



Student Teachers' Discourse During Puppetry-Based Microteaching

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Abstract. This study investigates how puppetry-based tabletop microteaching systems can contribute to student teacher training compared with normal microteaching. The study analyzes student teachers' discourse using a puppetry-based microteaching system called "EduceBoard" introduced to a university class. The analysis included an epistemic network analysis to identify the specific features that influence changes and clarify particular discourse patterns that were found and a qualitative analysis of the discourse data. Results indicate that the puppetry-based microteaching and improvisational dialogs that it elicited enhanced student teachers' practical insights and gave them the opportunity to develop their students' learning and run the class smoothly.

Keywords: Microteaching · Teacher education · Puppetry

1 Introduction

Nurturing students to explore things in a meaningful way, discover problems, reflect on their opinions, and engage in problem-solving alongside their peers is essential for preparing for 21st century society. To prepare for the conversations that will develop these skills in pupils, teachers need to imagine children's various voices, reactions, and questions to such issues [1].

Microteaching is a method of implementing such dialogic pedagogy in teaching. To practice microteaching as a part of teacher training, student teachers are usually introduced into the roles of teachers and students. Playing the role of the teacher allows student teachers to evaluate and improve their classes and teaching skills, whereas playing the role of the pupil gives them a greater understanding of the pupils' psychology in the teaching process [2]. However, previous studies indicate that student teachers roleplaying as students can lead to excessive self-consciousness [3] and evaluation anxiety [4]. Concerns have also been raised about evaluation methods that lead to psychological resistance or inhibition, which can result in over-adaptation [5].

To make the roleplay in microteaching realistic, a puppetry roleplay learning system called "EduceBoard" was created, and past empirical research on the system found that a wide range of students' voices are elicited through puppetry-based microteaching [6]. However, this study did not focus on how these dialogic exchanges occurred and what such changes meant for prospective teachers in teacher education programs. Thus, the present study reveals how the discourse patterns within the EduceBoard puppetry-based microteaching differ from normal microteaching to identify the former's specific effects.

2 Methods

2.1 Target Class and Participants

The practical evaluation included 36 Japanese undergraduates studying to acquire an elementary school teacher's license. The target class was conducted twice, both of which were 3 h and 30 min long. The students were instructed to prepare a teaching plan and materials for their microteaching. The participants were divided into 12 groups of 3 and each participant took turns being in charge of teaching (10 min of microteaching), while the remaining two participants participated as children. Table 1 shows the outline of the target class. In the first and third sessions of the microteaching practice, the participants roleplaying as a teacher taught in front of the whiteboard and pupils studied in front of the teacher in a self-performed format, whereas in the second microteaching practice, all of the students performed with puppets on the EduceBoard system as a group (Fig. 1). In the puppetry session, each participant playing pupils' roles manipulated two pupils' puppets simultaneously. The microteaching was recorded either by a camera or the EduceBoard system.

2.2 Assessment

A coding scheme based on Fujie [7] was created for the present study, the scheme classified classroom dialog structures into two types of utterances: formal utterances (teacher-formal TF, student-formal SF) and informal utterances (teacher-informal TI, student-informal SI; Table 2). If an utterance was considered as a mixture of formal and informal utterances, the coders coded both categories. If utterances from the participants roleplaying as pupils were judged as not having any meaning (such as only "ah" or "umm"), those utterances were coded as other kinds of utterances. The first and

Table 1. Outline of target class.

Time	Activities		
20 (min)	Guidance for announcing the outline of the class.		
10	1 st session: Self-performance 	Self-performed micro-teaching role-play	Student A taught Students B & C. (B & C played pupils' roles)
10		Reflections on their performances while watching the recorded video independently	
20		Mutual feedback discussion while watching video together	
10		Writing short essays independently regarding what they learned in this session	
10		Break	
10	2 nd session: Puppetry on EduceBoard 	Tutorial of EduceBoard system	
10		Puppetry microteaching	Student B taught Students A & C. (A & C played pupils' roles)
10		Reflections on their performances while watching the animation on the Web application independently.	
20		Mutual feedback discussion while watching the animation together.	
10		Writing short essays independently regarding what they learned in this session	
10	Break		
10	3 rd session: Self-performance 	Self-performed micro-teaching role-play	Student C taught Students A & B. (A & B played pupils' roles)
10		Reflections on their performances while watching the recorded video independently	
20		Mutual feedback discussion while watching video together	
10		Writing short essays independently regarding what they learned in this session	
10		Reflections	

fourth authors independently coded each microteaching utterance in accordance with the coding scheme (Cohen's kappa coefficient = .874). Table 3 shows quantified utterances classified into each relevant category and utterances coded for more than one category.

To conduct an epistemic network analysis (ENA; Shaffer [8]), ENA 1.5.2 (Marquart et al. [9]) was used to quantitatively analyze the discourse pattern in the microteachings and identify the characteristics of possible changes. ENA is a quantitative ethnographic method used for modeling the structure of speech, which can quantify and model the co-occurrence of codes in a conversation, provide a relevant visualization for each unit of analysis throughout the data, and create co-occurrence weighted networks. In this study, the structure of the utterance chain was quantitatively analyzed to study the changes that occurred in all three samples of microteaching and analyze the qualitative content using the feature values. Four codes were used in the ENA: TF, TI, SF, and SI. The number of the microteaching session and the conversation number and follow numbers used for the dataset for each group were included in the analysis. When differences were identified in the ENA, the strength of the co-



Normal microteaching



puppetry-based microteaching

Fig. 1. Normal microteaching and puppetry-based microteaching.

Table 2. Definition of utterances in roleplay microteaching [7].

Utterances	Definition
Teacher-Formal (TF)	A teacher's utterance that follows his/her lesson plan or is academic related
Teacher- Informal (TI)	A teacher's utterance based on his or her individual experience and reaction to the students
Student-Formal (SF)	A student's utterance that follows the teacher's instructions or is academic related
Student- Informal (SI)	A student's utterance based on his or her individual experience and intention (not academic)

Table 3. Total number of categorized sentences according to utterances in the discourse.

	1st (Self-performance)	2 nd (Puppetry)	3rd (Self-performance)
Teacher-Formal (TF)	992	1494	1153
Teacher-Informal (TI)	111	529	276
Double-coded utterances (included in TF & TI)	45	206	112
Student-formal	597	603	731
Student-informal	223	342	409
Double-coded utterances (included in SF & SI)	61	44	109

occurrence connection between the individual codes was mentioned as a feature of the discourse network to be further examined. The package rENA was used to calculate and compare the intensity of individual co-occurrences of any two codes (i.e., between the first and second data points and the second and third). This process made the isolation of any connection between any two codes for any individual, group, or set of groups possible. Comparing individual connection strengths made it possible to determine whether statistically significant differences existed between two groups for any given connection in an ENA network, even when no statistical differences exist between groups on the ENA dimensions. In addition, this approach can be used to compare individual connection strengths to quantify the extent to which different connections contribute to statistical differences between groups along an ENA dimension. This approach is particularly useful when an ENA model has many connections and is hard to interpret visually and in studies where researchers focus on the differences in theoretic connections, connections detected in qualitative analysis, or those that emerged as important when conducting an ENA. Therefore, this approach was used to identify a number of factors affecting the discourse network of microteaching by identifying the statistical differences among the three microteaching sessions. Furthermore, the discourse from the puppetry microteaching session that have significant differences in the co-occurrence connection strength analyses were qualitatively analyzed.

3 Results and Discussion

3.1 Results of the ENA

The ENA results are summarized in Fig. 2, which shows the first (self-performance), second (puppetry), and third (self-performance) ENA networks. The findings show that the TF-SF connection was the strongest and some of the other connections seem to have differences when comparing the different microteaching sessions. Figure 3 shows the differences between the first and second discourse networks and the second and third. Strong co-occurrence relationships was found for the second time in TF-TI, TF-SI, and TI-SI connections, whereas the TF-SF connection was stronger for the first and

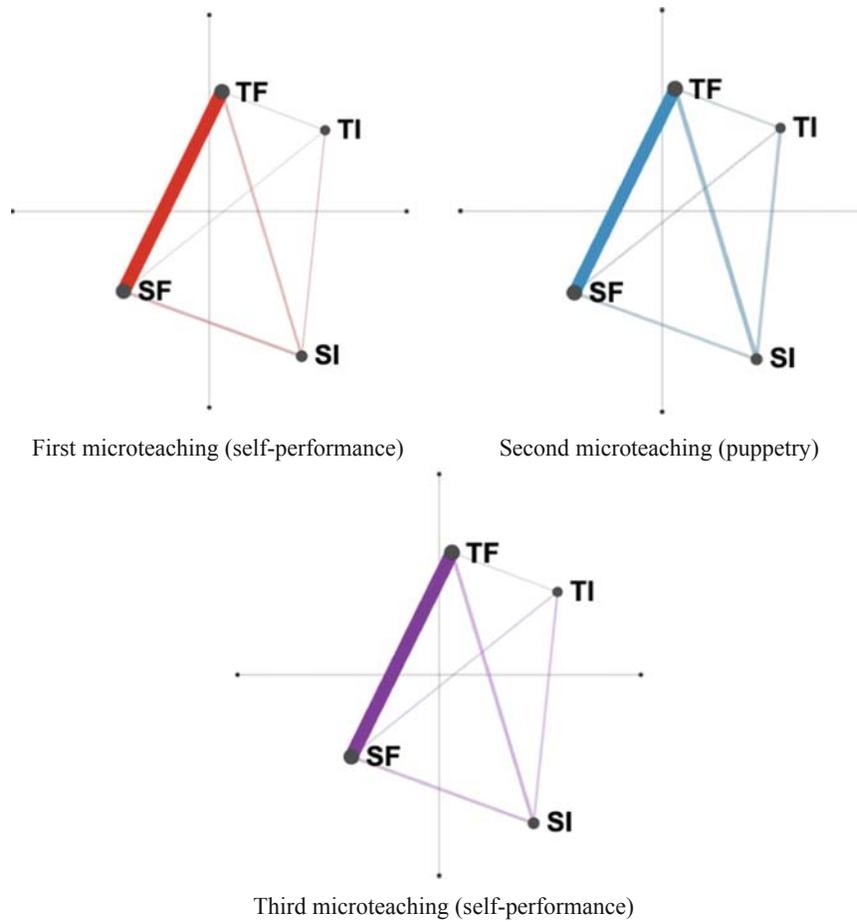
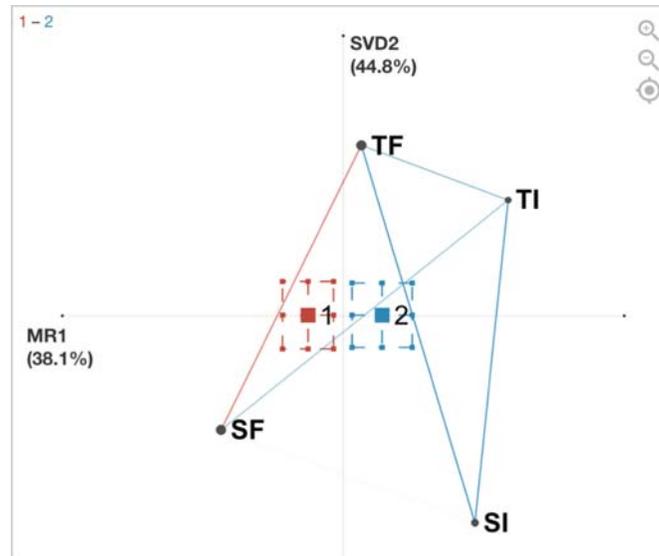


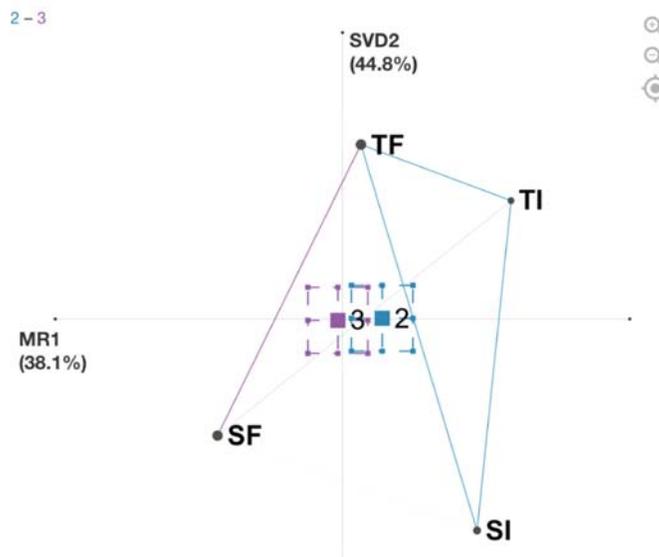
Fig. 2. First (self-performance), second (puppetry), and third (self-performance) microteaching discourse networks according to the ENA.

third times. The TF-SF connection consists of a normative IRE sequence [10]. These differences indicate possible significant changes in TF-SI, TF-TI, and TI-SI due to the puppetry microteaching.

Figure 3 shows that the mean of the plotted points of the discourse network fluctuate in each of the three rounds. When the differences between the first, second, and third rounds were measured with ENA, a significant difference was found along the X-axis between the first and second rounds (Mann-Whitney's $U = 931.00$, $p = .000$, $r = .48$) and the second and third rounds (Mann-Whitney's $U = 456.00$, $p = .03$, $r = .30$). This finding suggests that a significant discourse structure fluctuation occurred, especially during the puppetry microteaching session. As shown in the figures, the second microteaching session elicited a co-occurrence network with more connections to informal utterances. To investigate how such a significant fluctuation



Differences between the 1st (self-performance) and 2nd (puppetry) discourse networks



Differences between the second (puppetry) and third (self-performance) discourse networks

Fig. 3. Differences observed in the ENA between the first (self-performance) and second (puppetry) discourse networks and the second (puppetry) and third (self-performance) discourse networks.

was generated, a Freedman's test was conducted using rENA on the strength of the co-occurrence connections between codes for each session. The results revealed a significant difference among the three microteaching sessions. In particular, the

strength of the co-occurrence connections of TF–TI ($\chi^2(2) = 6.167, p = .046$, Cramer's $V = .72$) and a small yet significant difference in the co-occurrence of TI–SF ($\chi^2(2) = 5.167, p = .076$, Cramer's $V = .66$) was observed. Although the TF–TI co-occurrence network was higher in the second session due to the increase of double codes, the high co-occurrence of TI–SF still needed to be investigated by focusing on the puppetry microteaching discourse to identify the kind of specific discourse prompted in this context.

3.2 Content Analysis of TI-SF

We used ENA webtool to analyze the puppetry-based microteaching discourse containing the co-occurrences of TI–SF. The categories chosen for the analysis were generated from the dialog in a bottom-up manner, and the syntactic break (e.g., the end of the sentence) was chosen as the end of the conversational turn. Six categories were chosen, which will be discussed at length in the following subsections.

3.2.1 Confirming the Children's Understanding in a Group

This category included scenes where participants roleplaying as teachers asked questions using the puppets to confirm pupils' understanding. The participants roleplaying as students played various children similar to a real classroom setting. The following is an excerpt from an arithmetic class, which discussed how to find the sum of four rectangular angles (Teacher is teacher role student, and Child is pupils role student.). The student playing the teacher role asked child questions such as “who understands?” or “Do you understand?”. Then based on their reactions, the student playing the teacher role told the children that the figure is a rectangle or that the sum of the angles can be obtained when the four angles are combined only by hints:

Child 1: Yes (SF)
 Teacher: And who understands that [pointing to a rectangle] angle? (TF)
 Teacher: Is it a rectangle? (TF & TI)
 Child 2: Angle ... (SI)
 Teacher: How much would it be if the four were combined? (TF)
 Teacher: Do you understand? (TF & TI)
 Child 1: There are four 90 s ... I guess I should multiply. (SF)

3.2.2 Instructions for Children in a Group

This category included scenes where the teacher deals with a group of students with different learning levels and capacities. The example below is an excerpt from an arithmetic class where students struggle with addition and their calculations were wrong. Accordingly, the teacher improvised by instructing the student to use their hand:

Teacher: So, with your left hand? Because it is “2”? (TF & TI)
 Teacher: Let's do the same as me everyone. (TF & TI)
 Teacher: Raise your hand. (TF & TI)
 Child 3: Well. (SF)

In the puppetry-based microteaching, there were children with various degrees of understandings, so the student playing the teacher role needed to watch his/her pupils and to teach them in an improvised manner.

3.2.3 One-to-One Interactions Regarding a Child's Understanding

This category included teachers' one-to-one interactions with children who are struggling to understand in a group setting. The following excerpt is from the arithmetic class that discusses the area of a circle:

- Child 4: I do not know too. (SI)
 Teacher: Hmm, what do you not understand? (TI)
 Teacher: Well, you could draw a circle, right? (TF & TI)
 Child 5: I could draw a circle. (SF)
 Teacher: Could you draw a circle? (TF & TI)
 Teacher: Oh, fan-shaped ... Do you know where the fan-shapes are? (TF & TI)
 Child 5: Here, here, here, here, and here? (SF)

The student playing the teacher role did not only teach the whole of the class as described in Sects. 3.2.1. and 3.2.2, but also responded for each pupil's understanding in an improvised manner.

3.2.4 One-to-One Interactions Regarding Class Content

This category included teachers' one-to-one interactions with students about specific topics as part of a class discussion. These comments included an in-depth exploration of the child's remarks, which is usually in the form of the teacher asking the child more questions and replying in an improvised manner to the utterance of each child. The following excerpt is from a Japanese language class where the teacher asks more questions regarding the topic of "wisdom":

- Child 6: Well. (SF)
 Child 6: I, grandma's, grandma's wisdom, I have read. (SF & SI)
 Teacher: Grandma's wisdom? (TF & TI)
 Teacher: Oh. (TF & TI)
 Teacher: Grandma's wisdom ... (TF & TI)
 Teacher: Do you understand what that means? (TF)
 Child 6: Well, maybe not, Grandma has a lot of wisdom because she has been alive so long. (SF)
 Child 6: So, when I burned myself she applied aloe to my wounds. (SF)
 Child 7: Oh, there is aloe; there is aloe. (SI)
 Child 7: I am a growing aloe. (SI)
 Child 8: Oh, it's amazing. (TI)

Thus, in order to deepen the children's remarks, the student playing the teacher role drew remarks from the children by asking them more questions. The student playing the teacher role was required to accept the utterance of each child and to speak in an improvised manner that leads to learning. In the above-mentioned excerpt, the student playing the teacher role asked them to say what the grandmother's wisdom specifically means, and to share it with the class, so that the class theme of "what wisdom is" would be addressed. As mentioned above, the student playing the teacher role was able to experience enriching the class-wide conversation by talking with each child in an improvised manner.

3.2.5 One-to-One Interactions Regarding Discipline

This category included scenes where children required extra guidance regarding discipline. The following excerpt is from a Japanese language class where one child was instructed to listen more attentively to another child:

Teacher: I'm sorry Hana-chan, would you like me to say it one more time? (TF & TI)

Teacher: Well then. (TF & TI)

Teacher: I'm listening to Sho-kun attentively. (TF & TI)

Child9: Well. (SF)

Child10: Mameta was able to go to the Buddha's place, but after all [inaudible]... I think that he is a coward because he did not change his mind that he relied on his grandfather. (SF)

Thus, in the puppetry-based microteaching, student teachers playing pupil roles played various types of pupils who do not necessarily listen to their teacher's instructions. The student teacher playing a teacher role is required to respond to such situations in an improvised manner. In the above situation, the student teacher playing the teacher role noticed that there would be pupils who did not listen to other children's remarks and could experience giving instructions to such problematic pupils.

3.2.6 Summary

In the puppetry-based microteaching, all five of the categories discussed above required the participants roleplaying as teachers to improvise their responses to participants roleplaying as students. In a real classrooms, teachers constantly attempt to deepen their students' learning and conduct their classes smoothly. Teacher training can reflect this reality and improve teacher professionalism and confidence. As Sato [11] concluded, teachers' professional competencies are made up of practical insights requiring reflection, including (1) improvisational thinking, (2) situational thinking, (3) multidimensional thinking, (4) contextualized thinking, and (5) reflective thinking for frameworks. In puppetry-based microteaching where participants roleplay as students and teachers, classes do not proceed according to the prepared teaching plan as they do in normal microteaching training. This context allows for random events and examples of learning to occur. It also allows student teachers to practice responding to changing situations, respond in improvised ways, and get more involved. The EduceBoard system provides a more authentic, less scripted simulation of classroom involvement for teachers. Having these experiences as part of teacher training can thus contribute to the improvement of the student teacher's professionalism.

4 Conclusion and Future Issues

This study aimed to analyze the discourse patterns used in a puppetry-based microteaching system (EduceBoard [6]) as part of a university class for student teachers. We hoped to clarify how puppetry-based microteaching changes the learning discourse and how this influences students who wish to become teachers. The results show that the EduceBoard system used for microteaching elicits a great variety of voices that are more realistic to a classroom setting compared with normal microteaching training. As part of the exercise, student teachers roleplaying as students were engaged in improvised dialogs with student teachers roleplaying as teachers. This

process gave student teachers the opportunity to reflect on microteaching and develop practical insights.

Further analyses of the results still need to be conducted, including an analysis of the students' reflections after participating in microteaching training.

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