DIALOGUES IN FORMAL COMMUNICATION: A STUDY OF STUDENTS' TALK IN A D&T UNIT IN INDIA

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Communication is an important element of schooling and yet it receives little attention in the regular classroom teaching and learning contexts. According to Kimbell (1991) communication plays an important role in any design and technology activity and is essential at various stages in the Design-Make-Appraise approach. The study being reported here was conducted with Indian middle school students in three socio-cultural settings and focuses on communication aspects that were specifically built into a design and technology unit. It examines the nature of dialogues that students engaged in on two occasions – formal communication of design and reflections on the product. The recordings of students' talk were analysed using a modified form of the categories developed by Dawes et al (1992). This paper reports differences in the kind of talk that emerged among boys and girls within a setting and among students across the three social settings in the unit on puppetry.

INTRODUCTION

The present paper is part of a larger project at the Homi Bhabha Centre for Science Education, involving the development and trials of Design and Technology (D&T) units for Indian middle school students. The project aims at developing technological skills and content knowledge through collaborative learning. Communication - both structured (planned by the researchers) and unstructured (informal communication between the students) was an essential aspect of these D&T units. This paper attempts to examine the nature of dialogues between students working in groups on a D&T unit, at two different stages of the unit.

In the last decade or so, there has been a growing interest in investigating learning as a social process. This approach to studying learning proposed by Vygotsky and others emphasizes 'communities of practice' (Vygotsky,1978; Lave,1988). It considers communication as 'internalization of action' and as important in constructing knowledge (Rogoff, 1998). Solomon and Hall (1996) state that "Language is vital for almost all learning, for describing shapes, anchoring concepts, and making the tacit articulated….." Ability to use language is central to children's overall development and specially in developing technological capability. Communication in collaborative technology tasks involves verbal discourse, non-verbal interactions (sharing, gestures) and graphicacy skills that include writing and drawing (Dillenbourg et al, 1996). In design and technology, verbal communication is needed for 'articulating tasks that cannot be represented graphically' (Medway, 1994).

Given the importance of discourse in socio-cultural perspectives of learning, Wegerif and Mercer (1996) have analysed different types of discourse that occur when children reason together to solve problems. In these studies emphasis is placed on how language mediates the way knowledge is constructed. A coding scheme for analysing dialogues developed by Dawes et al (1992) was modified in our study to identify the types of talk that occurred when students engaged in collaborative D&T tasks. These discourses are considered to be 'social modes of thinking' that guide the construction of knowledge (Mercer, 1995) and include: (a) Disputational talk (b) Cumulative talk and (c) Exploratory talk. Disputational talk is characterized by; disagreements, challenges, direct rejections and individualized decision-making. There are few attempts to pool

resources or to offer constructive criticisms. In cumulative talk, students construct uncritically, a common knowledge by accumulation. It maintains group cohesion through confirmations, but does not produce critically grounded knowledge. During exploratory talk students engage critically but constructively with others' ideas, reflect on their work, make suggestions for joint understanding, justify challenges, and offer alternative hypotheses. The last kind of talk has been characterized as the embodiment of critical thinking by Dawes et al (1992).

D&T UNITS AND THEIR TRIALS

The overall approach of our D&T units was a modified form of the Design-Make-Appraise approach suggested by Kimbell (1994) and is presented as a model elsewhere (Choksi et al, 2006). The units were collaboration and communication centered, in which students needed to work on tasks that were connected with their immediate social context and were specifically designed for use among mixed ability students, both boys and girls, in different socio-cultural settings. Three units were tried out. The bag-making unit in which technology was characterized as a product (artefact) and could be done by an individual, though a group was involved in the process. The windmill unit required students to make a working model of a windmill to lift weights and test it. This activity was more complex, having many sub-parts and needing more mental and physical work. The third unit on puppetry (making a puppet and putting up a puppet show) was based on a systems approach to technology. Each group had to make a puppet and all the puppets made by all the groups were needed to put up a show, thus introducing a second level of collaboration.

In the trial of each D&T unit, around 20-25 students of Grade 6 (11-14 years of age) worked together for about 15 hours across 5 sessions. To bring in diverse socio-cultural contexts, 3 clusters were chosen: English medium students from an urban school, Marathi medium students from an urban school, and tribal students from a government-run residential Marathi medium school (*ashramshaala*) located at a distance of about 60 kilometers from the city of Mumbai. The units were tried in all the three clusters separately (a total of 60-65 students). In each cluster there were 2 groups of girls, 2 of boys and 2 mixed groups. To encourage collaborative learning students worked in groups of around 3-4 members each. The number of boys and girls participating in the trials were equal. Video records and detailed field notes were maintained during the trials of the units.

STRUCTURED COMMUNICATION IN D&T UNITS

Special attention was paid to communication aspects during planning of the units. Steps were built into the activities, which explicitly required the students to communicate, both orally and in writing. These steps called 'structured communication' were aimed at helping students strengthen their language and communication abilities. These steps were:

a) Suggest different words for the object/artefact to be made, in any language that they know

b) Write poems/ descriptive paragraphs on the activity/artefact being undertaken

c) Make sketches of the conceived artefacts as well as draw step-by-step procedures for making it (details in another paper by Khunyakari et al, in press)

d) Formal oral communication of the group's designs to the cluster *(design communication)*

e) Formal oral communication by a group after the product was made and evaluated by the group *(product communication)*

The framework of analysis for this paper focuses on the formal oral structured communications built into the D&T units (points d and e mentioned above) that occurred between students during various phases of trials of puppetry unit.

ANALYSIS

Communication is an important element of any design activity (Kimbell et al, 1991) and is essential at various stages in the Design-Make-Appraise approach. While informal communication between group members helps in gathering information, generating ideas and sharing them with other members in the group, formal communication provides an opportunity for sharing ideas with the entire cluster and getting their feedback to improve the design and the product (Refer Figure 1). During formal communication all the members of a group came to the front of the classroom and in the process of communicating they played different roles (e.g, one introduced the group, one displayed the design/puppet etc).

During the puppetry unit, formal oral communication happened at two stages: design communication and product communication. Design communication occurred after students had designed their puppet and it involved describing their ideas/designs of the puppet to the cluster. The designs were a result of brainstorming within the group and were represented through drawings and written descriptions of the puppet character. Here the focus was on conceptualization of the character with an emphasis on the physical appearance of the puppet and its behavioural characteristics. Product communication took place after the making and evaluation of the puppet. The positive and negative aspects of their puppet, the difficulties encountered while making and possibilities for improving their puppet were discussed.

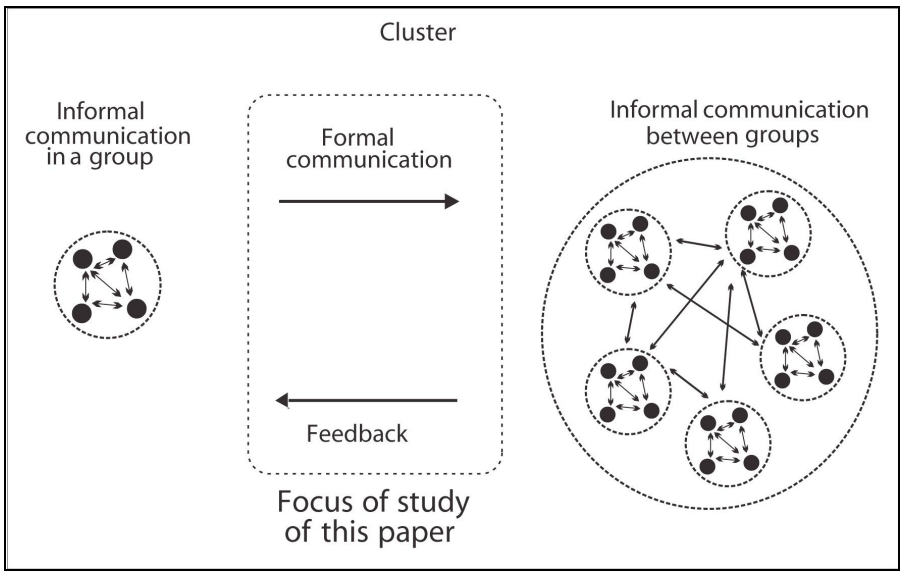

Figure 1: Structured and Unstructured Communication in D&T Units

For analysis video data were transcribed and the transcripts of the formal communication were coded. The unit of analysis selected was one complete or incomplete sentence uttered by a student at the time of formal communication. Two researchers in the team coded the transcripts

independently. Inter-rater reliability for design communication was 82% and for product communication was 67%. An illustrative excerpt from the transcript of the Urban Marathi cluster during product communication is given below:

Audience:	What have you done to make her [the puppet] look like a queen?	Challenge (D)
Audience:	What is her name?	Information (C)
	(Ignoring the question, continues to read from his file, pointing to the puppet) Features of the puppet are- its face is loving [pleasant]	Information (C)
	(answering the previous question) [We have given her] crown, as she is wearing a green saree, she looks like a vandevi (forest deity).	Justification (E)
	And she has long hair made of cloth.	Information (C)
	First we had made hair with wool, then it was not looking long so we made it with cloth	Reflect (E)
	The crown has a rakhi [stuck to it] and so…..	Information (C)
Audience:	The character is vandevi, is its name also vandevi?	Information (C)
All (P1-P4):	Yes (nodding)	Confirmation (C)
Audience:	In the materials list you had said that you required a sketch pen, but where have you used it?	Challenge (D)
	The threads at the back [for hair] were colored black with the sketch pen	Justification (E)
	Now we will tell you about the obstacles encountered while making the puppet	Information (C)
	We had difficulties with the saree.	Reflect (E)
	There were problems in sewing.	Reflect (E)
	I sewed it but it opened quickly.	Reflect (E)

Key: C= Cumulative talk, D= Disputational talk, E=Exploratory talk, P= Presenters

While no time limit was set, typically a design communication lasted for 2-5 minutes and a product communication for 4-5 minutes. The analysis of the coded dialogues is given in Table 1. Over all there were more verbal exchanges in the product communication (329) for all the groups across the 3 settings as compared to design communication (202). In the product communication there were more questions from the students and more elaborate answers to those questions. The kinds of questions asked by students in the product communication were also broader (more open ended) and their explanations were more vivid.

Clusters	Design Communication (DC)				Product Communication (PC)				Total (DC+PC)
	D	C	E	Total (DC)	D	C	E	Total (PC)	
U English	4	26	9	39	24	45	45	114	153
U Marathi	0	26	1	27	17	82	68	167	194
R Marathi	2	134	0	136	2	42	4	48	184
Total	6	186	10	202	43	169	117	329	531

Key: D= Disputational talk; C= Cumulative talk; E= Exploratory talk; U=Urban; R=Rural

Table 1: Frequency of the types of talk occurring across the three settings during formal communication of design and product

Overall the Urban Marathi cluster had the maximum interactions (194), followed by the Rural Marathi cluster (184) and the least number of interactions were observed in the Urban English (153). There were statistically significant differences between the urban and rural clusters in the kinds of talk that were observed during design communication. However, no significant differences were found for medium of instruction. Of the three kinds of talk, cumulative talk was most frequent in all the three settings for both design as well as product communication.

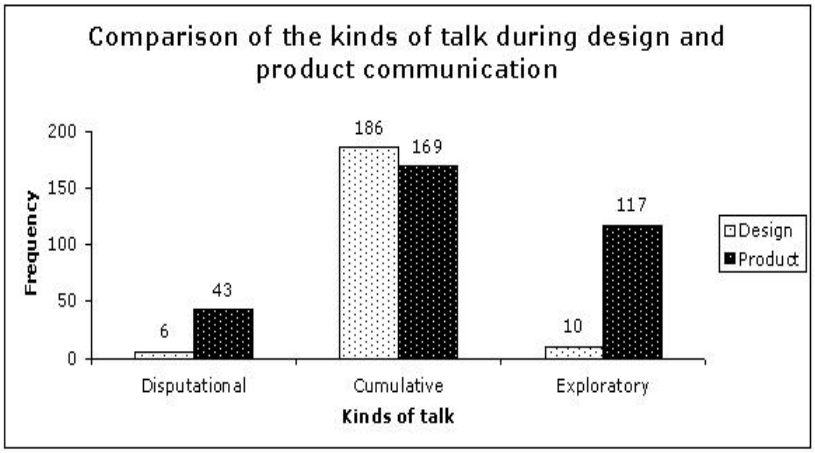

Figure 2: Comparison of kinds of talk

There was a relative paucity of exploratory talk in the design communication (10) and a significant increase in exploratory talk (117) during product communication (Refer Figure 2). Gender-wise comparisons across the groups indicated significant differences in the single sex groups in rural and urban settings for product communication. These findings cannot be generalized due to limitations of number of observations and the context of the D&T unit and further investigations would be required.

Development and enhancement of linguistic and critical thinking skills is one of the primary goals of education. These skills can be developed in students through D&T units with teachers as facilitators in tasks that encourage working together. Students learn from interacting with each other

and their experiences on a variety of tasks that require formal and informal communication, giving and getting feedback as well as incorporating these in their work.

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