THE EFFECTS OF COLLABORATIVE PRE-WRITING ASYNCHRONOUS DISCUSSION USING GRAPHIC ORGANIZERS ON EFL ARGUMENTATIVE WRITING PERFORMANCE

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Abstract: Chinese university students often face challenges in developing their English writing skills, which can cause frustration. To address this issue, the research study explored the impact of collaborative pre-writing asynchronous discussion on argumentative essay performance among Chinese EFL undergraduates. The study identified low levels of student participation in asynchronous online discussions and proposed an alternative method of collaborative pre-writing discussion through digital applications to generate graphic organizers. The research study utilized a quasi-experimental design in which two intact classes were randomly assigned to two conditions: (1) pre-writing discussion involving graphic organizers (n=56) and (2) pre-writing discussion with WeChat, a social networking tool (n=55). The results indicated that students in the experimental group who used graphic organizers significantly improved their argumentative essay writing skills. This suggests that online discussion using graphic organizers was a more effective pre-writing strategy as it facilitated more reflective and elaborative opinions, as demonstrated by the statistical results. Moreover, students in the experimental group displayed a positive attitude towards using graphic organizers in online discussions. These findings have important implications for improving the writing skills of Chinese EFL undergraduates. It suggests collaborative pre-writing discussions using graphic organizers can effectively enhance students' writing skills.

Keywords: Argumentative writing, collaborative pre-writing, interaction pattern graphic organizer

INTRODUCTION

Argumentative writing poses difficulty to native English speakers and it is more challenging for English as a Foreign Language (EFL) learners, especially those who have insufficient knowledge and experience in related genres of writing in their mother tongue (Ghanbari & Salari, 2022; Liao & Liao, 2022). Argumentative writing has cognitive complexity, because it requires related genre knowledge, knowledge relevant to the task topic, efficient organization of ideas based on logic and reasoning and appropriate use of language to formulate ones' thoughts (Liao & Liao, 2022). Besides, the difference in the rhetorical norms between the foreign language and mother tongue arises confusion and difficulty for EFL learners (Bacha, 2010).

EFL writing is an indispensable component of College English, a compulsory course in China Colleges (Wang, 2016). Within Chinese universities, argumentative writing has become increasingly paramount, regarded as equally valuable alongside other academic abilities (Cai, 2010). In college study, students should be able to produce appropriate academic papers with effective evidence-based arguments (Cai, 2010). The significance of argumentative writing is equally demonstrated by its incorporation in many important examinations, such as the China College Entrance Examination, College English Test, Band Four & Six (CET-4 & 6), a Chinese national English test for university students.

An argumentative essay given a high score in these examinations shows accurate and complex linguistic items and effective argumentation. However, the problems of argumentative writing cannot be solved solely by using linguistic dimensions by providing a fixed template (Yu et al., 2021). Typically, effective argumentation involves not only counterarguments as the opposite sides of arguments, but also the process of weighing and compromising arguments and counterarguments (Casado-Ledesma et al., 2021). It is important to integrate arguments and counterarguments to reach a reasoned conclusion (Mateos et al., 2018; Nussbaum & Schraw, 2007).

BACKGROUND OF THE STUDY

In argumentative writing, learners should incorporate many argument elements: claims, evidence, counterargument session, rebuttal session and conclusion. In addition, they should coordinate between claim and evidence. Research shows that EFL students do not include all the argument elements in argumentation (Qin & Karabacak, 2010). They lack the skills to efficiently combine claims and supporting ideas (Fan & Chen, 2021). Students' argumentation skills need to be further enhanced (Yang, 2022b).

In written argumentation, a writer must simultaneously play the role of several interlocutors who present opposing views and refute others' viewpoints (Kuhn & Udell, 2007; Shi et al., 2023). The lack of skill and the absence of other people who take opposing views make the writer neglect the necessary counterarguments and rebuttals (Iordanou & Rapanta, 2021; Roussey & Gombert, 1996). Collaborating with partners who present contrasting perspectives can lead to a more comprehensive argument (Kuhn & Crowell, 2011; Rapanta & Felton, 2022). The argumentative conversation before composing provides the argumentative process developed by peers, which can support the learner who writes an argumentative essay individually (Prata et al., 2019).

Collaboration before argumentative writing is a form of collaborative pre-writing activity. Pre-writing plays an essential role in EFL writing performance, especially in argumentative writing, which has a more complex text structure and requires higher-order skills to achieve efficient argument (Liang & Xie, 2023). Pre-writing activities prepare students with content

and structure by reading and discussion before students begin the recursive process of writing.

With the development and widespread use of web 2.0 tools, learners' collaboration facilitated by Internet technology has gained popularity in L2 research and pedagogical practice (Elola & Oskoz, 2017), including collaborative pre-writing (Beiki et al., 2020; Koszalka et al., 2021; Leeming et al., 2022) and asynchronous online discussion (Jeon et al., 2023; Kim & Ketenci, 2019; Li & Yu, 2020). Asynchronous online discussion is a text-based technology-enhanced interaction, where participants exchange ideas and get exposed to multiple opinions and insights to construct knowledge (Koszalka et al., 2021). In the education context, asynchronous online discussion is viewed as a planned instructional strategy which facilitates students' interaction and engagement in learning content with others (Koszalka et al., 2021).

The process of conducting an asynchronous online discussion is called threading (Qiu, 2019), and each thread represents a discussion topic. Participants' respondents in the thread are arranged chronologically, from up (earlier respondent) to bottom (late respondent). The discussion in Learning Management System and social media (e.g. WeChat in China) are both threaded discussion. Following the discussion flow requires high cognitive resources (Jyothi et al., 2012a). Students' limited cognitive capacity may prevent students from reviewing all the posts, and they would respond to postings with easy access (Hewitt, 2005; Murphy & Coleman, 2004). Sometimes, they send irrelevant messages and individual opinions without responding to others' views. Furthermore, students' messages in the online discussion were dominantly superficial, without reflective, elaborating and critical views (Aloni & Harrington, 2018). In this way, students' perspectives on a writing topic are not extended, and the interactive discussion becomes an individual pre-writing activity.

An efficient pre-writing tool is necessary to engage students in online discussions and prepare them for content and organization in their argumentative writing. This study suggests utilizing graphic organizers in collaborative pre-writing asynchronous online discussions before individual argumentative writing. This approach has not been widely adopted and is still underexplored.

This study aims to explore the effects of collaborative pre-writing asynchronous discussions using graphic organizers on individual argumentative essay performance among Chinese EFL undergraduates. A comparison will be made with WeChat, a threaded discussion platform and the most popular social medium. The research questions are as follows:

1. Does using a graphic organizer during pre-writing asynchronous online discussions improve students' argumentative essay writing compared to WeChat, a threaded online discussion platform?
2. Does using graphic organizers in asynchronous online discussions during pre-writing elicit more reflective comments compared to WeChat, threaded online discussion platform?
3. What are the students' perceptions about using graphic organizers in asynchronous online discussions for pre-writing?

LITERATURE REVIEW

Argumentative Writing

In school settings, argumentative writing is vital to demonstrate one's comprehension and evaluation of academic issues (Wolfe et al., 2009). In writing class, argumentative writing requires students to prove an opinion persuasively (Qin, 2009). Argumentation is a verbal and social activity of reasoning for the acceptance and declination of a controversial viewpoint by raising a systematic array of opinions to justify or refute the controversial viewpoint (van Eemeren et al., 2016). It suggests that argumentation involves dialogic interaction of

justification, disagreement, and discussion rather than just giving arguments. Argument can be a product as well as a process (Kuhn & Udell, 2007). An individual produces an argument to support a claim, and the argument is considered as a product. By contrast, argumentation or argumentative discourse involves the dialogic process, where people challenge and criticize claims that are inconsistent with hers.

The dialogic argumentation among individuals can promote personal argumentative writing and argumentative proficiency (Kuhn et al., 2013; Kuhn & Udell, 2007; Shi et al., 2023), by providing the missing interlocutor. There is a link between oral and written argumentation, and the oral collaborative argumentation prepare students for individual written argumentation (Wagner et al., 2017). Collaboration is considered effective for enhancing argumentation skills, with partners who present and evaluate multiple opinions, which constitutes the dialogical structure of argumentative writing (Iordanou & Rapanta, 2021; Kuhn & Crowell, 2011).

The oral collaborative argumentation can be conducted online to settle the problem of limited time of in-class instruction. In the present study, collaborative pre-writing asynchronous discussion serves as the argumentative dialogue before argumentative writing, through which learners get prepared in argument development and linguistic expressions before they begin to write argumentative essays.

Collaborative Pre-writing

Pre-writing involves the elicitation and organization of ideas, as well as the exploration of linguistic resources (Magdahalena, 2016). Collaborative pre-writing is a method that can be employed to improve individual writing performance. This approach is based on the Sociocultural Theory (Vygotsky, 1978), which encompasses the Social Interaction Theory (Vygotsky, 1981) and the Zone of Proximal Development (ZPD). According to this theory, individuals with greater capabilities can assist those with lesser capabilities through scaffolding (Vygotsky, 1986) and languaging (Swain, 2010), leading to better writing outcomes.

It is worth noting that pre-writing activities conducted in group settings promote social interaction, which is an essential component of the Sociocultural Theory. Social interaction, especially between individuals of higher capacity and novice learners, plays an important role in learning and language development (Vygotsky, 1981). Through collaborative pre-writing, individuals can work together to generate ideas, build on each other's perspectives, and identify potential challenges that may arise during the writing process.

Moreover, the interaction with more capable individuals leads to knowledge construction only when it is within their Zone of Proximal Development (ZPD), which means the distance between what the novice can do individually and what he can accomplish with the assistance of the more capable individual (Vygotsky, 1986). The ZPD acknowledges that individuals learn best when provided with opportunities to engage with more competent individuals who can challenge them to reach new levels of understanding and competence (Vygotsky, 1986). The assistance and encouragement from individuals at higher level was termed as scaffolding. It helps learners achieve higher performance during the interaction (Vygotsky, 1986). In the argumentative dialog, individuals of opposing positions provide scaffolding to each other regarding argumentation development. Scaffolding takes place in the form of language or speech, which is used as a tool for communication to explain opinions and complete tasks during social interaction (Wells, 1999).

Swain (2010) introduced the term "languaging" to describe the use of language as a tool in language learning. She identified two distinct forms of languaging: private speech and collaborative dialogue. Private speech refers to self-directed language use, while collaborative dialogue occurs when learners interact to solve a problem (Swain et al., 2011). Both private speech and collaborative dialogue offer valuable opportunities for learning and argumentation

development. By engaging in private speech and collaborative dialogue, learners can develop their argumentation skills and language proficiency more effectively.

In this research, collaborative pre-writing asynchronous discussion allows for interaction on the content, organization, and formulation of the subsequent individual writing assignment. During the interaction, scaffolding occurs among learners of similar levels or between expert students and novice learners in each discussion group, or between the instructor and learners, with the aid of writing instruction, graphic organizers or WeChat and learning materials. Developing the graphic organizer or WeChat in each discussion group functions as "languaging" or "speech" for interaction and scaffolding. Learners elicit social speech when responding to each other's ideas and working collaboratively to plan for the composition. Then, they utilize social speech to facilitate the development of their thoughts and plans for the composition. Collaborative pre-writing discussion can improve writing performance and develop writing proficiency.

A majority of research showed that essays written after collaborative pre-writing got higher scores than those written following individual pre-writing (Chang & Lu, 2018; Ebadijalal & Moradkhani, 2023; Jiang et al., 2021; Li & Zhang, 2021; Liao, 2018; McDonough et al., 2019; Neumann & Mcdonough, 2014; Neumann & McDonough, 2015). Students' interaction during collaborative pre-writing allowed for collective scaffolding and enabled participants to achieve more competent developmental levels beyond their actual levels (Ebadijalal & Moradkhani, 2023; Li & Zhang, 2021).

Interaction Pattern in Asynchronous Online Discussion

Sociocultural theory argues that learning takes place in social interaction. It means that knowledge is co-constructed through engagement in dialogue with other people. Grounded in Vygotsky's theory, Gunawardena et al. (1997) proposed an Interaction Analysis Model to evaluate the social construction of knowledge in an online collaborative learning environment, with the premise that online interactive discourses can demonstrate learners' knowledge construction process in online learning. The Interaction Analysis Model has been utilized in numerous studies to illustrate the process of knowledge construction and assess the quality of online learning (Dubovi & Tabak, 2020; Gruzd et al., 2020; Haythornthwaite et al., 2018; Tawfik et al., 2017; Ye & Pennisi, 2022).

The Interaction Analysis Model (Gunawardena et al., 1997) analyzes the online discussion content and describes five phases of knowledge construction based on the learning behaviors (referred to as "operations") reflected in the interaction content. The five phases include sharing or comparing information, discovering and exploring inconsistencies in ideas, negotiating meaning, testing and modifying proposed co-construction, and applying newly constructed knowledge.

The initial stage of "sharing or comparing information" is characteristic of supporting other's opinions by providing additional evidence. In the second stage of "discovery and exploration of inconsistent ideas", opposition to opinions arises and problems of earlier messages are identified. The inconsistency of ideas results in the third stage of meaning negotiation. In the negotiation stage of meaning, the opposition of opinions is attended to, and a new viewpoint is proposed for consideration. Then, in the fourth phase of "testing and modification of proposed co-construction", the newly proposed meaning is elaborated and tested. Finally, in the final stage of "application of newly constructed knowledge," desirable learning outcome is achieved after elaborating and testing the newly proposed meaning. Summary of the prior discussion is made, agreed synthesis of information is achieved, and the newly constructed meaning is arrived at.

In order to determine the discussion behavior of collaborative pre-writing, Neumann and

McDonough (2015a) distinguished learners' episodes with reflective and non-reflective episodes. Reflective episodes showed justification, evaluation, and consideration of alternatives. Justification means providing reasons and explanations for ones' ideas. Evaluation meant identifying weakness and gap in the ideas that had just produced. Consideration of alternatives meant critical selection and comparison of different options. The list of options without further discussion was not categorized as reflective. Reflective content was distinct from simple responses which only had the function to move the discussion to the new topic. Non-reflective showed none of the characteristics.

The present study adopts the term "reflective ideas" to evaluate learners' online discussion quality. From the perspectives of phases of knowledge construction, learners' messages which is categorized as reflective ideas indicates that the third and fourth level of knowledge construction have been achieved. Learners go through challenging situations, meaning negotiation, testing, and modification of certain ideas, as well as evaluation and information synthesis. From the argumentative perspectives, learners' messages categorised as reflective ideas suggest that learners begin to realise the existence of opposing ideas. They attempt to strengthen their own ideas and weaken the opposing viewpoints before reaching a reasonable conclusion.

Graphic Organizer

A graphic organizer takes the form of a concept map (Novak & Cañas, 2006), a mind map (Buzan & Buzan, 1996) and diagrams (Butcher, 2006). Graphic organizers positively impact information processing (Larkin & Simon, 1987).

The web-based peers' interaction on knowledge and ideas could be conducted alternatively using a graphic organizer in online discussion. It means group members synchronously or asynchronously share, co-edit, and co-revise the same graphic organizer, such as mind maps, concept maps, and diagrams, for idea exchange, meaning negotiation, multiple perspectives evaluation, and knowledge reconstruction. Moreover, graphic organizers positively impact information processing (Larkin & Simon, 1987). When a graphic organizer is integrated, it could facilitate online discussions (Jyothi et al., 2012b).

Generating maps is a pre-writing tool, with the visually represented text structure and radiating format of ideas. Maps could activate the producers' ideas and review the pre-writing work with greater efficiency (Buzan & Buzan, 1996). With the development and widespread use of web 2.0 tools, pre-writing can be conducted collaboratively in synchronous online discussion and demonstrated positive effects (Amiryousefi, 2017; Chang & Lu, 2018; Ebadijalal & Moradkhani, 2023; Liao, 2018). However, asynchronous online discussion which promotes interaction, availability, and convenience, has not been widely implemented and investigated.

METHODOLOGY

Research Design

The study adopted a quasi-experimental design. With convenience sampling, the two intact classes were randomly assigned to experimental and control groups. The experimental group (n=56) took graphic organizers as a collaborative pre-writing online discussion tool, while the control group (n=55) discussed on WeChat, a social networking tool. Both groups were divided into 14 discussion units, with four students in each unit, except for a unit of 3 students from the

control group.

Participants

The participants were 111 undergraduates majoring in mechanical manufacturing from two parallel intact English classes at a university in Northeastern China. They were lower-intermediate EFL learners.

Treatment

The research was conducted for eight weeks. In the first week, the experimental and the control group took a pre-test on argumentative writing. Students in both groups were given 30 minutes to write an argumentative essay on "The Effects the Internet Plays on People' s Interaction". They were encouraged to outline in the first ten minutes. Then, both groups took writing instruction from the same teacher for six weeks, with "Writing Coursebook for Chinese EFL Students", written by Ding Wangdao, as the textbook.

During the intervention, the experimental group was trained to respond to ideas with a graphic organizer on Tencent Docs, while the control group was required to exchange ideas on WeChat, a social networking tool. Participants of both groups had the same argumentative writing instruction and were provided with the same guiding worksheet for clarity, accuracy, precision, relevance, depth, logic and significance in online discussion (refer to Appendix C). In the last week, both groups discussed with graphic organizers and WeChat, respectively, before writing an argumentative essay individually for 30 minutes as a post-test.

Data Collection

To assess participants' argumentative writing skills. Two timed argumentative essays with a word count of 150 words were used for the pretest and post-test before and after the intervention. Qin (2009) adopted the holistic writing rubric to assess the overall quality of students' argumentative essays (see Appendix A). The rubric, which underwent four rounds of validating process in PhD research on Chinese EFL argumentative writing, was a 5-scale scoring rubric for dimensions of the effectiveness of argument, language use in general and overall organization. The total score was 15 points, with 5 sub-points for each dimension.

Two raters, who got the master degree of TESOL and had experience teaching English for 10 years, scored the pre-test essays after some training sessions. They graded 15 essays independently, then negotiated the differences in sub-scores and tried to reach an agreement on the implementation of specific criteria for the writing rubric. Using coefficient alpha, the inter-rater reliability was .82. The pretest writing scores showed no significant difference between both groups in argumentative writing ($p = .456$). The raters conducted the same writing procedure in the post-test gradings.

Then, semi-structured interviews were conducted with sixteen participants from the experimental groups. The interview questions were presented in Appendix B.

Data Analysis

One-way ANCOVA was conducted to examine whether online discussion supported by graphic organizers in Tencent Docs improved argumentative writing. The independent variable was the online discussion method, which graphic organizers used in Tencent Docs or by WeChat. The dependent variable was the scores of participants' argumentative writing post-tests. The covariate was pretest writing scores since students' prior writing ability may influence the post-

test results.

Students' perspectives were categorized into four groups: off-topic ideas, meaningful contributions with inappropriate items, restating others' views, and elaborating others' views. Off-topic ideas refer to comments irrelevant to the issue being addressed. Meaningful contributions with inappropriate items are referred to as relevant ideas with inappropriate items. Restating others' views referred to messages showing agreement without supporting details. Elaborating on others' views means stating one's views with reflective and elaborating ideas. The research examined the number of episodes in each category of students' perspectives in the online discussion before the post-test argumentative essay. Two markers, who also rated the pre- & post- tests essays coded students' episodes. The inter-rater reliability, using coefficient alpha, was .81.

To find out the EFL students' perceptions towards collaborative pre-writing asynchronous discussion using graphic organizers and to further interpret the quantitative findings, an individual semi-structured interview was conducted with 16 EFL students in the experimental group. The semi-structured interview explored students' perceptions in the following four aspects: performance expectancy, effort expectancy, and facilitating conditions (Abbad, 2021). The semi-structured interviews were then transcribed and analyzed, using thematic analysis (Creswell, 2014) to determine the main themes and categories.

RESULTS AND FINDINGS

Learners' Writing Performance

The first question concerns whether using graphic organizers during pre-writing asynchronous online discussions improves students' argumentative essay writing compared to threaded online discussion platforms. Descriptive statistics of students' overall scores and sub-scores between the two conditions in the pre- & post-test are shown in Table 1.

Table 1. Group means and standard deviations of the overall score and sub-scores in pre- & post-test

		Pre-test		Post-test	
Components	Group	Mean	SD	Mean	SD
Overall	EG	6.25	1.938	8.36	1.873
	CG	6.11	2.015	6.65	1.713
Argument effect	EG	1.61	0.652	2.29	0.868
	CG	1.60	0.564	1.47	0.539
Organization	EG	1.56	0.601	2.80	0.724
	CG	1.56	0.660	1.89	0.658
Language	EG	3.05	1.017	3.29	0.868
	CG	2.95	1.026	3.29	0.916

Note. EG = experimental group; CG = comparison group; SD = standard deviation.

Baseline test results showed that students' performance in overall scores and the three sub-score had no significant difference before the intervention (overall, $p = .542$; argument effect, $p = .656$; organization, $p = .731$; language in general use, $p = .825$). However, the experimental group was superior to the control group in the overall score and argument effect after six weeks of intervention, as shown in the descriptive statistics in Table 1.

Table 2: ANCOVA analysis of participants post-test writing performance

	SS	*Df*	*MS*	*F*	*sig*	*η2*
Contrast	40.840	1	40.840	44.053	.00	.290
Error	100.123	108	.929			

One-way ANCOVA analysis was conducted to determine whether the use of graphic organizers in Tencent Docs had a statistically significant effect on the enhancement of argumentative writing scores, as compared with the other discussion tool of WeChat. The preliminary tests were conducted, and no violation of assumptions of normality and linearity was shown. Besides, there were no significant difference between the groups, since participants' writing performance in the test of assumption of homogeneity of regression slopes (p= .651). Levene's test of equality showed that the data were homogeneous in variances (p= .528). The statistical analysis shows a significant difference in post-test scores between the two groups (F=44.053, p< .001, $\eta 2$ = .290) (see Table 2).

The results show that learners using graphic organizers in the collaborative pre-writing asynchronous discussion make significant improvement in writing performance, as compared with those using WeChat.

The Number of Reflective Ideas

The second question concerns about whether using graphic organizers in asynchronous online discussions during pre-writing elicit more reflective comments compared to threaded online discussion platforms

Table 3: Independence-sample T Test analysis of participants' online discussion features

	F	*Sig.*	*T*	*df*	*Sig.*
Reflective Ideas	2.923	.098	4.783	30	<.001
Off-topic	4.432	.044	-5.190	30	<.001
Inappropriate items	.731	.399	1.126	30	.269
Restating	.099	.755	2.365	30	.025

An Independent *T*-test was conducted to compare online discussion's effects using graphic organizers and WeChat on students' discussion. The results showed a significant improvement in the number of reflective ideas (p < .001) and significant decrease in off-topic contribution (p < 0.001). There was no significant effect on relevant but mislabeled contributions (p = .399) and restating (p= .755).

The results show that learners using graphic organizers in the collaborative pre-writing asynchronous discussion make significantly larger number of reflective ideas than those using WeChat. The results suggested that online discussions using graphic organizers made students more concentrated, and more likely to challenge and negotiate.

DISCUSSION

The results provide evidence on the similarity and difference in the learning affordances which graphic organizers and threaded discussion offer. From sociocultural perspectives, both mediums established an environment for interaction, where learners explored each other's ideational and linguistic resources, and received scaffolding in content and language. Learners had languaging by conducting a graphic organizer or text-chatting in WeChat. Ideas and

linguistic items were co-constructed through active interaction, which facilitates the self-regulated writing process (Swain, 2006). These findings lend support to the research of Liao (2018).

Despite the shared benefits and features offered by the two mediums, the two mediums resulted in significant difference in essay scores, and number of reflective ideas. The difference is caused by interaction patterns and distinct layout of graphic organizers and WeChat.

The Improved Argumentative Writing Performance

The superiority of graphic organizers to WeChat in the effects to facilitate argumentative writing performance may be attributed to different interaction patterns generated by the two collaborative pre-writing asynchronous discussion tools, which is revealed by the significantly larger number of reflective ideas elicited in graphic organizers than those in WeChat. Reflective ideas mean that learners respond to other's ideas by challenging, justifying, evaluating, and considering alternatives (Neumann & McDonough, 2015).

A large number of reflective ideas indicates that learners had critical discussion about the controversial issue, which involved challenging, justification, evaluation. Such discussion may lead to the proposition and verification of a refined viewpoint, a stage of knowledge co-construction (Gunawardena et al., 1997). In this research, graphic organizers drive interaction to fall into higher phases of meaning co-construction. The distinction in interaction pattern may result in a difference in the opportunity for scaffolding and languaging between graphic organizers and threaded discussion.

Scaffolding is referred to as peers' assistance, which can lead to individual's better performance (Vygotsky, 1986). Participants can refine their opinions, and criticise opposing ideas, when exposed to reflective ideas which involves challenging, criticism and evaluation. Conversely, it is impossible that off-topic and restating contribution can be regarded as the useful assistance, which can help others to make improvement in content and linguistic forms. Consequently, reflective ideas make participants more aware of the existence of alternative perspectives, as well as the weakness of their own opinions and the opposing viewpoints. Exposure to reflective ideas contributed to the production of solid evidence, as well as the generation of counterarguments and rebuttals.

Languaging, also termed as speech, means that learners use language as a tool for learning (Swain, 2010). Languaging takes effects in learning in two ways: social speech and individual speech (Swain et al., 2011). Social speech occurs when peers work collaboratively in the collaborative pre-writing asynchronous discussion, for co-construction of arguments, counterarguments and rebuttals, which requires meaning negotiation, idea refinement, challenging, refutation and information synthesis. In this regard, participants in the experimental group had more opportunity of languaging, with a larger number of reflective ideas in the discussion through graphic organizers. Social speech can be transferred to private speech, with which learners self-regulate decision-making in individual essay writing (Swain et al., 2011).

It is found that participants in the experimental group produced arguments with solid evidence and a larger number of counterarguments and rebuttals, as demonstrated by a significantly higher sub-score of argument effectiveness. The findings are consistent with the research on the "Argue with Me" method (Iordanou, 2022; Iordanou et al., 2019; Kuhn et al., 2008, 2013), which demonstrated the positive effect of social interaction on the advancement of argumentation skills, and suggested that the argumentation skills gained in the argumentative dialogue were transferred to the skill development in the written argumentative discourse.

A Greater Number of Reflective Ideas

The ineffectiveness of WeChat, may be attributed to the inherited features and affordances of the threaded discussion board, which inevitably poses challenges to participants when participating in asynchronous online discussion (Aloni & Harrington, 2018). When examining learners' discussion content in WeChat, it was frequently found that two associated postings were separated by others' contributions. Such separation between relevant ideas would pose a barrier for further meaning negotiation. Such finding was consistent with the research of Suthers et al. (2008), which argued that it was hard to establish a learning community in the threaded asynchronous discussion.

Moreover, the separation of relevant ideas made it hard for participants to have a review of the discussion content globally when participants failed to catch the discussion flow when they returned to the asynchronous discussion board. Consequently, participants tended to respond to easily accessible or unread postings. They failed to have an overview of the whole discussion content. Such findings support the claims that finding out the relations between the chronologically arranged ideas and catching the discussion flow requires great cognitive effort (Jyothi et al., 2012a). Failing to achieve idea synthesis and evaluation was termed as a lack of convergence (Suthers, 2001) in the online discussion.

By contrast, the advantage of graphic organizer in discussion quality was attributed to the fact that discussion content was organized by clustering relevant information around. Intervals between access would not pose a barrier to catching the discussion flow, even though the discussion has lasted for several days, with several new ideas emerging each day. The convenience of reviewing discussion contents globally can acquaint individuals with the issues under exploration and avoid the problem of incoherence. Besides, understanding the ideas as a whole encourages the simultaneous analysis of many messages and makes it easy to summarize and synthesize, which is an act of convergence in online discussion. The ease of following discussion development enabled participants to respond to a greater number of views critically, contribute more alternative views and exert higher-order thinking process (Kwon et al., 2018).

Learners' Acceptance

The third research question concerns about learners' acceptance of using graphic organizers in asynchronous online discussions for pre-writing. Based on Theory of Acceptance and Use of Technology (UTAUT), three categories except social influence were identified: performance expectancy, effort expectancy, and facilitating conditions, suggesting students' behavior intention to graphic organizers (Venkatesh et al., 2003). In addition, the quantitative findings regarding learners' writing performance and the number of reflective ideas were triangulated with the qualitative analysis and interpretations of the interview.

The first category is performance expectancy, which revealed the extent to which the participants believe that the use of graphic organizers in collaborative pre-writing asynchronous discussion will positively impact the writing performance (Venkatesh et al., 2003). Four themes were identified. The theme of "scaffolding for discussion" and "sufficient instructor's support" accounted for higher level of engagement in online discussion. The theme of "improvement in content" and "improvement in organisation" accounted for the improved argumentative writing performance.

The theme of "scaffolding for discussion" was revealed in the student's (S1) comments:
S1: I have little experience discussing a subject-related topic, primarily through the internet. I have no idea what I could do. The items and example questions guided me on how to evaluate peers' comments.

The theme of "sufficient instructor's support" was illustrated in the student's (S7) comments:

S7: Discussing on the internet seemed scary. I do not know the peer's response if I could find fault in his comments. Thanks to the instructors' encouragement and the widespread technology environment, I think almost all of us feel more comfortable commenting on our peers' views.

The theme of "improvement in content" was illustrated in the student's (S2) comments:

S2: The discussion opened my mind. At first, I came up with limited claims and supporting data. More and more claims and supporting data emerged from the discussion, and I had more ideas for my writing. I found different verbal for the same idea when reviewing the posts. The confusion with expressions made me pay attention to formations in reading materials.

The theme of "improvement in organization" was illustrated in the student's (S6) comments:

S6: The structure of the graphic organizer made me clear that raising opposing ideas was an important part in an argumentative essay. The radiating boxes made me aware that I should integrate ideas or refute ideas to reach a reasonable conclusion.

In sum, learners had higher level of engagement, due to instructors' guidance and the layout of graphic organizers. On the one hand, the instructor provided assistance and support, by providing the discussion guidance and pre-writing worksheet. Learners were guided to critically respond to peers' ideas and keep active in the collaborative pre-writing asynchronous discussion. On the other hand, graphic organizers helped facilitate asynchronous online discussion and represent the structure of an argumentation.

The second category of effort expectancy revealed the extent to which the participants believe that it is easy to use graphic organizers in collaborative pre-writing asynchronous discussion (Venkatesh et al., 2003). One theme was identified to indicate whether learners found it easy and convenient to use before writing an argumentative essay.

The theme of "ease of learning" was revealed in the student's (S3) comments:

S3: Generating graphic organizers on Tencent Docs is not a very hard work. It is easy to follow the steps. It is easy to know peers' opinions about a certain topic. I typed in my opinions around theirs. I get used to text-chatting.

The third category of facilitating conditions revealed the extent to which the participants believe he is supported using graphic organizers in collaborative pre-writing asynchronous discussion (Venkatesh et al., 2003). One theme was identified to indicate whether learners thought that they were sufficiently supported.

The theme of "the instructor's feedback" was revealed in the student's (S7, and S12) comments:

S7: I was happy that the instructor gave useful tips for the graphic organisers which my teammates and I generated. In that case, I would know how to do better next time.

S12: The instructor gave a score for the graphic organiser which we made. I felt motivated to made a better one for the next essay.

In sum, the learners revealed reasons why they accepted graphic organizers to do collaborative pre-writing asynchronous discussion. They thought the graphic organizer was efficient for collaborative pre-writing and asynchronous discussion. Using graphic organizers was helpful to write an argumentative essay. The collaborative construction of graphic organizers on Tencent Docs was not very hard. It was easy to follow the steps to contribute ideas in graphic organizers. Besides, they felt that they were supported by the instructor when using graphic organizers before argumentative essay writing.

CONCLUSION AND RECOMMENDATION

The study aims to examine the effects of graphic organizers in an asynchronous online discussion on students' argumentative writing performance, compared with the effects of WeChat, a form of threaded online discussion. The primary findings were summarized: (1) Compared to threaded online discussion platforms, collaborative pre-writing asynchronous discussion using the graphic organizer significantly improved argumentative writing score. (2) There was a significantly larger number of reflective ideas when students had online discussions using graphic organizers. (3) The experimental group responded positively to collaborative pre-writing asynchronous discussion using graphic organizers.

The effectiveness of using graphic organizers for collaborative pre-writing discussion was attributed to more opportunities for idea negotiation and reflection, as shown by a larger number of reflective ideas but fewer off-topic messages in the experimental group. Students' interaction on content and organization allowed for collective scaffolding and social speech, leading to the improvement in idea organization and argumentation development.

The findings of this study are expected to provide valuable insights into the potential benefits of incorporating graphic organizers into online discussion platforms for academic or professional purposes. As the present study results implied, instructors could use graphic organizers to implement the pre-writing discussions as an alternative to threaded online discussions. This pre-writing strategy addresses the content issue, the organization and the development of the argumentation. It provides students with scaffolding for extending ideas, trying out linguistic output, and understanding the text structure for an argumentative essay.

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APPENDIX

Appendix A:

Writing Rubrics, adapted from Qin (2007)

	Arguments	Organisation	Language in general use
Excellent	Clear point of view; good and sufficient claims; well-elaborated and convincing data; reasonable counter claims; well-elaborated and convincing counter data	Well-organised	No mechanical errors
Good	A reasonably clear point of view; plausible claims; data which can explain and elaborate to some extent, with one piece of irrelevant information, a counter claim, ineffective counter data	Generally well-organised and flows well	Less than 5 mechanical errors, without impeding overall communication
Acceptable	A point of view; one or two good claims, not in a fully coherent way, with limited plausibility and some inconsistencies	The organisation is not well-developed, and ideas could be better sequenced;	A noticeable number of grammar/mechanical errors
Minimally Acceptable	A point of view; one good claim; unrelated or inconsistent or incoherent data;	The organisation is weak and ideas are not sequenced well	Impeding communication
Not Acceptable		Numerous grammar and mechanical errors	Impeding communication

Appendix B

1. Do you like have a discussion by graphic organiser/WeChat? Would you list the benefits and shortcomings?
2. In what way does discussion by graphic organiser/WeChat promote argumentative writing?
3. How to improve the efficiency to have discussion by graphic organiser/WeChat?
4. In what way does the worksheet provide useful guidance for the online discussion?
5. In the process of discussion, can you make judgement on peers' comment?

Appendix C

Worksheet for guidance in students online discussion, adapted from Dong (2017)

	Standard	Explanation	Guidance
1	Clarity	Easy for understanding, without confusion	Give an example, or other illustrating ways.
2	Accuracy	Without any error	How to verfy?
3	Precision	Specific	Be more specific, detailed, exact
4	Relevance	Be related to the issue	Does it help for the issue
5	Depth	Containing multiple interrelationships, with thoroughness.	The difficulties, the complexity of the issue
6	Breadth	Containing mutiple perspectives	Consider it in another way
7	Logic	Parts make sense together, with contradiction,	Does what you say follow the evidence
8	significance	Having importance	Is this the most important issue to deal with? Which of this supporting data more important?