Mining Sequential Patterns in Classroom Discourse: Insights from Visualization-Supported Primary Instruction

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Abstract: In primary education, effective dialogic strategies employed by teachers play a crucial role in stimulating student engagement in classroom discussions. Despite this, a gap exists in practice due to teachers' reliance on subjective assessment of their questioning strategies, which can impact students' engagement in classroom discourse. This study introduces a classroom dialogue analyser designed for primary school teachers to bridge this gap. The analyser processes classroom videotapes to produce visualization-based reports on dialogue and student engagement over three months. This facilitates teachers' self-reflection and refining dialogue strategies within the 20-student classroom setting. Data mining techniques were utilized to evaluate shifts in teachers' questioning strategies, students' participation in classroom dialogues, and the occurrence of frequent teacher-student interaction sequences. Results indicate an increase in teachers' use of talk moves and student participation in discussion. Furthermore, by combining data on teachers' and students' dialogue engagement, several high-frequency dialogue sequences were identified. Such sequences included instances where students responded to teachers' requests to "say more" and expressed their agreement following teachers' revoicing of their opinions. Within these sequences, consistently employed talk moves facilitate classroom dialogue between teachers and students. Identifying these high-frequent dialogue sequences discovered that teachers' conscious use of talk moves benefits students' engagement in classroom dialogue.

1 INTRODUCTION

Developing problem-solving abilities and logical thinking skills in young students is crucial but challenging within regular primary classrooms. Many early childhood students lack the necessary skills to overcome learning obstacles and maintain focus, relying heavily on their teachers' verbal support to guide their thinking processes (van der Graaf et al., 2019). Research by Nystrand and Gamoran (1991) highlights the significance of heuristic questions and collective discussions in enhancing students' learning performance. Therefore, it becomes crucial for teachers to promote active participation (Mercer & Littleton, 2007), utilizing various types of questions to stimulate thinking (van der Wilt et al., 2022).

Teachers need advanced skills to facilitate interaction and collaboration, enabling meaningful dialogue and deepening discussions (van der Veen et al., 2017). Productive classroom dialogue focuses on core issues and encourages critical thinking about potential solutions (Resnick et al., 2010), guided by thought-provoking questions from teachers.

Nevertheless, developing effective questioning strategies and teacher-student talk patterns can be challenging for teachers (Khong et al., 2019), especially considering the demands of managing tasks in primary classrooms with numerous students and limited time (Lehesvuori et al., 2019). In regular classrooms, teachers may rely on familiar communication strategies without engaging in deep reflection on their practices (Pehmer et al., 2015), leading to negative consequences for students' thinking and working skills and unsatisfactory learning outcomes.

1.1 Promoting Productive Classroom Discourse

Researchers have explored various conversation guides and frameworks to promote productive classroom discourse and facilitate effective talk moves between teachers and students. These

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frameworks include academically productive talk (APT) (Michaels & O'Connor, 2015; Resnick et al., 2010), dialogic teaching (Alexander, 2008), and exploratory talk (Mercer & Littleton, 2007). These approaches share the goal of fostering productive classroom talk to enhance classroom interaction and academic achievement. Previous studies have shown a strong relationship between teacher-student dialogic interaction and students' authorship, communication skills, and academic performance. For instance, Forman et al. (2017) found that teachers' use of discursive moves supported students' scientific argumentation and transformed the teacher's role from mentor to partner. Cheng et al. (2022) discovered that when teachers provided opportunities for students to express their voices, students assumed the role of authors, and their authorship was further enhanced through engaging in rich dialogic discourse. van der Veen et al. (2017) uncovered the significant effect of productive classroom talk and metacommunication on early students' oral communicative competence. Additionally, Amodia-Bidakowska et al. (2023) compared classroom dialogues in different curriculum contexts and revealed that students' elaboration of ideas was associated with improvements in reading, spelling, punctuation, and grammar skills.

Considering the impact of productive classroom talk on students' classroom participation and academic performance, numerous studies have explored practical dialogue strategies to assist teachers in effectively guiding student participation (Chen et al., 2020; Michaels & O'Connor, 2015). Academically productive talk, as a structured conversation approach, aims to equip all classroom participants with the skills to engage in academically productive talk. It emphasizes accountability to the learning community, accepted standards of reasoning, and knowledge. Strategies for APT enable teachers to employ accessible and practical discourse strategies to facilitate open and extended classroom dialogue (Mercer, 2002; Michaels et al., 2007).

However, an urgent problem remains: how can we better support primary ICT teachers in employing more APT and understanding changes in classroom talk? The significance of addressing this issue lies in the high dependence of early childhood primary students on teachers' guidance, as their thinking and working skills are developed through engaging in classroom discourse, ultimately benefiting their long-term academic performance. Previous research has explored strategies such as video-based professional development programs (Hennessy et al., 2018), visualization-supported instruction reflections (Chen & Chan, 2022), and instructional intervention scaffolding supported by analytics technology (Aslan et al., 2019). There is a consensus regarding the need to support productive classroom talk, and empirical evidence shows that professional development programs and visualization tools aimed at improving classroom talk moves have a positive impact on classroom interaction and academic performance (Chen et al., 2020; Pehmer et al., 2015).

1.2 Sequential Pattern Mining of Educational Data

Sequential pattern mining is a method used for temporal analysis and detecting transitions in learning processes, including the passage of time and the order in time (Molenaar & Wise, 2022). The passage of time provides insights into what happened, how long it occurred, and the sequential order of events. The order in time examines consecutive events within a period to understand the learning process (Zhang & Paquette, 2023). While time series analysis is commonly employed to understand learners' online behavioural patterns, sequential analysis has also been applied to analyse learners' dialogue and classroom discourse sequences.

In the online learning context, researchers have utilized lag sequential analysis and clustering techniques to uncover behavioural patterns and group interactions among online learners (Hou et al., 2010; Perera et al., 2009). Moreover, sequential analysis has been used to reveal differences in inquiry learning processes and the impact of technological support on group inquiry transition patterns (Lämsä et al., 2020). Wong et al. (2019) employed a sequential pattern mining algorithm to explore differences in students' behavioural patterns with and without regulated prompts.

While sequence analysis has primarily been applied in the online field, there are also studies that have analysed learners' dialogue sequences. For instance, Yang et al. (2022) identified meaningful participation patterns in online discussions from a temporal dimension, while Ricca et al. (2019) examined collaborative discourse to uncover temporal patterns of group dynamics. Some studies have also explored classroom dialogue from a temporal perspective, investigating sequential patterns of classroom discourse across different subjects (Furtak et al., 2018; Song et al., 2022).

These previous studies demonstrate the value of sequential analysis in understanding the relationship between learning events over time, particularly in the context of classroom dialogue. It not only reveals the participation of individual teachers and students in

classroom discourse but also facilitates the joint analysis of conversations between teachers and students, shedding light on the types of questions that guide talk moves in the classroom (Amodia-Bidakowska et al., 2023; Song et al., 2022).

This study aims to 1) provide teachers with visualization-supported reports to support their reflection on classroom discourse and 2) employs sequence pattern mining to reveal changes in classroom dialogue during visualization-supported instruction. The analysis firstly examines the questioning strategies employed by teachers and how students respond during dialogic instruction in visualization-supported primary classrooms. Additionally, it investigates the patterns of discourse moves between teachers and students and examines how these patterns evolve over time in visualization-supported primary classrooms. To address these research questions, the study will analyse the classroom dialogue participation of teachers and students separately, as well as compare the joint classroom dialogue interaction between teachers and students to reveal changes in classroom dialogue during three-month intervention period.

2 METHODS

2.1 Context

The study was conducted in second-grade ICT classes at a local primary school in Hong Kong, China. The participating teacher had over ten years of experience in teaching ICT but had not previously used APT or visualization-supported tools in teaching. The class consisted of 20 students, with an average age of 8 years, including an equal number of boys and girls. Informed consent forms were obtained from the parents of the participating children and the school.

The classroom instruction spanned a period of four months and aimed to develop students' logical thinking and programming skills through visual programming using Dash robots. Before the teaching began, the teacher was introduced to the core concepts of APT and communicative strategies, with examples provided for better understanding. The basics of visualization analytics technology were also explained to ensure the teacher's comprehension of the visualization reports. Throughout the experiment, the teacher received visualization-based reports from the classroom dialogue analyser via email. Biweekly workshops were conducted to assist the teacher in analysing and understanding the content of the visualization-based reports, with targeted explanations on the use of APT to improve classroom teaching practices.

The classroom instruction data were used to analyse the sequence of classroom dialogue and focused on two inquiry topics: Dash for dancing (topic 1) and Dash for food delivery (topic 2). Dash for dancing involved students using programming to enable Dash robots to follow music and perform simple dance steps, representing their initial attempts at controlling Dash. Dash for food delivery required students to use visual programming to control Dash robots in delivering food and announcing the dish's name, representing their second attempt at controlling Dash. Each topic comprised four videos, and the teaching structures were similar. Initially, the teacher explained the content and requirements of the topic to the whole class, guiding them through progressively deepening class discussions to formulate visual programming plans. In the subsequent two classes, students worked in groups to explore and practice their programming plans. The teacher allocated time during the cooperative process for students to report on their progress and discuss any challenges they encountered, with the teacher asking questions to stimulate ideas and guide students' thinking. In the final class, students presented their outcomes in groups, and the teacher guided them in summarizing and reflecting on their learning process and achievements. Thus, these two complete classroom videos can to some extent reflect the changes in teacher-student interaction throughout the classroom since the teacher's involvement in the experiment.

2.2 Classroom Discourse Analyser: A Visualization-Supported Tool

The Classroom Dialogue Analyzer (CDA), depicted in Figure 1, was used in this study to support teachers in reflecting on and improving their classroom dialogue through visualization-based analysis (Chen et al., 2015). CDA offers a comprehensive overview of teaching videos, transcribed text, and visualization graphs for each class, allowing teachers to easily understand the frequency of their talk, use of talk moves, and turn-taking dynamics throughout the entire class. After completing classroom sessions, teachers can log into the system to access the visualization analysis of their classroom dialogue. This platform has been previously utilized as a reflective tool in teachers' professional development programs, resulting in positive effects on teachers' talk move usage and students' academic performance (Chen, 2020; Chen & Chan, 2022).

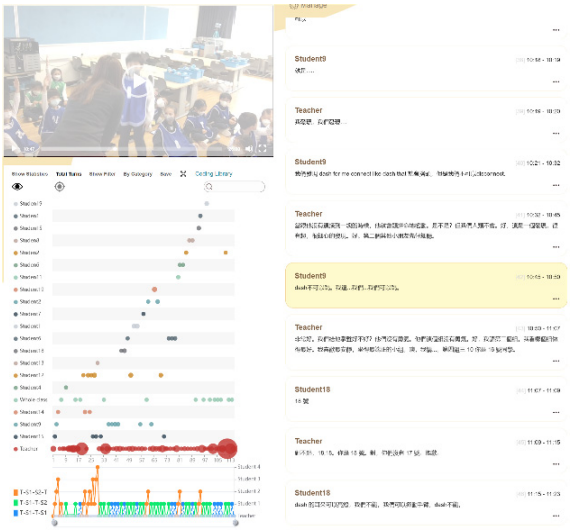

Figure 1: Classroom discourse analyser.

In this study, we generated visualization-based reports for teachers, corresponding to the platform's analysis. These reports, as shown in Figure 2, provided insights into the classroom dialogue between teachers and students, as well as students' overall participation in the class. By comparing these analytics results, we aimed to identify changes in teachers' talk and students' engagement. The analysis reports were then emailed to the teachers. Throughout the experiments, biweekly workshops were conducted, utilizing visualization-based analysis to support teachers in reviewing and reflecting on their classroom practices. This analysis focused on examining talk move usage, students' responses, and the level of student engagement throughout the entire class. Based on these insights, teachers could enhance their instructional strategies in future teaching practices. These ongoing changes and progress were videotaped in this study.

2.3 Data Collection and Analysis

The data collection for this experiment involved eight classroom teaching videos, with an average duration of 32.17 minutes per video. These videos provided comprehensive coverage of the classroom teaching situations and encompassed two complete learning topics conducted over three months. Each topic had an average duration of 128.69 minutes, allowing for a thorough exploration of the instructional content and student engagement within the specified timeframe. The analysis of the video data proceeded as follows:

First, we transcribed the classroom conversations using CDA and manually checked the accuracy of the

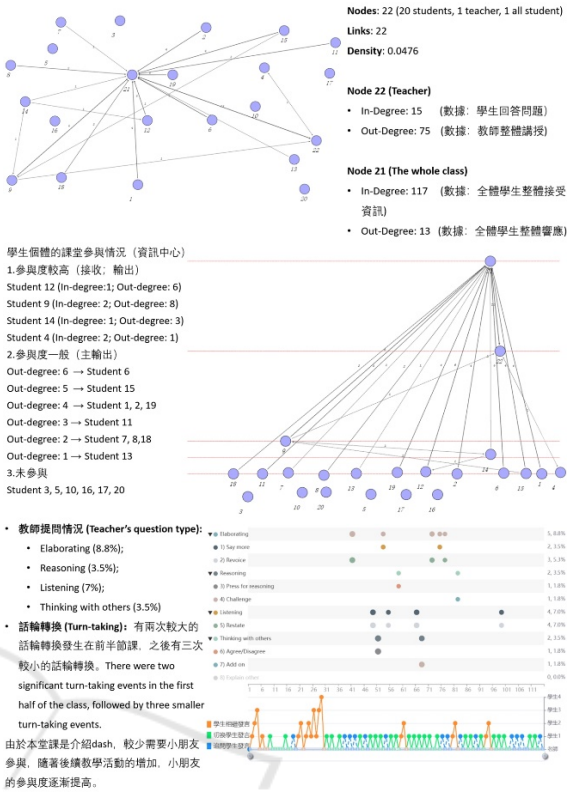

Figure 2: Visualization-based report.

transcribed text. The teacher's classroom dialogue was coded using the APT framework, which is a core dialogue strategy for facilitating productive classroom talk, based on the study by Michaels and O'Connor (2015). For coding student participation in classroom dialogue, we referred to the study by Pimentel and McNeill (2013). Each turn in the dialogue, which consisted of one or more utterances by an individual, was assigned a code. For example, if a teacher used a talk strategy to elicit students' reasoning, it was coded as a turn. A dialogue sequence represents a chain of exchanges containing multiple turns, reflecting the topic-focused discussion between teachers and students (Jin et al., 2016). The specific coding framework and examples can be found in the Appendix. The first author coded all classroom conversations based on turns, while the fourth author coded 50% of the data. The coding consistency coefficient, Cohen's kappa value, was 0.71. In cases of coding inconsistencies, the two coders engaged in negotiations until a consensus was reached.

After completing the coding process, we employed the prefixSpan algorithm, a highly efficient sequential sequence mining algorithm, to extract classroom dialogue sequences (Jian et al., 2001). This

algorithm is commonly used in educational settings for behavioural sequence analysis (Bermudez et al., 2020), personalized recommendation systems (Salehi et al., 2014), and identifying problem-solving patterns (Liu & Israel, 2022). We calculated and identified sequences with a support value greater than 9, along with their corresponding confidence levels. The support of a sequence (X → Y) represents the number of sequences containing items from X followed by items from Y in the sequence set. For example, if the sequence {SAM} appears without intervals before the items from {ELA} for three times, the support of the sequence SAM → ELA would be three. The confidence of each sequence (X → Y) reveals the support of the sequence divided by the number of sequences containing items from X. It can be interpreted as the conditional probability P(Y|X). For instance, if the confidence of the sequence SAM → ELA is 100%, it means that every time teachers use the talk strategy "say more," they always receive a response from students involving "elaboration."

Once the analysis was completed, we compared the frequently used questioning strategies by teachers, the answering strategies of students, and the dialogue interactions between teachers and students across the two topics. These findings are presented in the findings section of this study.

3 FINDINGS

3.1 Teachers' Use of APT

The analysis focused on examining the use of APT employed by the teacher during classroom teaching, as guided by Michaels and O'Connor (2015). The objective was to compare the teacher's usage of APT in the two topics and identify any developmental changes in their ability to foster productive classroom discourse with students over three months.

Upon analysing the teacher's questioning strategies in the two topics, a notable disparity emerged: teachers in the second topic employed a significantly higher number of talk moves compared to those in the first topic. Specifically, topic 1 comprised 87 question sequence sets, while topic 2 encompassed 103 sequence sets. To gain a more comprehensive understanding, we conducted a detailed examination of the teacher's use of each APT tool in both topics. This analysis aimed to facilitate a thorough exploration of the similarities and differences in the implementation of APT between the two topics, as depicted in Figure 3.

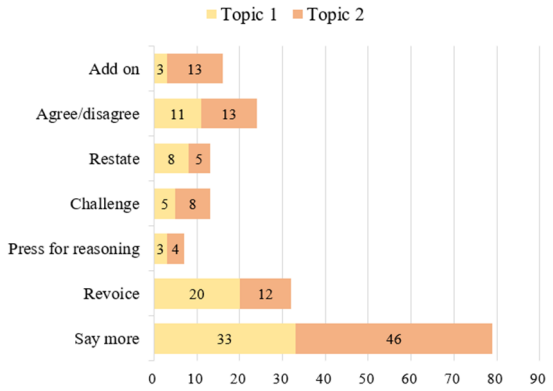

Figure 3: Teachers use the frequency of APT within two topics.

Overall, for both topics, the teacher most frequently employed questioning strategies that guided students to explain their opinions, using talk tools like "say more" and "revoice." Strategies aimed at guiding students to reason, listen, and engage with others' opinions were less frequently used, with slight differences observed between the two topics. To further investigate the variations in questioning strategies between the two topics, a comparative analysis was conducted.

The analysis revealed that in topic 2, the teacher used the strategies of "say more," "press for reasoning," "challenge," "agree/disagree," and "add on" more frequently compared to topic 1. Additionally, a decline in the use of "revoice" and "restate" was observed in topic 2. It is worth noting that the questioning tool "explain with others" was not used in either topic.

3.2 Students' Opportunities to Talk

Analysing students' responses to classroom conversations yields valuable insights into their participation and the influence of teachers' use of APT. Overall, we observed a significant increase in students' engagement in class discussions over three months of visualization-supported dialogic instruction. In the first topic, we identified 86 sequence sets, while in the second topic, there were 104 sequence sets. This indicates that teachers' increased utilization of APT positively influences students' involvement in classroom discussions.

Furthermore, we conducted a detailed analysis and comparison of students' responses during discussions. The results, presented in Figure 4, revealed interesting patterns. In both topics, the majority of students' responses focused on explaining their thoughts without providing reasoning.

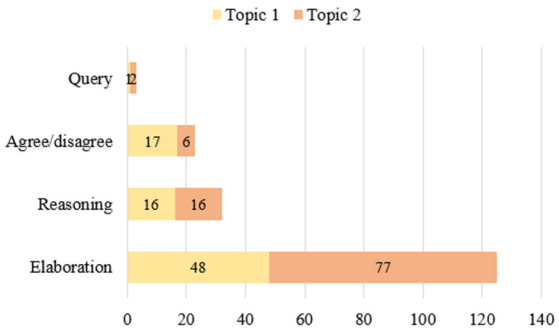

Figure 4: Students' frequency of talking within two topics.

Following that, students often offered reasoning to support their ideas or expressed agreement or disagreement with specific statements. A small number of students' responses deviated from directly addressing the teacher's questions and instead involved raising their own questions to the teacher and their peers.

When comparing the students' responses between the two topics, several notable differences became apparent. In the second topic, students tended to provide elaboration on their opinions without accompanying reasoning, while there was less emphasis on expressing agreement or disagreement with the teacher's questions. However, students' responses to elaboration with reasoning and querying remained consistent across both topics.

3.3 Sequential Patterns of Discourse Among Teachers and Students

The joint analysis of teachers' use of APT and students' responses provides valuable insights into the impact of visualization-supported dialogic instruction on classroom interaction. In this study, we employed a sequential pattern mining algorithm to examine the interaction patterns of classroom dialogue supported by APT, thereby revealing the effectiveness of this dialogue scaffolding on classroom interaction.

Our findings indicate that three months of visualization-based support resulted in more diverse classroom dialogic patterns. Specifically, in the first topic, we discovered 1,161 sequence sets, while in the second topic, the sequence set expanded dramatically to 29,614. This substantial increase in the second topic demonstrates that with the support of visualization, the classroom dialogue interaction patterns guided by teachers assumes an exceptionally rich form.

Table 1: Sequential patterns of teacher-student discourse within topic 1.

Order	Discourse sequence [a]	Support	Confidence
1	2SAM → 1ELA	23	79.31%
2	1ELA → 2REV	14	87.5%
3	2SAM → 1AGD	12	41.38%
4	2REV → 1AGD	11	64.71%
5	1ELA → 2REV → 1AGD	10	87.5%, 71.43% [b]
	.....		
Total		1,161	

Notes.
1. The number of each item in the discourse sequence indicates the speaker role (teacher: 2; student: 1).
2.. The first confidence refers to the confidence level of the first discourse sequence P(2REV\|1ELA), while the second confidence pertains to the confidence level of the second discourse sequence P(1AGD\|1ELA → 2REV).

To further explore the patterns of interaction, we present Table 1 and Table 2, which illustrate the frequent sequential discourse patterns among teachers and students. In the first topic, the classroom activity involved collaborative work with a Dash robot for a dancing task, serving as the students' initial collaborative assignment. The analysis of dialogue sequences in Table 1 revealed that direct communication was the most common sequence, with teachers prompting students to "say more" and students elaborating on their opinions. This sequence had a support of 23 and a confidence of 79.31%, indicating a high likelihood of students providing their thoughts without reasoning when prompted to elaborate. The second most frequent sequence involved the teacher restating children's answers after they expressed their opinions, with a support of 14 and a confidence of 87.5%. Another notable sequence was when students expressed their agreement or disagreement after the teacher elaborated on a judgment and invited further input, with a confidence level of 41.38%. Additionally, a pattern emerged where students would express their agreement or disagreement after the teacher revoiced their expressions and students had finished elaborating on their opinions.

Table 2: Sequential patterns of teacher-student discourse within topic 2.

Order	Discourse sequence	Support	Confidence
1	2SAM → 1ELA	29	87.88%
2	2SAM → 1ELA → 1ELA	19	87.88%, 65.52%
3	2SAM → 1AGD	11	35.48%
4	1ELA →2SAM	11	35.48%
5	1ELA → 2SAM → 1ELA	11	35.48%, 100%
6	2SAM → 1ELA → 2SAM	10	87.88%, 34.48%
7	2SAM → 1ELA → 2SAM → 1ELA	10	87.88%, 34.48%, 100%
8	2SAM → 1ELA → 2REV	10	87.88%, 34.48%
9	2SAM → 2SAM → 1ELA	10	35.48%, 90.91%
10	1ELA → 2REV	10	30.30%
11	2ADD → 1ELA	10	100%
	.....		
Total		29,614	

In the second topic, the classroom interaction of dialogue displayed even greater diversity, as presented in Table 2. The analysis identified eleven high-frequency talk sequences between teachers and students. The highest-ranked sequence resembled the one observed in topic 1, where after the teacher invited students to express their opinions, the students responded accordingly. This sequence had a support of 29 and a transition probability of 87.88%. The second-ranked sequence was closely correlated with the first one, with one student explaining their point of view and another spontaneously adding their perspective. This sequence had a support of 19, and the probability of the second student adding another explanation was 65.52%. The third high-frequency sequence involved the teacher inviting students to explain their opinions and then eliciting their agreement or disagreement, with a support of 11 and a confidence level of 35.48%. Further analysis of the 4th to 7th high-frequency sequences revealed that when students explained their opinions and the teacher asked them to continue explaining, there was a 100% probability of obtaining a clearer explanation. This indicates that teachers who frequently utilized the "say more" strategy were more effective in facilitating talk moves. Additionally, the 8th and 10th high-frequency sequences highlighted the teachers' frequent use of the questioning strategy "revoice students' opinion." In topic 2, we also found that teachers asked students to add others' opinions. Notably, when teachers invited students to add others' opinions, there was a 100% chance of receiving a more detailed explanation from students. Overall, our analysis of the sequential discourse patterns reveals the impact of APT on classroom dialogue interaction. The utilization of APT, coupled with visualization-based support, not only leads to more diverse conversation patterns but also enhances the effectiveness of teachers in facilitating productive dialogue among students.

4 DISCUSSION AND CONCLUSION

After analysing the conversation data from eight second-grade primary school classes, we observed an increase in the use of APT by teachers, specifically in inviting students to express their opinions, provide reasoning, and support their peers' ideas. However, in topic 2, we noticed a lower frequency of teachers inviting students to restate their peers' answers. Students showed improvement in expressing their ideas with more content, although reasoning was still limited. Furthermore, the need for simple agreement or disagreement responses decreased in topic 2. These findings align with previous research indicating that increased use of talk moves by teachers facilitates students' engagement in meaningful dialogue and critical thinking, thereby enhancing their oral language competences (van der Veen et al., 2017), and promoting higher mathematics achievement (Chen et al., 2020).

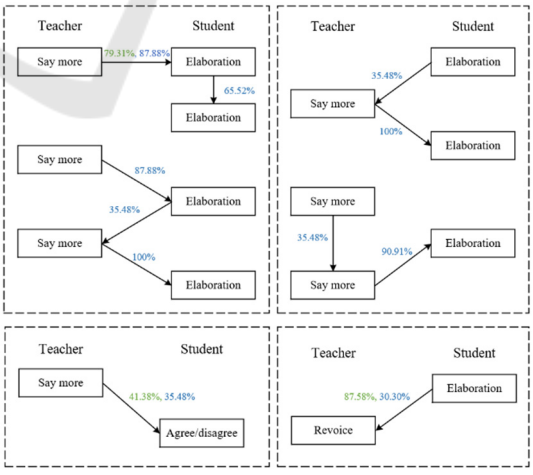

Figure 5: The common high frequent sequential patterns of dialogue within two topics.

Note. In topic 1, confidence is represented by the colour green, while in topic 2, confidence is represented by the colour blue.

Our analysis of frequent dialogue sequences revealed both shared and unique patterns in the two topics, as shown in Figure 5 and Figure 6. Consistently inviting students to elaborate further resulted in more detailed explanations without reasoning. This finding was particularly evident in topic 2, indicating the effectiveness of persistent questioning strategies in facilitating ongoing student engagement and expanding classroom discussions (Orsolini & Pontecorvo, 1992). Revoicing, where teachers rephrase and present students' responses, played a crucial role in facilitating productive classroom discourse and clarifying students' thoughts (Michaels & O'Connor, 2015). After revoicing, students often responded with agreement or disagreement, creating a negotiation space among children (Mercer & Littleton, 2007).

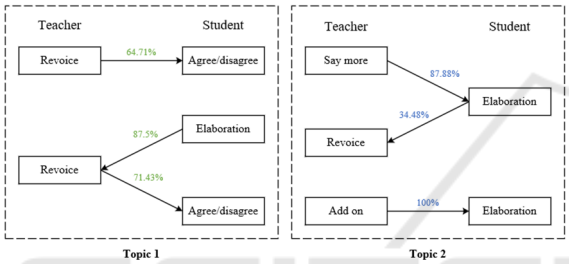

Figure 6: The high-frequent sequential patters of dialogue in topic 1 and topic 2, respectively.

The study demonstrates that dialogic teaching with visual support can optimize dialogue strategies and improve students' participation in classroom discourse. Teachers' increased utilization of talk moves led to more dialogue interactions and a trend towards more productive classroom discourse. However, due to limitations in experiment duration and available videos, advanced talk strategies were not fully explored. Future experiments with extended duration are needed to validate these findings.

In summary, this study highlights the importance of timing in classroom dialogue and the potential of dialogic teaching with visual support to enhance dialogue strategies and student participation. APT by teachers effectively guided students' thinking, while strategies for facilitating student self-expression were also employed. The use of the revoice strategy was prominent, given the young age of the participants (Mercer & Littleton, 2007; Orsolini & Pontecorvo, 1992). As the experiment progressed, the "add on" strategy emerged as a frequently employed questioning technique. Conducting larger-scale and longer-term experiments will provide more comprehensive insights into effective talk moves in educational settings and promote productive classroom discourse.

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APPENDIX

Coding scheme for teachers' questions to the classroom discourse.

Code	Category name	Description	Example
SAM	Say more	Teachers encourage students to generate or expand their opinions.	"Can you give more details about how to set the move distance of the Dash robot?"
REV	Revoice	Teachers rephrase students' opinions and ask for the correctness of their understanding.	"Do you mean humans are more flexible to move than Dash robots?"
PRE	Press for reasoning	Teachers encourage students to explain their opinions.	"Why do you think the Dash robot does not need to replenish energy?"
CHA	Challenge	Teachers guide students to think of a similar or opposite position.	"Does Dash robot always go faster than people?"
RES	Restate	Teachers invite one student to restate other student's answers.	"Can you tell me why they say their restaurant is called Mangrove?"
AGD	Agree/disagree	Teachers ask one student whether they agree with their peers.	"Do you agree with him that the Dash robot needs to deliver meals to customers faster to avoid things getting cold?"
ADD	Add on	Teachers invite one student to add others' thoughts.	"Do you have any other suggestions on accurately operating the Dash robot to move the designated distance?"
EXO	Explain other	Teachers encourage one student to explain the meaning of others' opinions.	"Can you explain why their group's Dash robot route setting deviated from the original design?"
OTH	Others	Not applicable.	"Please look at the teacher with your eyes!"

Coding scheme for students' contributions to the classroom discourse.

Code	Category name	Description	Example
ELA	Elaboration	Students express their complete thoughts without explanation.	"Our restaurant mainly sells breakfast."
REA	Reasoning	Students elaborate their thoughts with some explanations.	"Dash did not go to the designated location because he set the distance shorter in the system."
AGD	Agree/disagree	Students express whether they agree or disagree.	"Yeah", "Agree", "No"
QUE	Query	Students post their questions to others.	"Why is your restaurant called Mangrove?"
OTH	Others	Not applicable.	"I don't know"