 0.837, and Total = 0.896, whereas its validity indexes (Factor loadings) were Factor 1 = 68.32%, Factor 2 = 71.29%, and Factor 3= 73.92% of 100 variance, respectively or 0.712.

Data Collection

The first set of research tool was distributed online to the samples in Phase I, and the target samples in Phase II were asked to take the Pretest as soon as they joined the class. They then used the instructional innovation lesson by lesson by themselves, along with regular suggestions and encouragement from the researcher via the Google classroom communication functions and a Line group. Each lesson consists of the introduction of the concepts of a type of thinking, its functions to help students with academic writing at the prewriting stage, examples, exercises, and quizzes in subjective and objective formats in various forms and means. The students were required to use the instructional innovation by themselves asynchronously. When the students finished the last lesson, they were asked to take the Posttest and answer the questionnaires to evaluate their satisfaction. All the tests and questionnaires were answered online, and the Google Classroom function collected all data.

Data Analysis

To find the answer for the first 2research objectives, the data were analyzed by the AMOS 29 Program As for objective 4, the data were analyzed by a Paired Samples t-test and One-Sample t-tests using the SPSS 29 (IBM, 2024) and G*Power Programs (HHU, 2023).

Evaluation Criteria

Table 1: Effect Sizes and their Meanings (Wikipedia, 2023; Coe, 2002)

No.	d	Meanings	PC rank	Ref.
1	0.01	Very small	51	Sawilowski, 2009
2	0.20	Small	58	Cohen, 1988
3	0.50	Medium	69	Cohen, 1988
4	0.80	Large	79	Cohen, 1988
5	1.20	Very large	88	Sawilowski, 2009
6	2.00	Huge	98	Sawilowski, 2009

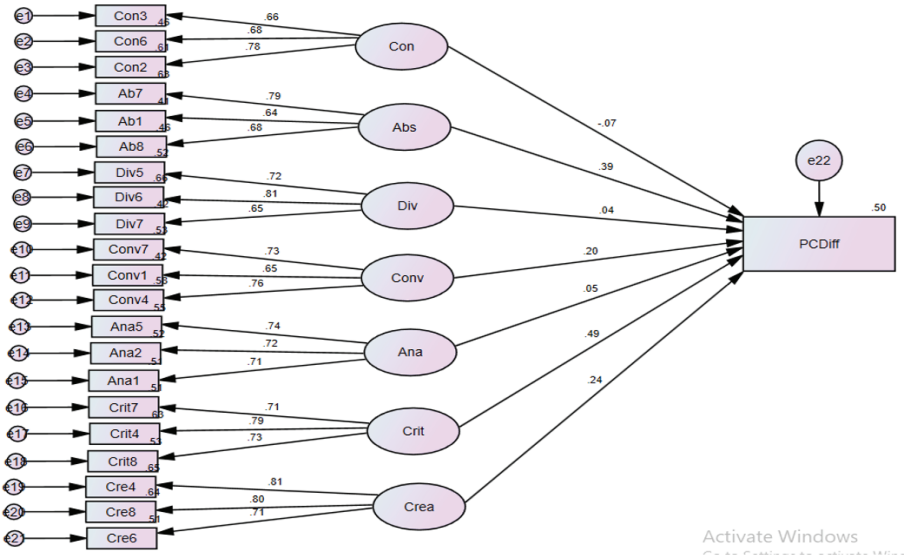
Table 2: Means and their Meanings of the Satisfaction Levels(Boone & Boone, 2012; Rudin, 1976)

No.	Means	Meanings
1	0.00 – 1.50	Unsatisfied
2	1.51 – 2.50	Slightly satisfied
3	2.51 – 3.50	Moderately satisfied
4	3.51 – 4.50	Very satisfied
5	4.51 – 5.00	Extremely satisfied

Findings

1. The effects of 7 types of thinking on the perceived difficulty in academic writing of Thai EFL undergraduates

Figure. 3: Trimmed Model with Standard Path Coefficients and R Squared of the 7 Types of Thinking



χ^2 p = 0.078, CFI = 0.923, RMSEA = 0.068 & SRMR = 0.065

Fig. 2 reveals explicitly that 4 out of 7 types of thinking, namely, Critical (p = 0.49), Abstract (p = 0.39), Creative (p = 0.24), and Convergent (p = 0.20), had a significant effect on the students' perceived difficulty levels of academic writing whereas 3 other types of thinking, namely, Divergent, Analytical, and Concrete had insignificant effects. However, the total effect (R2) of all types of thinking on perceived difficulty was 50% of the total variance, considered high or large (Hopkins, 2001). Based on the 4 common criteria for model fit, they indicate that the theoretical model fits the empirical model statistically at p = 0.05 (Kline, 2011).

2.1 The rank orders of their effects

The descending order of the effects of 4 types of thinking is Critical (p = 0.49), Abstract (p = 0.39), Creative (p = 0.24), and Convergent (p = 0.20). The path coefficients stemming from each observed variable (item) for each latent variable (a type of thinking) ranging from 0.65 – 0.81 are significantly high (Hopkins, 2001).

2.2 The relationships between the 7 types of thinking

Table 3: The Correlation Coefficients between the 7 Types of Thinking

	Con	Abs	Div	Conv	Ana	Cri	Cre
Con	--	0.955*	0.891*	0.861*	0.965*	0.949*	0.920*
Abs		--	0.961*	0.993*	0.978*	0.983*	0.929*
Div			--	0.931*	0.957*	0.973*	0.944*
Conv				--	0.962*	0.952*	0.920*
Ana					--	0.975*	0.983*
Cri						--	0.989*
Cre							--

* p< 0.05

The figures in Table 1 show that the relationships between the 7 types of thinking are very high and significant at p = 0.05 since all range from 0.891 to 0.989 (Hopkins, 2001). This indicates that all 7 types of thinking are very tightly related to each other in academic writing.

3. The construction of a set of instructional innovations or NITF for Thai EFL undergraduates to use to solve the problems mentioned above.There were 12 lessons in NITF, and they were constructed under the concepts of Bloom's Revised Taxonomy of Learning and Vygotsky's Zone of Proximal Development (ZPD). The materials were presented in Powe Point as an asynchronous class via Google Classroom and evaluated by 2 English instructors using a set of checklists for instructional material evaluation. The data were analyzed by Fleiss' kappa using the SPSS 29 program, and it was found that its congruence index or content validity was 0.875, which indicates a substantial level (Hartling et al., 2012).

4. The effectiveness of the constructed innovation in terms of a) its effect size and b) students' satisfaction with the innovation.

4.1 The difference between the mean of the Pretest and Posttest scores and effect size.

Table 4: The Differences between the Means of the Pretest and Posttest Scores and Its Effect Size (n = 47)

Test	$\bar{X}$	SD.	df	t-value	Sig (1-tailed)	r_{xy}	d
Pretest	32.77	12.105	46	30.278	0.005	0.853	1.625
Posttest	43.08	9.769					

* $p < 0.05$

Table 4 reveals explicitly that, on average, the Posttest score of the students after using the innovation ($\bar{X}$ = 43.08, SD. = 9.769) was significantly higher than that of the Pretest before they used it ($\bar{X}$ = 32.77, SD. = 12.105) at p = 0.05and its effect size (d) was 1.625. This value indicates a large effect of instructional innovation on the student's academic achievement (Sawilowsky, 2009; Cohen, 1988). It means that, on average, the students can stand at percentile rank 79 after they finish using the instructional innovation while they were at percentile rank 50 before they used it. This shows that the innovation can make them move up 29 percentile ranks from their original rank, and this improvement is considered a large effect (Becker, 2001; Coe, 2005).

5.2 Students' Satisfaction with the Instructional Innovation

Since some questionnaires asking the students the same constructs were combined to form 3 main Likert scales or factors, the ordinal scale from each item becomes an interval scale (Brown, 2011; Carifio & Perla, 2008). There are 3 to 4 aspects of each factor dealing with the qualities of the instructional innovation, NITF. Their mean scores and standard deviations were compared with a set of criteria to interpret the meaning of the student's satisfaction with the instructional innovation. The findings are presented in Table 5 below.

Table 5: Students' Satisfaction Levels with Instructional Innovation in 3 Aspects

Factors	$\bar{X}$	S.D.	criteria	meaning
Factor 1. The general quality of the learning materials				
a. Technological quality	4.629	0.5086	3.50	*Very satisfied*
b. Quality of English language content	4.655	0.4273	4.50	*Extremely satisfied*
c. Visual quality	4.677	0.4415	4.50	*Extremely satisfied*
Factor 1: Summary	4.654	0.3944	4.50	*Extremely satisfied*
Factor 2. Didactic adaptation of the innovation				
a. Didactic Significance	4.711	0.3951	4.50	*Extremely satisfied*
b. Adequacy of language content	4.585	0.3703	3.50	*Very satisfied*
c. Relation between theory and practice	4.570	0.4120	3.50	*Very satisfied*
Factor 2: Summary	4.622	0.3523	4.50	*Extremely satisfied*
Factor 3. Ability to motivate academic writing.				
a. Implication	4.722	0.3408	4.50	*Extremely satisfied*
b. Contribution to learning	4.533	0.4735	3.50	*Very satisfied*
c. Relevance	4.527	0.5062	3.50	*Very satisfied*
d. Interaction	4.674	0.4112	4.50	*Extremely satisfied*
Factor 3: Summary	4.614	0.3999	3.50	*Very satisfied*
Total	4.630	0.3725	4.50	*Extremely satisfied*

Table 5 manifests that, on average, the students were extremely satisfied with 1) the general quality of the learning materials and 2) the didactic adaptation of the innovation but were very satisfied with its ability to motivate academic writing. However, when considering all 3 factors, it was found that the students were extremely satisfied with the instructional innovation or NITF.

In addition, for the first factor, they were also extremely satisfied with the quality of English language content and the visual quality of the innovation but very satisfied with the technological quality. As for the second factor, they were also extremely satisfied with the didactic significance but very satisfied with the adequacy of language content and the relation between theory and practice. Moreover, as for the third factor, they were also extremely satisfied with the implication of the innovation and its interaction but were only very satisfied with its contribution to learning and its relevance.

Discussions

Based on the findings, some issues are worth discussing as follows:

1. Why does critical thinking have the strongest effect on the students' perceived

difficulty in academic writing?

This finding can be due to the following reasons:

1) There are many dimensions of critical thinking. For instance, (Churches, 2008):

a) Analyzing is done by comparing, organizing, deconstructing, attributing, outlining, finding, structuring, and integrating.

b) Evaluating utilizing checking, hypothesizing, critiquing, experimenting, judging, testing, detecting, and monitoring.

c) Creating utilizing designing, constructing, planning, producing, inventing, devising, and making new ideas.

2) "...critical thinking is one of the major concepts under consideration in education, and it has also received a significant position in second and foreign language learning. According to Scriven (1996), critical thinking is the intellectually disciplined process of actively and skillfully conceptualizing, applying, analyzing, synthesizing, and/or evaluating information gathered from, or generated by, observation, experience, reflection, reasoning, or communication, as a guide to belief and action. Besides, Angelo (1995) stated that most formal definitions characterize critical thinking as the intentional application of rational, higher-order thinking skills, such as analysis, synthesis, problem recognition, and problem-solving, inference, and evaluation" (as cited by Prastya et al. 2014).

3) Since the associations between the 7 types of thinking are very high and significant for all, ranging from 0.891 to 0.989, this indicates that all 7 types of thinking are very tightly related to each other in academic writing. In other words, it can mean implicitly that some types of thinking can benefit academic writing at different stages or types of writing.

4) Critical thinking is 1 out of 2 higher-order thinking skills besides creative thinking that is rarely used in academic writing.

5) The finding on the strong effect of critical thinking on the students' perceived difficulty in academic writing is supported by the findings from many researchers who found that it has significant effects on the students' writing achievements mentioned earlier, for example, Rahmat et al. (2020), Rahmat (2020), Supatra (2018), Yancey (2015), Nikou et al. (2015) and Prastya et al. (2014).

2. Why could the instructional innovation, NITF, increase, on average, the pretest mean score of the undergraduate students significantly higher than their Pretest mean score, and as a result, make it have a very large effect size?

This finding could be due to the following principal reasons:

1) "A honeymoon effect" or "a novelty effect" NITF is a brand-new set of

instructional materials for undergraduate students learning academic writing, especially at the prewriting stage, and this may have "a honeymoon effect" or "novelty effect" on them. Novelty can make learners more sensitive to learning and perform tasks faster. These results are consistent with theoretical and behavioral investigations suggesting that intrinsically motivated exploration is shaped by several factors (Baranes et al., 2014). Additionally, novelty is inherent to creative processes. It could benefit creative performance when divergent thinking is required but inhibit creative performance when convergent thinking is required. In a study, learners were primed with novelty and performed a creative task requiring divergent thinking (Gillebaat et a., 2013). Therefore, novelty significantly affects the students using NITF for academic writing, especially at the prewriting stage, since it gives them higher motivation, interest, sensitivity, and speed in learning academic writing.

1) "A honeymoon effect" or "a novelty effect" NITF is a brand-new set of instructional materials for undergraduate students learning academic writing, especially at the prewriting stage, and this may have "a honeymoon effect" or "novelty effect" on them. Novelty can make learners more sensitive to learning and perform tasks faster. These results are consistent with theoretical and behavioral investigations suggesting that intrinsically motivated exploration is shaped by several factors (Baranes et al., 2014). Additionally, novelty is inherent to creative processes. It could benefit creative performance when divergent thinking is required but inhibit creative performance when convergent thinking is required. In a study, learners were primed with novelty and performed a creative task requiring divergent thinking (Gillebaat et a., 2013). Therefore, novelty significantly affects the students using NITF for academic writing, especially at the prewriting stage, since it gives them higher motivation, interest, sensitivity, and speed in learning academic writing.

2) *NITF is a user-friendly, multimedia, and rich-media instructional material used in an asynchronous class*. The materials were constructed for use via the Google Classroom platform, which has many modern, beneficial features for e-learning. For example, students can interact or communicate with the instructor directly and quickly. A Line group was also created to provide a channel for communication between them. The innovation can provide immediate learning feedback to students. Various types of media, e.g., VDO clips, graphics, charts, tables, and PowerPoint slides, can make their learning attention span longer so that they can enjoy learning more subject content (Perko, 2020).

3) NITF was constructed mainly based on the concepts of Bloom's Revised Taxonomy of Learning and Lev Vygotsky's Zone of Proximal Development (ZPD). The concepts from the 2 primary sources were applied to construct the instructional materials, and they

were proven to have a high content validity, as mentioned earlier. Many studies found that the concepts from both sources were beneficial for effective learning (Sideeg, 2016; Crews, 2010). This finding implicitly means that the materials are suitable for teaching and learning academic writing, especially at the prewriting stage.

3. Why were the undergraduate students satisfied with various aspects of NITF at high and very high levels?

This finding could be due to the advantages of the asynchronous class as follows (Poppas, 2023; Brown, 2021; Open Learning, 2021):

1) Engagement and Interest: NITF innovations often bring novelty and excitement to learning. Students are naturally drawn to technology and innovative tools, and incorporating these into writing instruction can make the learning experience more engaging and exciting.

2) Interactive Learning: NITF's innovative tools and technologies can provide interactive and hands-on experiences. Whether using writing software, online platforms, or collaborative tools, students may find these methods more interactive and participatory than traditional teaching methods.

3) Multimedia Integration: Many NITF innovative tools allow for integrating multimedia elements, such as images, videos, and audio. They can enhance the writing process by allowing students to create more dynamic and multimedia-rich compositions, making the learning experience more varied and expressive.

4) Real-World Application: Some NITF innovations in writing instruction aim to simulate real-world writing scenarios. Students may be more motivated to learn when they can see the practical applications of their writing skills in the digital age, such as VDO clips, PPT presentations, graphic presentations, or multimedia presentations.

5) Personalization: NITF innovations often provide opportunities for personalized learning experiences. Adaptive learning platforms, customizable writing tools, and individualized feedback systems can cater to students' unique needs and preferences, fostering a more personalized and effective learning journey.

6) Feedback and Improvement: Some NITF innovations include instant feedback and assessment features. Students may appreciate receiving immediate feedback on their writing, allowing them to identify areas for improvement and make revisions promptly.

7) Digital Literacy Development: Using NITF's innovative tools can contribute to developing digital literacy skills. As technology is pervasive in the modern world, students benefit from gaining proficiency in digital communication, online research, and using various digital tools for writing purposes.

Recommendations

A. For research finding consumers

1. The instructional innovation constructed for the study or NITF should be utilized for teaching academic writing, especially at the prewriting stage, since it was proven that its effectiveness was very high, and many of its aspects were regarded as highly satisfactory by the students using it.

2. Since the significant effects of the 4 types of thinking were critical (0.49), abstract (0.39), creative (0.24), and convergent (0.20), and the total effect (R2) of all types of thinking on perceived difficulty was 50% of the total variance. Therefore, it is considered a large effect. Therefore, when teaching academic writing, instructors should consider the 4 types of thinking and emphasize their effects on academic writing. As for the other 3 types of thinking, namely, divergent, analytical, and concrete, although they may not directly affect academic writing, they should be addressed because all types of thinking correlate with each other very highly. This indicates that some of them may indirectly affect academic writing.

B. For further studies

1. Since “A honeymoon effect” or “a novelty effect” may have a short-term impact on student achievement psychologically, a Pretest-Posttest & Delayed Test Design should be utilized by any researchers who use NITF for teaching academic writing to investigate the effect sizes of the treatment after the delayed test. The new effect sizes can be compared with the ones from the present study to test the impact of the honeymoon effect and the retention rate of the treatment.

2. Since this study employs only a quantitative approach, it is suggested that anyone using NITF investigates the students’ opinions, attitudes, and satisfactions qualitatively, and analyzes the data with more reliable computer software such as Hyper-Research and NVIVO instead of jotting frequency counts manually. This kind of analysis may reveal both the advantages and disadvantages of the mentioned innovation.

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