

Language Socialization through Collaborative Reasoning in Peer Group Discussions

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Abstract: Language socialization has been widely used to examine how learners acquire communicative practices through participation in interaction. However, relatively little research has explored how Chinese EFL learners develop argumentative reasoning in peer discussion from a language socialization perspective. Drawing on Freeman's argument model (2011), this study employs discourse analysis to investigate the development of reasoning structures in collaborative discussions, with a focus on self-evidence, rebuttal, and counter-rebuttal. The results reveal several developmental patterns. First, students gradually developed preemptive rebuttal, indicating an emerging awareness of potential counterarguments. Second, participants increasingly showed a preference for rebutting the premise or conclusion itself rather than the reasoning process. Third, while fallacious rebuttals appeared during the developing stage, they disappeared in the later stage as collaborative reasoning became more stable. Finally, re-counter-rebuttals emerged in the mature stage, reflecting more sustained argumentative interaction. These findings highlight the dynamic development of argumentative structures in collaborative reasoning and contribute to a better understanding of how peer discussion facilitates the socialization of reasoning practices among EFL learners.

Keywords: Language socialization, collaborative reasoning, discourse analysis, peer discussion.

1. Introduction

Collaborative Reasoning (CR) is based on a critique of traditional classroom teaching and an awareness of the needs of the times. The traditional classroom model of "IRF" is mainly aimed at checking whether students have mastered the text, greatly restricting the way students express and think. (Clark et al., 2003) [5].

Therefore, CR is gradually gaining popularity for use in the classroom. In CR, students take positions on a "big question" raised by a story and then present reasons and evidence for and against these positions. Students collaboratively construct arguments in complex webs of reasons and supporting evidence. (Chinn & Anderson, 1998) [3].

Previous studies can be broadly categorised into three groups according to their focus. The first category focuses on the study of argument stratagems. Anderson et al. (2001) [1] devised several tests of whether the pattern of occurrence of argument stratagems conformed to the snowball hypothesis and concluded that the hypothesis was strongly supported. The second category studies peer influence. The case study led by Kumpulainen & Kaartinen (2003) [13] suggests that students' communication and problem-solving strategies, as well as their command of mathematical language are likely to have a mediating role in shaping the nature of collaborative activity in peer dyads. The third type is a comparative study of collaborative reasoning by changing the conditions of the study object. Dong et al. (2008) [8] selected Chinese and Korean students as study objects and compared the results with American students'. Kim et al. (2007) [12] extended to an online environment. Ding et al. (2016) [6] set up an experimental and control group and found that students in the experimental group used a significantly higher amount of evidence than the control group, but were unable to find evidence of a significant difference between the two groups in terms of counter-arguments.

However, previous studies have basically focused on children's mother tongue learning, and little research has been

done on second language learning, especially for Chinese learners of English. And domestic studies are still based on questionnaires reflective writing and focus on the role of teachers in collaborative reasoning. Therefore, the author will take the second language learners majoring in English as the target of the study, use the method of discourse analysis, and study how the second language learners' collaborative reasoning ability changes from the perspective of language socialization and how they are influenced by other group members. The aim is to provide a targeted theoretical basis and policy recommendations for efficient and feasible group discussions among English majors in colleges and universities from different perspectives to promote the development of English majors and students.

2. Literature Review

2.1. Collaborative Reasoning

Collaborative Reasoning is a discussion approach intended to stimulate critical reading and thinking and to be personally engaging (Anderson et al., 2001). [1] In the process of collaborative reasoning, students take positions on a "big question" raised by a story and then present reasons and evidence for and against these positions. Students collaboratively construct arguments in complex webs of reasons and supporting evidence (Chinn & Anderson, 1998). [3] During CR, children use a variety of argument stratagems (Anderson et al., 2001). [1] An argument stratagem is a recurrent pattern of talk that embodies a reasoning strategy or serves a social function in a discussion.

Previous studies have shown that CR discussions can significantly enhance the quality of students' reasoning and engagement. For example, Anderson et al. (2001) [1] found that students demonstrate relatively high levels of reasoning during CR discussions, while Chinn et al. (2001) [4] reported that students' levels of thinking were higher in CR discussions than in conventional classroom discussions. In addition, CR discussions encourage more active participation, as students

are allowed to speak freely without teacher nomination, leading to increased student talk and improved discussion quality (Jadallah et al., 2011) [11]. A number of studies have further examined the role of collaborative reasoning in different educational contexts. For instance, Kumpulainen and Kaartinen (2003) [13] explored how social interaction and problem-solving strategies supported collaborative reasoning in mathematical problem solving. Dong (2009) [7] found that Chinese and Korean students adapted quickly to CR discussions and demonstrated strong engagement and self-regulation in managing discussions. Similarly, Zhang & Stahl (2010) [22] reported that CR discussions significantly benefited English learners' language and literacy development in classroom settings. These findings suggest that collaborative reasoning provides a productive environment for the development of argumentative thinking and interactional competence.

2.2. Language Socialization

Language socialization, first proposed by Schieffelin and Ochs (1986) [17], refers to the process through which individuals acquire linguistic practices and social knowledge through participation in communicative activities. This framework emphasizes the inseparable relationship between language learning and social participation.

In order to conceptualize how trajectories of socialization sometimes diverge, there are several patterns (Wortham, 2005) [20]. "Social-historical" patterns develop over decades and centuries. "Ontogenetic" patterns need data on an individual across months and years. "Local" patterns can develop over days, months, and years and one must study models and habits that develop in a site over days and months. Empirical "microgenetic" patterns need detailed data on how particular events develop. In this paper, the author will study language socialization from the perspective of microgenetic patterns.

Ochs & Schieffelin (2011) [14] pointed out that the concept of language socialization has a double connotation: one is socialization through the use of language, and the other is socialization to use language. Wei & Zhang (2013) [19] pointed out that socialization research focused on the interactive relationship between language, culture and society, and mainly examined how socialization was achieved through language use in everyday social interactions. Specifically, language socialization refers to the process by which an individual is continuously socialised through the learning of language forms and accepts the corresponding values, behaviours and social customs (Yin & Kang, 2009) [22].

In recent years, there has been an increasing number of studies on language socialization in second language acquisition. Dong (2009) [7] explains the implications of this paradigm for second language acquisition research and suggests that the domestic academic community should pay attention to the determining role of society on cognition in the process of second language learning. Yin (2017) [21], Shi (2017) [15], Shi & Feng (2018) [16] studied the cultural adaptation, pragmatic competence development and intercultural communicative competence cultivation of second language learners, especially international students coming to China. Su and Yang (2022) [18] further conducted a study on the socialization process of academic literacy among Chinese English majors.

3. Methods

3.1. Research Question

To address these research gaps, this study uses qualitative and quantitative methods to address the following three questions:

- (1) How do English majors engage in collaborative reasoning during peer discussion?
- (2) Are there any changes in English majors' collaborative reasoning from the first discussion to the last discussion? If any, then Q3.
- (3) How does the collaborative reasoning process change from the perspective of micro-genetic patterns?

3.2. Data Collection

The original recording materials add up to more than 200 hours, and originate from real motivated situation. The talk recordings and transcribed data are about 150,000 words, forming 481 pages of documents, building a resource bank for further analysis and a wide selection of interactions. Total 5 group members have all agreed and signed up to take part in the research as data providers. The data is reliable in origins, authentic in recording ways, and valid in research ethics. Data was transcribed by group members with careful proofreading in the software named "Folker". It provides a self-partitioning time axis, which can be accurate to the 0.01 second. This makes it possible to make a preliminary judgments of turns, which helps to divide the start and end times of utterances. It is a good auxiliary data of original materials to improve the research efficiency, authenticity and accuracy. After unifying the format, the data consists of the raw recording with a 481 pages document for reference.

3.3. Data Analysis

This study adopts discourse analysis to examine the language socialization process in collaborative reasoning. To analyze the structure of arguments in the discussions, the study draws on Freeman's (2011) [9] argument model.

Freeman's model identifies five main components of argumentation: premise, conclusion, modal qualifier, rebuttal, and counter-rebuttal. Premise and conclusion constitute the core elements of an argument. A premise provides the reason supporting a conclusion, while a conclusion represents the claim advanced by the speaker. A modal qualifier indicates the degree of certainty with which the premise supports the conclusion (e.g., maybe, perhaps, must). A rebuttal refers to a challenge raised by another participant against the initial argument, whereas a counter-rebuttal represents a response defending the original claim against such challenges.

Based on this framework, the analysis focuses on three types of argumentative structures observed in the discussions: self-evident arguments, arguments with rebuttal, and arguments with counter-rebuttal. These structures were identified and coded in the transcripts in order to examine the development of collaborative reasoning patterns across discussions.

4. Results and Discussion

4.1. The Structures of English Majors' Collaborative Reasoning

To address the first research question, the argument structures employed by English majors during collaborative reasoning were first identified. The analysis shows that one of

the most common structures is the self-evident argument, in which participants present one or more premises leading directly to a conclusion.

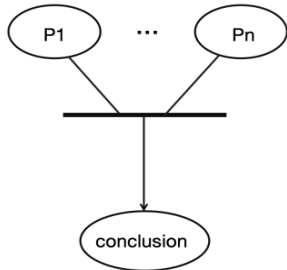
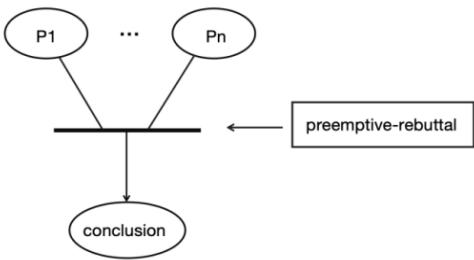
4.1.1. The Structure of Self-Evident Arguments

Self-evident arguments represent the most basic reasoning

structure observed in the collaborative discussions. As shown in Table 1, two main schemas were identified:

- (1) arguments consisting of premise(s) and conclusion, and
- (2) arguments that include a preemptive rebuttal before the conclusion.

Table 1. The Schema of Self-evident Argument

Structures	Schema
Premise(s)+(modal qualifier)+conclusion	
Premise(s)+(modal qualifier)+preemptive rebuttal+conclusion	

Example 1 illustrates this basic structure. In this example, S2 provides three premises to support the conclusion that Alice's action of following the rabbit into the hole is not a good example for children to follow. The premises focus on different aspects, including potential trouble for Alice's family, the possible dangers in the hole, and the moral influence of the story on children. Through these multiple premises, the speaker constructs a relatively complete argument leading to the final conclusion. The second schema involves the insertion of a preemptive rebuttal before the conclusion. In such cases, the speaker anticipates potential objections from other participants and addresses them within the argument.

Example 1: Premise(s)+(modal qualifier)+conclusion

S2: Firstly, it will cause trouble for Alice's family members. Once a little girl like Alice disappears, elders will become anxious and try to find her.

Secondly, Alice knows nothing about the hole and there may be many dangers there.

Thirdly, the story is a fiction for children, and we should be careful about the values conveyed to them.

Therefore, Alice's action of following the rabbit into the hole is not a good example for children to follow.

Example 2 provides an example of this pattern. In this discussion, S3 argues that it is reasonable for Miss Bingley to pursue Mr. Darcy. Before presenting the final conclusion, the speaker acknowledges a possible criticism—namely that speaking negatively about Elizabeth may appear morally questionable. By addressing this potential objection in advance, the speaker attempts to strengthen the persuasiveness of the argument and reduce possible challenges from other participants.

These examples illustrate that even in relatively simple self-evident arguments, participants may strategically organize premises and potential counterpoints to support their claims in collaborative discussions.

Example 2: Premise(s)+(modal qualifier)+preemptive rebuttal+conclusion

S3: I think that Miss Bingley may feel eh little Mr darcy already had some admiration in Elizabeth.

If(.) Miss Bingley didn't act immediately. It very likely that Mr Darcy and Miss Elizabeth will be in the relationship. So now that eh Miss bingley she she's really, really attracted by Mr Darcy.

So I think it is reasonable for her to pursue Mr darcy. In in that kind of way, even though it is a bit a little bit dirty, you know, to devalue the Elizabeth, to say some bad words about Elizabeth to prevent Elizabeth are getting close to Mr Darcy, but I think it is also an effective way to, you know defeat.

The opponents defeat the rivals and win the favor from Mr Darcy. I think it is reasonable for yeah for Miss Bingley to do so. Act so vigorously, yeah.

4.1.2. The Structure of Reasoning with Others' Rebuttal

In addition to self-evident arguments, participants frequently engaged in reasoning that involved rebuttals from other group members. In such cases, an argument initiated by one participant was challenged by another, resulting in an interactive reasoning process. Based on the analysis of the corpus, three main types of rebuttal were identified: rebuttal on the process of reasoning, rebuttal on the premise or conclusion itself, and fallacious rebuttal. Table 2 outlines the schematic structures of these three distinct types of rebuttal in collaborative reasoning.

Table 2. The Schema of Reasoning with Others' Rebuttal

Structures	Schema
Rebuttal on reasoning process	
Rebuttal on premise or conclusion	
Fallacious rebuttal	

Example 3 illustrates a rebuttal targeting the reasoning process. In this interaction, S5 argues that the refusal to attend Gatsby's funeral demonstrates indifference and a lack of humanity. However, S2 challenges the reasoning process rather than the conclusion itself. By introducing the premise that Gatsby was widely believed to be a murderer, S2 suggests that the participants' behavior could be interpreted as socially understandable. In this way, the rebuttal does not directly deny the original claim but instead questions the underlying reasoning that leads to the conclusion.

Apart from rebuttals targeting the reasoning process, participants also occasionally challenged the premises or conclusions of others' arguments directly. In such cases, the rebuttal focused on questioning the validity or relevance of the premise itself. By rejecting a key premise, the challenger effectively undermined the entire argumentative structure. This type of rebuttal occurred less frequently but still played an important role in shaping the direction of the discussion. Example 3 illustrates a rebuttal targeting the reasoning process.

Example 3: Rebuttal on the process of reasoning

S5: And Mr. Nick has sincerely invited them, but they still refused. And there is nothing very important umm. It really shows their indifference. I think that the funeral of a stranger should also receive respect. It has nothing to do with others, nothing umm, only about your own humanity.

S2: But maybe to consider the situation. And that's how

Gatsby was considered as a murderer who killed umm Tom's lover. And it is completely acceptable for people not attending others funeral.

Example 4 demonstrates a case of fallacious rebuttal. In this example, S3 argues that Miss Bingley must take action to attract Mr. Darcy's attention, otherwise the situation will remain unchanged. S1 attempts to challenge this reasoning by suggesting that the situation "can change." However, the rebuttal is not supported by any concrete evidence or further reasoning. As a result, the challenge fails to effectively undermine the original argument. Following Bennett's (2020) [2] classification, this response can be interpreted as a form of hasty generalization, where a conclusion is proposed without sufficient supporting evidence.

Example 4: Fallacious rebuttal

S3: Ah, okay. I want to point out that the present condition is that Mr darcy already expressed some admiration to Elizabeth, so it's very likely for him to keep pursuing Elizabeth. If if eh Miss Bingley still didn't do nothing and stay silent, just as you mentioned, to be implicit. Do you think that this condition will be changed? If there's nothing changed.

S1: Um, I think it can. It also have the possibility to change this kind of eh condition.

Overall, the presence of different types of rebuttal demonstrates that collaborative reasoning discussions involve a dynamic process of argumentation. Participants not only propose claims but also actively evaluate and challenge the

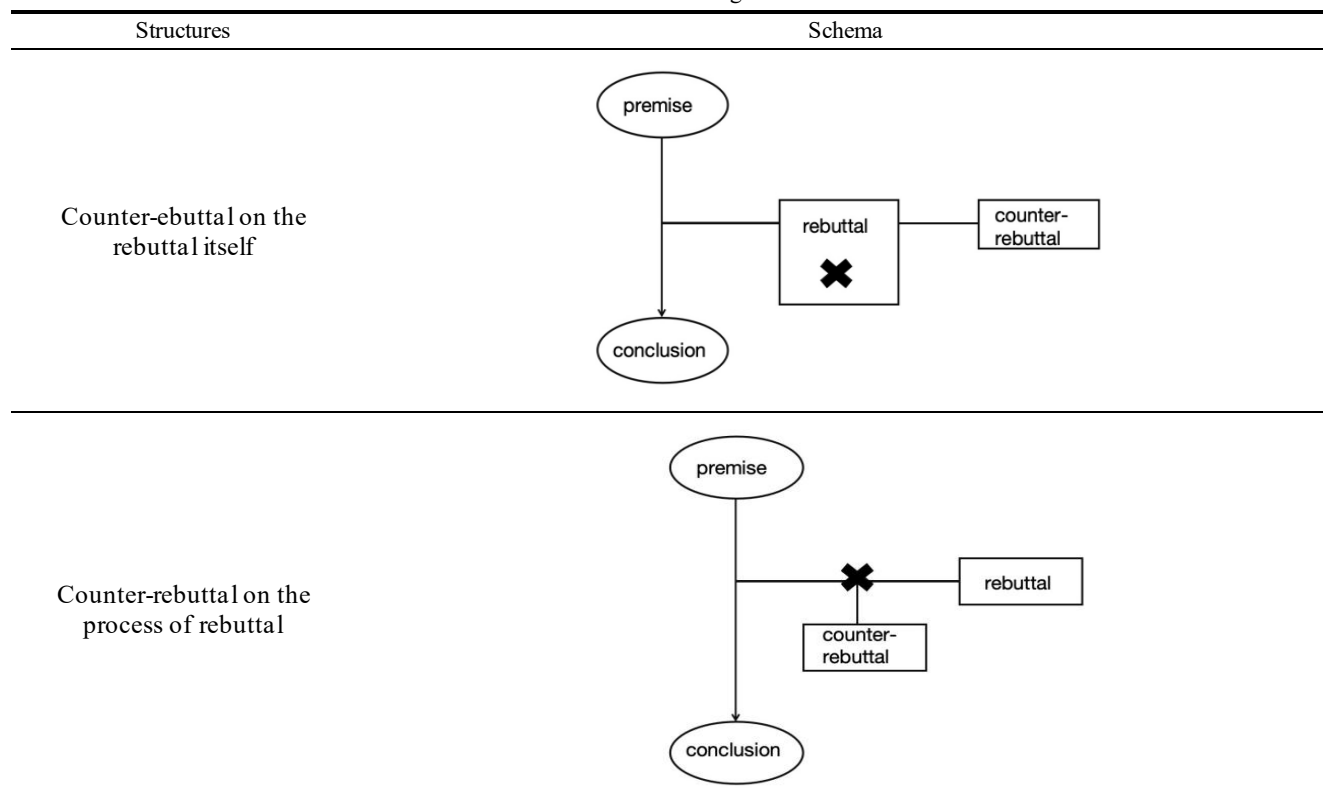
reasoning of their peers. These rebuttal strategies contribute to the interactive nature of the discussion and provide important evidence for the development of argumentative competence within the group.

4.1.3. The Structures of Reasoning with Counter-Rebuttal

In addition to arguments with rebuttals, some discussions

further developed into more complex argumentative structures involving counter-rebuttals. In these cases, the original speaker responded to the challenger's rebuttal and attempted to defend the initial claim. According to Freeman's argument model (2011), counter-rebuttals may target either the rebuttal itself or the reasoning process underlying the rebuttal. Table 3 presents the main patterns observed in the corpus.

Table 3. The Schema of Reasoning with Counter-rebuttal



Example 5: Counter-rebuttal on the rebuttal itself

S5: We don't think it is a malicious mocking. And Alice refused to satisfy his vanity. The reason Alice laughed at them was because these actions were too absurd, and the original intention. Alice just played the juror a little bit. This juror paid too much attention to the insignificant details and kept meaningless notes since this behavior indeed stupid. Why can't they be laughed at by a child?

S4: Me too.

S5: I mean that we don't need to consider that this is unreasonable. Because we don't think this as malicious mocking. This juror paid too much attention to insignificant details such as record, so these behaviors are indeed stupid. Why can't it be laughed at?

S3: Oh, yes. I think I got your idea. Okay. I will show you why it is not proper or it shouldn't. So because I think to take away the juror's pencil will leave the juror into danger, and it is totally inhuman, inhuman, is totally not humanistic.

Because we need to know that the king and queen are crazy and stupid. The Queen even decided to kill door mouse just because he interrupted the court with a simple sentence, was only one sentence. So there is no doubt if a juror misses his duty because he didn't have a pen or didn't have a pencil to write with. He's very likely to be executed by the king or queen.

In Example 5, S5 argues that Alice's laughter is justified

because the juror's behavior appears absurd. S3 responds by introducing a counter-rebuttal, arguing that interfering with the juror's work may expose the juror to potential punishment from the king or queen. In this case, S3's response directly addresses S5's rebuttal rather than the original claim. Therefore, this instance represents a counter-rebuttal targeting the rebuttal itself.

Example 6: Counter-rebuttal on the process of rebuttal(S2) and counter-rebuttal on the rebuttal itself (S3)

S3: Oh, sorry, because Nick he, you know take part in the funeral, even if he knew that he might get involved in the in such kind of mess. So I think for other people, they also should take part in the funeral. But they can no know but they knew the truth he knew that Gatsby didn't murder others, but other people, they they didn't know that Gatsby was was designed to appear (yes) as a murderer. Other people they didn't know that.

Example 6 demonstrates a more complex sequence of rebuttal and counter-rebuttal. S2 initially challenges S3's claim by arguing that people avoided the funeral because they were afraid of public opinion. S3 then responds with a counter-rebuttal, pointing out that Nick still attended the funeral despite the potential social risk. In doing so, S3 attempts to undermine the reasoning behind S2's rebuttal. However, S2 subsequently introduces another counter-rebuttal by emphasizing that Nick knew Gatsby was innocent,

whereas others did not. This response highlights a limitation in S3's reasoning. Therefore, the interaction includes both a counter-rebuttal addressing the rebuttal itself and a counter-

rebuttal targeting the reasoning process of the rebuttal. The structure of this interaction is illustrated in Figure 1.

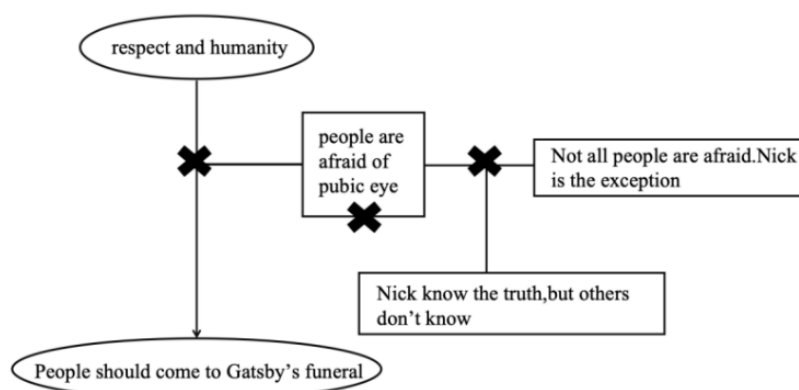


Figure 1. Detailed Schema of Counter-rebuttal on the Process of Rebuttal (S2) and Counter-rebuttal on the Rebuttal Itself (S3)

4.2. Changes in English Majors' Collaborative Reasoning

To address RQ2 concerning the development of English majors' collaborative reasoning during literature discussions, this section examines how participants' argumentative behaviors evolved throughout the discussion process. Specifically, the analysis focuses on the distribution of different reasoning structures across discussion stages and the increasing complexity of argumentative interactions among participants. By examining these patterns, the study aims to reveal how collaborative reasoning gradually developed during the group discussions.

4.2.1. The Appearance of Preemptive Rebuttal

Preemptive rebuttal is a debate strategy in which speakers anticipate potential objections and address them before opponents explicitly raise them. As noted by David Godden (2014) [10], the premise–conclusion link can be strengthened by demonstrating the absence, inapplicability, or unacceptability of potential defeaters.

Before the collaborative reasoning activities began, the teacher introduced the basic procedure of argumentation, encouraging students to “establish a position and support it with evidence from the passage, personal experience, or other readings.” During the early stage of the discussion (L1–L3), students primarily adopted the self-evident argument structure of premise (s) + (modal qualifier) + conclusion. In these cases, premises were mainly drawn from textual evidence, reading experience, or everyday knowledge. This structure was relatively straightforward and provided a foundation for subsequent rebuttals.

The first instance of preemptive rebuttal appeared in Example 7.

Example 7

S2: Maybe it's a little bit harsh and cruel, but you have to know that the juror had a role, had a role in the trial. So that the juror even have difficulty in the basic skills like remember names and spelling words, needless to say the professional quality, like reciting the articles of law. So I think maybe the juror may influence the...the results of the trial. And it helps nothing in the trial. So I still think there's nothing wrong with Alice to make fun of it.

In this example, S2 anticipates a possible criticism of her claim—namely that judging the juror in this way might appear “harsh or cruel.” By acknowledging this objection in advance and then shifting the focus to the juror's professional

competence, S2 attempts to weaken the potential criticism and reinforce the conclusion. In this sense, the speaker raises and responds to a possible counterargument before it is explicitly introduced by other participants.

After this initial use in L4, preemptive rebuttal gradually appeared more frequently in subsequent discussions. Different students employed this strategy in various ways. In some cases, speakers anticipated criticism directed at their personal viewpoints and addressed it directly. In other cases, they anticipated the premises that their opponents might introduce and attempted to undermine those premises in advance. For example, one student predicted that others might argue that scientific development improves productivity, and responded that such improvement does not necessarily guarantee human happiness. Another student anticipated that exam success might be attributed to superstition and rejected this reasoning by emphasizing the importance of personal effort.

These examples suggest that students gradually became more capable of anticipating potential counterarguments and responding to them proactively. The increasing use of preemptive rebuttal therefore reflects the development of more sophisticated argumentative strategies during the collaborative reasoning process.

4.2.2. Changes in the Structure of Argument with Rebuttal

Based on the classification introduced in the previous section, the frequencies of the three types of rebuttal were calculated across the 14 discussions. According to the observable changes in rebuttal distribution, the discussions were divided into three stages: the initial stage (L1–L4), the developing stage (L5–L10), and the mature stage (L11–L14). Table 4 presents the distribution of rebuttal types across the three stages.

Table 4. Occurrence Times of Different Type of Rebuttal

Stage	Rebuttal on the premise or the conclusion itself	Rebuttal on the process of reasoning	Fallacious rebuttal
Initial stage	6	5	0
Developing stage	13	4	4
Mature stage	5	2	0

In the initial stage, the frequencies of rebuttal on the

premise or conclusion and rebuttal on the reasoning process were relatively similar, suggesting that students had not yet developed a clear preference for a particular rebuttal strategy. Notably, no fallacious rebuttals were observed during this stage. In the developing stage, rebuttals targeting the premise or conclusion became more frequent, while fallacious rebuttals began to appear. This indicates that although students became more active in challenging others' arguments, their reasoning strategies were not always logically sound. By the mature stage, fallacious rebuttals disappeared, while rebuttals continued to focus mainly on the premise or conclusion. This pattern suggests that students gradually improved their argumentative reasoning and were better able to avoid logically flawed responses during collaborative discussions.

Example 8

S3: Ah, okay. I want to point out that the present condition is that Mr darcy already expressed some admiration to Elizabeth, so it's very likely for him to keep pursuing Elizabeth. If if eh Miss Bingley still didn't do nothing and stay silent, just as you mentioned, to be implicit. Do you think that this condition will be changed? If there's nothing changed.

S1: Um, I think it can. It also have the possibility to change this kind of eh condition.

S5: Eh we think Mr Darcy didn't explicitly refuse eh Miss Bingley's pursuit now, so she does not need to have any burden and it says that her pursuit has not disturbed others at present.

S3: Yes.

Example 8 illustrates a case of fallacious rebuttal identified in the developing stage. According to Bo (2020), S1's response can be classified as hasty generalization, where a general conclusion is drawn without sufficient supporting evidence. The response was not taken up by other participants, and the discussion soon shifted to a new round of reasoning. This example reflects how fallacious rebuttals occasionally emerged during the transitional stage of students' collaborative reasoning development.

Overall, the results suggest a developmental trajectory in students' use of rebuttal strategies. While early discussions showed no clear strategic preference, later discussions demonstrated increased argumentative engagement together

with a gradual reduction in logically flawed rebuttals.

4.2.3. The Emergence of Re-Counter-Rebuttal

A notable change can also be observed in the development of re-counter-rebuttal structures during the discussions. The three stages identified in the previous section likewise characterize the socialization process of this argumentative pattern.

In the initial stage, re-counter-rebuttals were almost absent, appearing only once in L4. This indicates that early discussions were relatively simple in structure, with limited interaction beyond the initial rebuttal.

During the developing stage, counter-rebuttals appeared in almost every discussion. However, these responses rarely developed into extended argumentative exchanges. After receiving a counter-rebuttal, the following speaker often initiated a new line of reasoning rather than continuing the rebuttal sequence. Nevertheless, compared with the initial stage, the frequency of reasoning sequences containing counter-rebuttals increased considerably (see Figure 2). In some discussions, the first instances of re-counter-rebuttal also emerged, marking a shift toward more interactive argumentative engagement (see Figure 3).

In the mature stage, students demonstrated greater proficiency in employing these argumentative structures. Longer rebuttal sequences began to appear, including cases in which multiple rebuttals followed a counter-rebuttal (see Figure 4). This development suggests that participants became increasingly capable of sustaining extended argumentative exchanges during collaborative reasoning.

Overall, the emergence and increasing complexity of re-counter-rebuttal sequences indicate a gradual development of argumentative interaction within the discussion groups. As students became more familiar with the discussion format and with each other's reasoning styles, they were better able to identify weaknesses in opposing arguments and respond with more sustained rebuttal chains. The increasing presence of counter-rebuttal and re-counter-rebuttal structures also brings the discussion pattern closer to the complete argumentative structure proposed by Freeman's argument model, reflecting the development of collaborative reasoning and critical thinking among the participants.

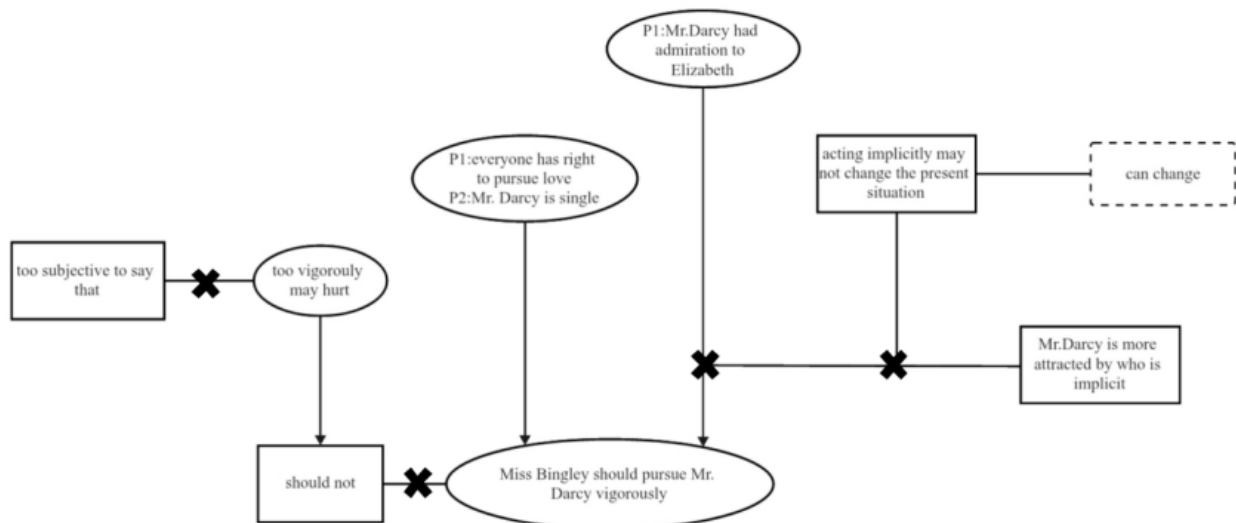


Figure 2. Two rounds reasoning with one counter-rebuttal per round

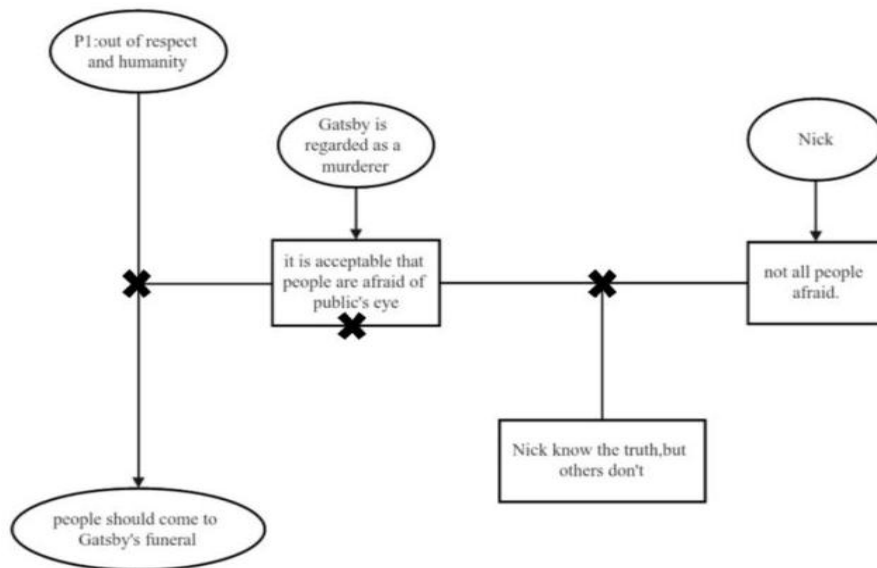


Figure 3. Reasoning with re-counter-rebuttal

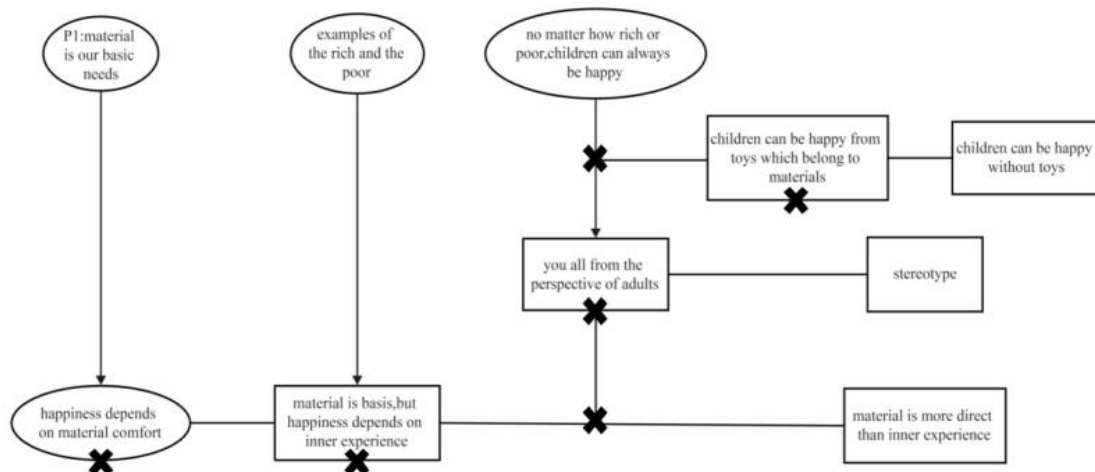


Figure 4. Reasoning with four re-counter-rebuttal

5. Conclusion

The present study examined the collaborative reasoning structures used by students during group discussions, focusing on self-evident arguments, rebuttals, and counter-rebuttals. The analysis shows that as the discussions progressed, students gradually began to employ more complex argumentative strategies. One notable development was the emergence of preemptive rebuttal, in which speakers anticipated possible objections and addressed them in advance. This strategy appeared to be influenced by interaction with peers and the evolving dynamics of group discussion. In terms of rebuttal strategies, students increasingly tended to challenge either the premises or the conclusions of their opponents' arguments. Such patterns may be related not only to individual reasoning abilities but also to the interactional norms gradually formed within the group, resulting in a distinctive rebuttal style in the collaborative reasoning process. In addition, several forms of fallacious rebuttal were observed during the early stages of discussion. However, these fallacies gradually disappeared as the discussion developed. This change may suggest that students became more aware of the limitations of weak reasoning strategies and attempted to avoid argumentative dead ends. Furthermore, students who were initially unable to construct

counter-rebuttals gradually developed the ability to engage in multiple rounds of counter-rebuttal, and in some cases even produced re-counter-rebuttals. Such developments indicate an increasing level of interaction in collaborative reasoning and reflect the gradual improvement of students' argumentative competence.

These findings also provide several implications for classroom teaching. Teachers may adjust instructional design based on the observed reasoning patterns and their development over time, thereby supporting students in developing stronger argumentative skills, particularly in the use of rebuttal and counter-rebuttal. In this context, fallacious rebuttals may serve as a useful entry point for instruction in collaborative reasoning activities. By identifying and classifying common fallacies and analyzing students' reasoning processes, teachers can guide students to recognize logical weaknesses and improve their critical thinking abilities. For students, participation in collaborative reasoning activities offers valuable opportunities to practice logical argumentation and debate. Through interaction with peers, students can reflect on the limitations of their own reasoning and gradually refine their argumentative strategies. At the same time, collaborative reasoning also contributes to students' language socialization, as they learn to respect differing viewpoints, negotiate meanings, and develop a sense

of cooperation within the group.

Despite these contributions, several limitations should be acknowledged. Although the present analysis is based on a particular argumentation model, the interpretation of argumentative structures may still be constrained by the analytical framework adopted in this study. Applying alternative argumentation models could potentially generate more nuanced interpretations of the data. Future research could expand the analytical scope by incorporating additional perspectives or data sources to further enrich the discussion. Exploring the discourse structures of student discussions through discourse-analytic approaches remains a promising and meaningful direction for future research.

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